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Formulation of Morocco's Digital Tourism Policy: Empirical Evidence from ARDL Bounds Testing

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Abstract. Morocco is among the nations positioning tourism as a key driver of economic and social development. The kingdom has historically implemented various tourism policies, with the most notable modern initiatives being the Vision 2010 and Vision 2020 strategies, both aimed at establishing Morocco as a leading global tourist destination. In recent years, the digital transformation of tourism policies has emerged as a critical factor in enhancing destination competitiveness and sustainability. This study investigates the key determinants shaping Morocco's digital tourism policy through a mixed-methods approach that integrates both qualitative and quantitative analyses. The qualitative analysis, based on policy document examination, explores the perspectives of national policymakers by reviewing government reports and strategic policy frameworks. This approach provides a deeper understanding of the rationale behind national digital tourism policy formulation, the challenges encountered during implementation, and the anticipated impacts on national tourism development. The quantitative component employs the Autoregressive Distributed Lag (ARDL) Bounds Testing model to analyze both long-term and short-term relationships between digitalization indicators and tourism policy formulation. The analysis is based on a dataset encompassing key macroeconomic and technological variables, including digital infrastructure, online tourism services, and e-governance. The study's findings reveal that variables related to the digital transition, such as digital marketing, online public services, e-government, broadband penetration, and ICT investment, have strong and statistically significant positive effects on tourist arrivals in Morocco. These effects are observed in the short term through improved visibility and accessibility of the destination, and in the long term through the development of structural digital infrastructure and digital governance in the tourism sector. Moreover, the ARDL bounds test results confirm the robustness of the model, the existence of cointegration relationships among the variables, and strong explanatory power, thus providing empirically grounded recommendations to guide Morocco's future digital tourism policy.

Keywords : *Digital-tourism-policy, Tourism-development, Tourism-digitalization, Econometrics, Morocco.*

1. Introduction

Studies on Moroccan tourism policy digitalization are rare, yet their necessity is becoming increasingly urgent as digital transformation reshapes how destinations worldwide are marketed, managed, and governed. Morocco's tourism sector characterized by its rich cultural heritage, diverse natural landscapes, and a mix of public and private stakeholders, faces both significant opportunities and challenges in adapting to this shift.

In this regard, Morocco ranks among the nations that have strategically positioned tourism as a cornerstone of economic and social development. Over the years, the country has implemented

various tourism policies, with Vision 2010 and Vision 2020 standing out as the most significant. These initiatives aimed to establish Morocco as one of the world's premier tourist destinations (García, 2018).

The COVID-19 crisis in 2020 dealt an unprecedented blow to the sector, leaving it unprepared for the severe downturn. Tourist arrivals plummeted by 79%, with only 3 million visitors recorded. Likewise, tourism revenues shrank by 54%, dropping to 36.5 billion dirhams compared to 2019 levels (OBST, 2022) (Mirar, et al., 2023). In response, the Ministry of Tourism launched a recovery program in August 2020, introducing 21 measures designed to achieve three main objectives: preserving the economic structure and employment, accelerating the recovery process, and laying the foundation for a more sustainable tourism sector (MTAESS, 2020) (Didast, et al., 2023).

Despite its evident fragility, Moroccan tourism has demonstrated remarkable resilience. In 2024, the sector rebounded, welcoming 17.41 million visitors and generating 112.48 billion dirhams in revenue—an increase of 20% and 7.5%, respectively, compared to 2023 figures (OBST, 2025). Notably, these numbers surpass pre-pandemic performance, with 1.53 million more tourists and an additional 25.94 billion dirhams in revenue compared to 2019 (OBST, 2020).

March 2023 marked another significant milestone with the launch of Morocco's operational roadmap for 2023-2026. This strategic plan sets ambitious targets, including attracting 17.5 million tourists and generating 120 billion dirhams in foreign currency revenue. Additionally, it aims to create 200.000 new direct and indirect jobs through targeted interventions across five key areas: air capacity, promotion and marketing, cultural and recreational activities, accommodation infrastructure, and human capital development (MTAESS, 2024).

Recently, Morocco's tourism sector is undergoing a critical transition toward sustainability and competitiveness, particularly in anticipation of the FIFA World Cup 2030, which the country will co-host alongside Spain and Portugal. These destinations are already working to develop their digital tourism policies (Ercan, 2023).

By extension, a digital tourism policy refers to a strategic framework that guides the integration of digital technologies into the tourism sector to enhance efficiency, sustainability, and visitor experiences. It encompasses regulations, incentives, and initiatives that promote the adoption of smart technologies such as Big Data, Artificial Intelligence, the Internet of Things (IoT), and digital platforms in tourism management and marketing of a tourism destination.

Adding, this policy plays a crucial role in the development of Smart Tourist Destinations (STDs) by providing the necessary governance, infrastructure, and regulatory support for digital transformation. By aligning with smart destination projects, digital tourism policies ensure that technology-driven solutions optimize resource use, improve accessibility, enhance personalization, and promote sustainable tourism growth. A well-structured digital tourism policy serves as the foundation for creating interconnected, resilient, and competitive smart tourist destinations.

This study explores the following research question: what are the key determinants of Morocco's digital tourism policy formulation that contribute to the development of a national smart tourism destination? The objective is to identify the main factors shaping future digital tourism policies, evaluate the extent to which past and current strategies have integrated digitalization principles, and pinpoint areas that require further development to enhance Morocco's transition toward a smart tourism destination. Also, two hypotheses are studied:

H1: Moroccan tourism policy documents, including Vision 2010, Vision 2020, and the 2023–

2026 roadmap, incorporate components of digital tourism strategy.

H2: Despite their integration efforts, these Moroccan tourism policy documents do not fully address the key determinants of digital tourism strategy.

To address the research problem and objectives, this paper is structured as follows: it begins with a literature review on digital tourism policies, followed by an examination of the contextual theoretical foundations and the framework of national tourism policies. It then outlines the research methodology, data sources, and econometric modelling approach, presents the results and hypothesis testing, and discusses the policy implications. The paper concludes by highlighting its limitations and offering research perspectives.

2. Literature review of digital tourism policy

By the early 20th century, tourism as an industry had arguably attained a prominent status in the international public consciousness, particularly in the developed world. This was the period when tourism policy formulation began (Lew, et al., 2004). In principle, tourism policy (TP) is defined as a set of regulations, rules, guidelines, strategies, and objectives that provide a framework within which collective and individual decisions are made, directly affecting the long-term development of tourism and day-to-day activities within a destination (Ritchie, et al., 2003).

Tourism policy (TP) plays an important role in many societies, its ultimate goal is to integrate the economic, political, social, cultural benefits of tourism coherently with indigenous communities and internal destinations of countries, in order to improve the local quality of life, and to provide a basis for international peace and prosperity of nations (Edgell, 1990). Adding a TP defines the direction or course of action that a country, region, locality or individual destination plans to take when developing or promoting tourism. In any tourism policy, the fundamental principle is to ensure that the nation derives the maximum economic and social benefits from tourism, with the aim of promoting the development and the quality of life of its citizens (Edgell , et al., 2019) (Biederman , 2007).

The objective of TP is to ensure optimal visitor reception, maximizing benefits for stakeholders while minimizing negative impacts, expenses, and consequences related to ensuring the success of the destination (Ritchie, et al., 2003). Thus, tourism policy aims to create an environment conducive to the provision of high-quality experiences that are favorable to the destination's stakeholders, while preserving its environmental, social, and cultural integrity (Goeldner, et al., 2012).

Tourism policies cover various areas, namely, the role of tourism in the socio-economic development; the destination model that will most effectively fulfill the roles desired by this industry ; visitor stimulation ; availability of infrastructure and access to means of transport ; evolution and maintenance of tourism products ; training of human resources and supply of labor ; determination of regulatory practices towards stakeholders representing the private sector (e.g., hotel chains, airlines, travel agencies) ; establishment of the tax system and environmental restrictions ; subsidies and financing of sector actors ; encouragement of local entrepreneurship, and integration of new information and communication technologies (Goeldner, et al., 2012).

Also, tourism policy as a progressive process of directives, guidelines, principles, procedures and actions established within an ethical framework and which represents the intention of a community (or the nation) to effectively achieve promotional massification, sustainability and competitiveness objectives tourism development (Edgell , et al., 2019). These are the three theories behind every TP framework.

First, the promotional massification theory which aims to increase tourism revenue by encouraging rapid growth, without making the cultural and ecological environment a priority. This occur in the first stage of the destination development, when the tourism activities are favored only by the maximization of economic benefits. These tourism policies enhance mass-tourism model through the grounding of the 3 S (sea, sand, sun) concept which has been a fundamental driver of mass destinations, particularly in coastal areas (Garcia, 2014 p. 21).

Recognizing that mass tourism refers to the large-scale movement of tourists to popular destinations, often characterized by standardized, affordable travel packages, high visitor numbers, and extensive infrastructure development. It typically involves all-inclusive resorts, guided tours, and well-established attractions, making travel accessible to a broad audience. While it generates significant economic benefits, it can also lead to overcrowding, environmental degradation, and cultural homogenization (Guo, et al., 2019 pp. 1-2).

Adding, sustainable tourism policies emerged from international debates on sustainability in the early 1980. Authors on tourism policies noted the major importance of integrating environmental and sociocultural factors into tourism development, such as "Soft Tourism", which made it possible to react to the paradox of "tourism destroys tourism" due to the overexploitation and depletion of resources resulting from mass tourism models. As well as taking into account the quality of local life for the benefit of indigenous communities (Guo, et al., 2019 pp. 1-2).

Knowing that sustainable tourism is a concept of research and experimentation that was theorized in the early 1990s as a response to the Brundtland Report entitled "Our Common Future" published by the World Commission on Environment and Development (Hardy, et al., 2002 p. 475). It is an application of sustainable development objectives to the field of tourism, knowing that this latter is defined as a process aimed at meeting the needs of the present without compromising the ability of future generations to meet their own needs (UNEP, 2005 p. 8).

This sustainability model has seen significant extrapolation into tourism development policy strategies. Sustainable tourism is defined as a positive approach aimed at reducing tensions and frictions created by the complex interactions between the tourism industry, visitors, the environment, and the communities that host vacationers (Khan, et al., 2021 p. 3). Adding, these sustainable tourism policies are guided by the "Tourism in the 2030 Agenda" which aligns with the United Nations Sustainable Development Goals (UN SDGs). These goals particularly emphasize: No poverty (goal 1) ; Zero hunger (goal 2) ; Good health and well-being (goal 3) ; Quality education (goal 4) ; Gender equality (goal 5) ; Clean water and sanitation (goal 6) ; Affordable and clean energy (goal 7) ; Decent work and economic growth (goal 8) ; Industry, innovation and infrastructure (goal 9) ; Reduced inequalities (goal 10) ; Sustainable cities and communities (goal 11) ; Responsible consumption and production (goal 12) ; Climate action (goal 13) ; Life below water (goal 14) ; Life on land (goal 15) ; Peace and justice (goal 16) ; Partnerships for the goals (goal 17) (UNWTO, 2017).

In the early 1990s and the era of post-modern globalization, many changes took place on a global scale, thus favoring the emergence of several forms of tourism. This under an established shift from Fordism (or standardized mass production), to post-Fordism (flexible, specialized and differentiated production). This period of post-Fordist tourism, also called "The New Age of Tourism" is characterized by a hyper-segmentation of demand, flexibility of the actors of production and distribution of the tourism value chain facilitating the adaptation to the trends and preferences of the consumers, the diagonal integration of the companies and tourism clusters (against the vertical or horizontal integration or diversification in the framework of mass tourism) by using new technologies to integrate into the key activities (even outside

tourism) allowing to perpetually approach their target clientele (travel insurance, car rental service, security and accompaniment on site, recovery of valuables, etc.) (Smeral, 1998 p. 374).

This change in the international tourism framework had led to competitiveness-oriented tourism policies built on a combination of the theory of comparative advantages and the conceptual framework of competitive advantages. These two approaches have been widely theorized in tourism literature and enriched by the conceptual model of destination competitiveness developed by Geoffrey Crouch and Brent Ritchie (also known as the Calgary competitiveness model). (Hanafiah, et al., 2019 p. 29). Whose objective is to achieve the capacity, for a destination, territory or space, to achieve and maintain normal or extraordinary sustainable tourism profits comparable to regional and international competitors (Fayos-Solà, 2002 p. 6).

The COVID-19 crisis marked a turning point in global tourism policy, accelerating the shift toward digital transformation as destinations sought to recover and rebuild more resilient tourism models. The unprecedented disruptions caused by the pandemic exposed vulnerabilities in traditional tourism governance, highlighting the need for data-driven decision-making, contactless services, and adaptive policy frameworks. Governments and industry stakeholders recognized that integrating digital tools into tourism policy was no longer optional but essential to ensuring sustainability, competitiveness, and crisis preparedness. As a result, digital tourism policies emerged as a key strategy for managing future uncertainties, improving visitor experiences, and fostering more inclusive and resilient tourism ecosystems (Dionysopoulou, et al., 2021).

One of the most significant changes in tourism policy after the pandemic was the widespread adoption of smart technologies and big data analytics to monitor and regulate visitor flows. In response to health and safety concerns, many destinations developed real-time tracking systems, digital health passports, and AI-powered crowd management tools to ensure compliance with safety regulations while restoring traveler confidence. Mobile applications integrated with AI and geolocation data allowed authorities to track tourist movements, assess risk levels, and provide timely updates on travel restrictions. These measures not only enhanced safety during the immediate recovery phase but also laid the foundation for long-term intelligent tourism management, where digital surveillance and predictive analytics optimize destination planning and crisis response strategies (Baggio, et al., 2020).

The shift toward digital tourism policy also emphasized the importance of contactless and automated services in reducing physical interaction and improving efficiency. Digital payments, biometric identity verification, and AI-powered customer service systems became standard in airports, hotels, and attractions, minimizing health risks while streamlining the travel experience. Many governments incentivized businesses to adopt smart check-ins, virtual concierge services, and AI chatbots, enabling travelers to navigate destinations with minimal human contact. Additionally, the rise of blockchain technology in digital identity verification and smart contracts for travel bookings reinforced the security and reliability of digital transactions, further accelerating the move toward a fully integrated digital travel ecosystem (Lee, et al., 2020).

The digital transformation of tourism policy also enhanced destination resilience and crisis management by equipping policymakers with better forecasting and emergency response capabilities. The pandemic exposed the limitations of static tourism policies that failed to anticipate or quickly adapt to shocks. In response, governments integrated AI-driven predictive models, real-time data dashboards, and early warning systems into their tourism strategies. These tools allowed policymakers to anticipate fluctuations in travel demand, detect emerging risks, and implement rapid-response measures to protect both visitors and local communities.

Additionally, the development of virtual tourism experiences through AI-generated travel guides—provided alternative ways for destinations to remain relevant and engage with global audiences during periods of restricted mobility (Tsaih, et al., 2018).

The post-COVID-19 shift toward digital tourism policy also reshaped the relationship between governments, businesses, and travelers, fostering a more collaborative and technology-driven governance model. Public-private partnerships played a crucial role in funding and developing digital infrastructure, ensuring that digitalization efforts were accessible and inclusive. Governments invested in digital literacy programs and provided incentives for small and medium-sized enterprises (SMEs) to adopt e-commerce, virtual tourism solutions, and AI-driven marketing strategies. Moreover, digital engagement platforms allowed for greater transparency and stakeholder participation in tourism planning, enabling real-time feedback from businesses and travelers to shape more adaptive and inclusive policies (Srisawat, et al., 2023)

Nowadays, a well-structured digital tourism policy plays a crucial role in the development of Smart Tourist Destinations (STDs) by ensuring that necessary infrastructure, governance mechanisms, and regulatory frameworks are in place to support innovation and digital adoption. It helps destinations transition from traditional tourism management approaches to dynamic, interconnected systems where real-time data, automation, and smart technologies drive decision-making, and enhance tourism service delivery (Gozgor, et al., 2024).

Also, a digital tourism policy aims to establish an intelligent destination framework, responding to the objectives of promotion, sustainability and competitiveness theories. By leveraging digital transformation, such a policy enhances mass-promotion strategies, ensures the long-term environmental and socio-economic viability of tourism, and strengthens the competitive positioning of destinations in an increasingly dynamic global market. Adding, the intelligent destination framework is a strategic model that integrates digital technologies, data analytics, and smart governance to enhance the development of tourism destinations. By leveraging real-time data, economic intelligence and interconnected digital platforms, this model enables policymakers, businesses, and travelers to interact seamlessly, facilitating informed decision-making and improving the visitor experience (Kitchin, et al., 2019).

3. Moroccan context and theoretical framework of digital tourism policies

Many developing nations saw the chance to engage in a sector that would boost their economies, like tourism, in the early 1960s, thanks to World Bank orders. In this regard, Morocco is among the countries that have always supported the travel and leisure sector. In fact, the tourist industry, following agriculture, has emerged as a structural vector of the nation's economic and social advancement since the establishment of the Ministry of tourism in 1965 with the 1965/67 three-year plan. Contemporary, two subsequent tourism strategic policies, the 2010 vision and the 2020 vision, were introduced in the 2000s to reflect the kingdom's interest in the travel and tourist industry (Steenbruggen, 2016).

Vision 2010 set out to attract 10 million tourists in 2010, house 7 million foreign visitors in hotels, reach a capacity of 230,000 beds, construct six large seaside resorts as part of the Azur plan, generate 8.873 billion dollars in foreign exchange earnings, create 600,000 new direct jobs, train 72,000 tourism professionals, and raise the tourism sector's share of GDP from 6.5% to 8.0% (García, 2018). Almost 9.3 million foreign visitors including 4.9 million foreign visitors and 4.3 million Moroccans living abroad visited the country at the end of 2010, with 8.18 billion dollars in tourism earnings (nearly to the 2010 vision goal) (WBG, 2024).

The 2020 vision main goal was to rank Morocco among the world's top 20 tourism destinations.

This tourism policy primary goals include: tripling the number of national air passengers; creating 470,000 new direct jobs; increasing tourism revenues to 15.5 billion dollars by 2020; doubling the number of foreign visitors to 20 million by 2020; doubling the capacity of tourist accommodations with the construction of 200,000 new bed places, including 160,000 hotel beds and 40,000 tourist residential properties; and increasing the contribution of tourism GDP to national GDP by two percentage points (García, 2018).

The outcomes were not at all what was anticipated. A total of 9.95 billion dollars was earned from tourism at the end of 2019 from roughly 13 million visitors, including 7.1 million foreign visitors and 5.9 million Moroccans living abroad. Also, tourism directly contributed 7% of the national GDP (12% when considering indirect contributions), created 550,000 direct jobs, and generated nearly 80 billion dirhams in annual foreign exchange travel receipts (MTAESS, 2020) (El Menyari, 2021).

Or, after the Covid-19 crisis, this industry found itself bare-handed, forged from audacity and helpless determination in the face of such a massive shock, with the desire for a quick and fruitful reinvention. Thus, a drop of -79% in arrivals has been recorded to receive almost 3 million tourists. While revenues have decreased by 54% to settle at 36.5 billion dirhams compared to the year 2019 (OBST, 2022) (Mirar, et al., 2023).

In August 2020, a recovery program contract for the tourism sector in the post-Covid-19 phase was established by the Ministry of Tourism, containing a set of 21 measures focused on three major objectives: preserving the economic fabric and employment; accelerating the restart phase; and laying the groundwork for a sustainable transformation of the sector (MTAESS, 2020) (Didast, et al., 2023).

If the observation about the fragility of the tourism sector is correct, then the one about its strong resilience is also true. Namely, 10.9 million tourists visited the country, and 91.3 billion dirhams in tourism revenue were generated during the year 2022. This represents a recovery of 84% and an increase of 15.9% respectively compared to 2019 (OBST, 2022).

In March 2023, the Moroccan government launched the new operational roadmap for 2023-2026, which aims to attract 17.5 million tourists and generate 120 billion dirhams in foreign currency revenue, as well as create 200,000 new direct and indirect jobs through a series of targeted actions across five cross-cutting sectors: air capacity, promotion and marketing, cultural and recreational activities, the national hospitality capacities, and the quality and skills of human capital (MTAESS, 2024).

Additionally, Morocco welcomed a total of 14.53 million visitors and generated 104.6 billion dirhams of tourist receipts in 2023. This represents an increase from 10.9 million visitors and 93.7 billion dirhams in 2022, with a marking growth rates of 11% and 12%, respectively (Tourism Observatory , 2024). Furthermore, the national tourism sector has surpassed its pre-Covid-19 performance, with an additional 1.53 million tourists and 25.94 billion dirhams in revenue compared to 2019 levels (Tourism Observatory, 2020). Despite the pandemic's massive negative impact, the pandemic confirms also the resiliency and the robustness of Moroccan travel and leisure activities.

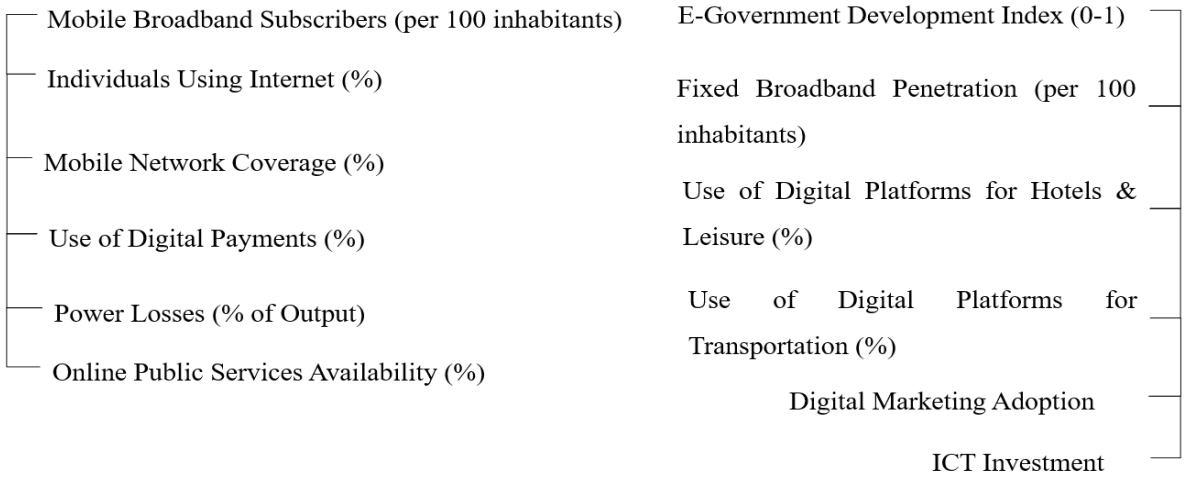
Table 1 : Morocco tourism policies and programs

Year	Tourism history and strategic-policies
1918	Creation of the tourism central committee to create a place for French people to rest. Invest in luxury hotels, transportation, travel administration, and any measure improving the stay of tourists.
1937	Creation of the Cherifian Office of Tourism in charge of the creation, management, and control of tourist hosting and information organizations and the preservation of historical monuments.
1946	Creation of the Moroccan National Tourism Office its mission is to promote and market Morocco as a tourist destination, both nationally and internationally.
1956	Creation of the Ministry of Tourism with the mission of tourism strategic-political governance.
1965 to 1967	Three-year planification plan recognizing tourism as a priority sector for the Moroccan economy after agriculture.
1968 to 1972	Five-year plan focusing on creating middle-market hotel capacity due to the lack of existing capacity.
1973 to 1977 1978 to 1980	Five-year plan and triennial plan designed to encourage mass tourism. In order to accommodate all socio-professional, average-income tourist categories, medium-category hotels—those with three and four stars—have been given preference.
1980 to 1992	1981-1985 plan and 1988-1992 plan: This period was characterized by the application of the structural adjustment program and by the stagnation of tourism, despite the withdrawal of the public sector.
1993 to 1999	This was a period of privatization and non-planning in the tourism sector, with a remarkably stagnation of classified hotel capacity.
2000 to 2010	National tourism policy with the main objective to attract 10 million tourists, indeed 7 million foreign (non-Moroccan) visitors.
2007	Creation of the Moroccan Society of Tourist Engineering – SMIT
2011-2020	New national tourism policy which focuses on sustainability with two core goals, attract 20 million tourists (doubling the market size) and emerge Morocco among the top 20 destinations in the world.

2020-2022	Recovery plan for the tourism sector in the post Covid 19 phase through three major objectives, preserve the economic fabric and employment, accelerate the restart phase, and lay the foundations for a sustainable transformation of the sector.
2023 - 2026	New ministerial operational roadmap with the aim of attracting 17.5 million tourists.

Source : Raffali, 2022; El Menyari, 2021; Almeida-García, 2018

Figure 1 : Conceptual framework of digital tourism pillars from Moroccan context



Source: authors

4. Methodology

This study employs a mixed-methods approach to investigate the key determinants shaping Morocco's digital tourism policy, integrating both qualitative and quantitative analyses to provide a deep comprehensive understanding of the problem. The qualitative component of the research begins with an in-depth examination of policy documents, including key national tourism strategies such as the Vision 2010 and Vision 2020 frameworks, along with more recent digital transformation initiatives in tourism policy. These documents will be scrutinized to identify the underlying objectives, priorities, and strategies outlined by Moroccan policymakers, shedding light on the historical trajectory of digital tourism development in the country.

This analysis aims to uncover the rationale behind the formulation of digital tourism policies, highlighting the motivations for embracing digital tools and platforms to enhance Morocco's tourism sector. Furthermore, this document analysis will explore the challenges policymakers face in implementing digital initiatives, focusing on the obstacles encountered in terms of infrastructure, institutional coordination, and resistance to change. Through this process, the study will also assess the anticipated impacts of digital tourism policies on broader tourism development, examining how these policies align with Morocco's broader socio-economic goals and its aspirations to enhance competitiveness and sustainability in the global tourism market.

The econometric aspect of the study employs the Autoregressive Distributed Lag (ARDL) Bounds Testing model to investigate both the long-term and short-term relationships between digitalization indicators and tourism policy formulation in Morocco. In this sense, The ARDL

approach is particularly appropriate, because it can simultaneously estimate short-term dynamics and long-term equilibrium relationships, even when the variables have different orders of integration. This flexibility is important in the Moroccan context, where the available time series on digitalization and tourism policy variables are relatively short and limited in scope.

The ARDL model is also well-suited for small-sample studies (like one country analysis), making it possible to extract meaningful inferences despite data constraints. Through the Bounds Testing procedure, the model identifies whether a long-run equilibrium relationship exists and measures the speed at which short-term fluctuations adjust toward that equilibrium. This allows for a more precise understanding of how changes in Morocco's digitalization, such as improvements in digital infrastructure, the adoption of online governance platforms, or the integration of data-driven decision-making tools, impact tourism policy formulation over time, offering valuable guidance for policymakers aiming to modernize and optimize the sector's strategic direction.

The analysis is based on a carefully curated dataset that includes key macroeconomic and technological variables relevant to the digital transformation of tourism in Morocco. The data will be drawn from national statistics, international databases, and sector-specific reports, ensuring a comprehensive and robust analysis of the relationship between digitalization and tourism policy. The ARDL model will allow for the examination of both the direct and indirect effects of digitalization on the formulation of tourism policies, providing empirical evidence of how digital transformation has influenced policy priorities and the tourism development trajectory in Morocco.

By combining these qualitative and quantitative methodologies, this study aims to offer a holistic view of Morocco's digital tourism policy formulation process. The findings from the document analysis will provide a detailed understanding of the institutional context, policy motivations, and challenges related to digital tourism in Morocco. Meanwhile, the ARDL model will offer empirical evidence on the impact of digitalization on tourism policy outcomes, highlighting both the short-term adjustments and long-term structural changes in tourism governance.

5. Data and econometric modelling

The analysis in this study relies on a comprehensive dataset that captures key dimensions of Morocco's digital tourism transformation. Given the dual methodological approach adopted, the data comprises both qualitative and quantitative sources, ensuring a robust and multidimensional understanding of the factors shaping digital tourism policy. The qualitative component is built upon policy documents, government reports, and strategic frameworks that outline Morocco's digital tourism ambitions, allowing for an in-depth exploration of policy formulation processes and institutional responses to digitalization challenges.

The quantitative analysis is supported by an extensive dataset comprising macroeconomic and technological indicators relevant to digital tourism development. These include measures of digital infrastructure, online tourism service adoption, e-governance performance, and broader economic variables influencing the tourism sector. The selection of these indicators is based on their relevance to both digitalization and tourism policy, ensuring a comprehensive empirical investigation of their relationship. Data sources include national statistics, international databases, and sector-specific reports, ensuring reliability and comparability across different analytical dimensions.

The data is collected in form of time-series generated through open-sources, especially the

World Bank, the World Economic Forum, and the Organization for Economic Co-operation and Development (OECD) for the for the Moroccan case over the period between 2000-2021. The ARDL bounds testing model used tourist arrivals as a dependent variable expressing national tourism growth.

Table 2 : List of variables and their sources

Variable	**Acronym**	**Source**
Tourist arrivals	TA	World bank
Individuals Using Internet (%)	IUI	World bank
Mobile Broadband Subscribers (per 100 inhabitants)	MBS	OECD
Mobile Network Coverage (%)	MNC	World bank
Use of Digital Payments (%)	UDP	World bank
Use of Digital Platforms for Transportation (%)	UDPT	World bank
Use of Digital Platforms for Hotels & Leisure (%)	UDPHL	World bank
Power Losses (% of Output)	PL	World bank
Fixed Broadband Penetration (per 100 inhabitants)	FBP	World bank
ICT Investment	ICT_INVEST	OECD
Digital Marketing Adoption	DMA	Estimated based on Digital Adoption Index of World bank
E-Government Development Index (0-1)	EGOV	United Nations
Online Public Services Availability (%)	OPSA	United Nations

Source: authors

Table 3 : Unit root test results

Variable	Acronym	ADF test - At First Difference: With Constant & Trend	
		t-statistic	p-value
Tourist arrivals	TA	-3.5941	0.0187
Individuals Using Internet (%)	IUI	-3.0169	0.0560
Mobile Broadband Subscribers (per 100 inhabitants)	MBS	-6.4008	0.0003
Mobile Network Coverage (%)	MNC	-6.6819	0.0001
Use of Digital Payments (%)	UDP	-2.1235	0.2394
Use of Digital Platforms for Transportation (%)	UDPT	-6.2782	0.0003
Use of Digital Platforms for Hotels & Leisure (%)	UDPHL	-5.6923	0.0009
Power Losses (% of Output)	PL	-3.6395	0.0171
Fixed Broadband Penetration (per 100 inhabitants)	FBP	-2.7702	0.2273
ICT Investment	ICT_INVEST	-1.1287	0.0506
Digital Marketing Adoption	DMA	-0.6690	0.3560
E-Government Development Index (0-1)	EGOV	-4.3194	0.0237
Online Public Services Availability (%)	OPSA	-2.8740	0.0720
Individuals Using Internet (%)	IUI	-3.0169	0.0560
Mobile Broadband Subscribers (per 100 inhabitants)	MBS	-6.4008	0.0003
Mobile Network Coverage (%)	MNC	-6.6819	0.0001

Source: authors

- **Empirical ARDL Bounds Test equation:**

The short-run equation for the dependent variable (Tourist Arrivals (TA)) — at time t — is:

$$\Delta Yt=\alpha_0+\gamma_1\Delta Y_{t-1}+\beta_1\Delta IUI_t+\beta_2\Delta IUI_{t-1}+\beta_3\Delta MBS_t+\beta_4\Delta MBS_{t-1}+\beta_5\Delta MNC_t+\beta6\Delta MNC_{t-1}+\beta_7 \Delta UDP_t+\beta8\Delta UDP_{t-1}+\beta_9\Delta UDPT_t+\beta_{10}\Delta UDPT_{t-1}+\beta_{11}\Delta USPHL_t+\beta_{12}\Delta USPHL_{t-1}+\beta_{13}\Delta PL_t+\beta_{14} \Delta PL_{t-1}+\beta_{15}\Delta FBP_t+\beta_{16}\Delta FBP_{t-1}+\beta_{17}\Delta ICT\_INVEST_t+\beta_{18}\Delta ICT\_INVEST_{t-1}+\beta_{19}\Delta DMA_t+\beta_{20} \Delta DMA_{t-1}+\beta_{21}\Delta EGOV_t+\beta_{22}\Delta EGOV_{t-1}+\beta_{23}\Delta OPSA_t+\beta_{24}\Delta OPSA_{t-1}+\varepsilon_t$$

Where:

- ΔY_t: Represents the first difference (change) in the dependent variable — either Tourist Arrivals (TA), Tourist Revenues (TR), or Tourist Nights (TN) — at time t.
- α_0: The intercept or constant term in the equation.
- $\gamma_1\ \Delta Y_{t-1}$: Represent the lagged first differences of the dependent variable — at lag 1, respectively. These capture the short-run dynamics of the dependent variable.

- ΔIUI_t, ΔIUI_{t-1}: Represent the current and lagged first differences of Individuals Using Internet (%).
- ΔMBS_t, ΔMBS_{t-1}: Represent the current and lagged first differences of Mobile Broadband Subscribers.
- ΔMNC_t, ΔMNC_{t-1}: Represent the current and lagged first differences of Mobile Network Coverage (%).
- ΔUDP_t, ΔUDP_{t-1}: Represent the current and lagged first differences of Use of Digital Payments (%).
- $\Delta UDPT_t$, $\Delta UDPT_{t-1}$: Represent the current and lagged first differences of Use of Digital Platforms for Transportation (%).
- $\Delta USPHL_t$, $\Delta USPHL_{t-1}$: Represent the current and lagged first differences of Use of Digital Platforms for Hotels & Leisure (%).
- ΔPL_t, ΔPL_{t-1}: Represent the current and lagged first differences of Power Losses (% of Output).
- ΔFBP_t, ΔFBP_{t-1}: Represent the current and lagged first differences of Fixed Broadband Penetration.
- ΔICT_INVEST_t, ΔICT_INVEST_{t-1}: Represent the current and lagged first differences of ICT Investment.
- ΔDMA_t, ΔDMA_{t-1}: Represent the current and lagged first differences of Digital Marketing Adoption.
- $\Delta EGOV_t$, $\Delta EGOV_{t-1}$: Represent the current and lagged first differences of E-Government Development Index.
- $\Delta OPSA_t$, $\Delta OPSA_{t-1}$: Represent the current and lagged first differences of Online Public Services Availability (%).
- γ_1, γ_2: Coefficients corresponding to the lagged differences of the dependent variable (ΔY).
- $\beta_1, \beta_2, \beta_3, \ldots, \beta_{26}$: Coefficients corresponding to the current and lagged differences of the independent variables ($\Delta IUI, \ldots, \Delta OPSA$).
- ε_t: Represents the error term, capturing the unexplained variation in the dependent variable not accounted for by the model.

The long-run equation for the dependent variable Yt (Tourist Arrivals (TA)) is:

$$Yt=\theta_0+\theta_1 IUI_t+\theta_2 MBS_t+\theta_3 MNC_t+\theta_4 UDP_t+\theta_5 UDPT_t+\theta_6 USPHL_t+\theta_7 PL_t+\theta_8 FBP_t+\theta_9 ICT\_INVEST_t+\theta_{10} DMA_t+\theta_{11} EGOV_t+\theta_{12} OPSA_t+\varepsilon_t$$

Where:

- Y_t: Represents the level of the dependent variable — Tourist Arrivals (TA) — at time t.
- θ_0: The intercept or constant term in the equation.
- IUI_t: Individuals Using Internet (%)
- MBS_t: Mobile Broadband Subscribers (per 100 inhabitants)

- MNC_t: Mobile Network Coverage (%)
- UDP_t: Use of Digital Payments (%)
- $UDPT_t$: Use of Digital Platforms for Transportation (%)
- $USPHL_t$: Use of Digital Platforms for Hotels & Leisure (%)
- PL_t: Power Losses (% of Output)
- FBP_t: Fixed Broadband Penetration (per 100 inhabitants)
- ICT_INVEST_t: ICT Investment
- DMA_t: Digital Marketing Adoption
- $EGOV_t$: E-Government Development Index (0–1)
- $OPSA_t$: Online Public Services Availability (%)
- $\theta_1, \theta_2, \ldots, \theta_{13}$: Represent the long-run coefficients associated with each independent variable (IUI_t, ..., $OPSA_t$). These coefficients capture the long-run impact of each digital and infrastructure-related factor on tourism performance.
- ε_t: Represents the error term, capturing the part of the variation in the dependent variable that is not explained by the independent variables in the model.

6. Results, hypothesis testing and policy implications

The ARDL bounds testing approach was employed to examine both the short-run and long-run relationships between tourist arrivals (TA) and several digital development variables. The dependent variable is tourist arrivals, while the independent variables include Digital Marketing Adoption (DMA), Online Public Services Availability (OPSA), E-Government Development (EGOV), Fixed Broadband Penetration (FBP), and ICT Investment (ICTINVEST). These variables were selected based on their statistical significance in prior unit root testing using the Augmented Dickey-Fuller (ADF) method at first difference with trend and constant.

The long-run form of the ARDL bounds testing model reveals that all five digital-related variables have statistically significant positive effects on tourist arrivals. The coefficients indicate that a one-unit increase in DMA leads to an increase of approximately 42.18 units in TA, while increases in OPSA, EGOV, FBP, and ICTINVEST are associated with rises of 19.89, 37.84, 27.97, and 18.80 units in TA respectively.

These results confirm that digital infrastructure and institutional digital readiness have strong long-term impacts on the growth of international tourism. The positive influence of variables like e-government development and broadband penetration further supports the idea that a well-digitalized public sector and strong internet connectivity play vital roles in facilitating tourism activities.

In the short run, the same set of variables continues to exert significant positive effects on tourist arrivals. The lagged dependent variable (LN_TA(-1)) is also statistically significant, indicating that past values of tourist arrivals influence current values, thus capturing the inertia commonly present in tourism demand. The short-run results are consistent with long-run estimates, highlighting that improvements in digital services and ICT infrastructure can yield immediate benefits in tourism inflows.

Importantly, the error correction term (CointEq(−1) = −1.2853, $p < 0.01$) is negative and highly

significant, indicating a statistically valid convergence toward the long-run equilibrium following short-term shocks. The magnitude greater than one suggests that the adjustment process slightly overshoots equilibrium before stabilizing, which can occur in dynamic models when the correction mechanism is strong. This finding reinforces the stability of the estimated relationships and the appropriateness of the ARDL-ECM framework in this context.

The F-bounds test result supports the presence of a long-run relationship among the variables. The F-statistic (7.68) is significantly higher than the upper bound critical value at the 5% level (3.79), confirming cointegration. This implies that even if the variables are integrated of mixed order (I(0) and I(1)), they move together in the long run, validating the ARDL bounds testing approach.

Model diagnostics further reinforce the reliability of the estimates. The R-squared value of 0.8278 indicates that over 82% of the variation in tourist arrivals is explained by the included regressors. The adjusted R-squared remains strong at 0.6771, even after accounting for degrees of freedom. The model's overall significance is confirmed by the F-statistic (5.49) with a p-value of 0.0143. Additionally, the Durbin-Watson statistic (2.38) suggests the absence of first-order autocorrelation, and information criteria (AIC, SC, HQ) indicate a relatively good model fit.

The analysis confirms the existence of both short-run and long-run effects of digital transformation on tourism development, especially in terms of attracting more international tourist arrivals. Nonetheless, the unusual behavior of the error correction term warrants further examination to ensure the robustness of the findings. If corrected, the model could offer strong empirical evidence for the hypothesis that digital transformation of tourism policies significantly drives tourism demand.

After conducting the empirical test, the study confirms the second hypothesis, which states that Moroccan tourism policy strategies do not sufficiently prioritize or promote digital transformation as a strategic lever for tourism development. Despite the demonstrated significance of digital variables—such as digital marketing adoption, broadband penetration, and the development of e-government services—in driving tourist arrivals, the analysis of policy frameworks reveals a persistent gap between the digital potential and the actual integration of these technologies into national tourism strategies.

The empirical results, grounded in ARDL bounds testing, underscore the positive and substantial effects of digital transformation on tourism growth, yet Moroccan policy strategies appear to underemphasize or marginalize these dimensions. This disconnect suggests a need for a policy shift, wherein digital transformation is no longer treated as a peripheral element but rather as a central axis of tourism planning, investment, and governance. By not planning a digital tourism policy strategic axes or action-plans, Morocco risks falling behind global trends where competitiveness increasingly hinges on the ability to offer connected, responsive, and digitally empowered tourism ecosystems.

While the empirical results show robust positive relationships between digitalization variables and tourist arrivals, caution is warranted regarding potential econometric limitations. First, the possibility of endogeneity cannot be entirely excluded. Reverse causality, whereby higher tourist arrivals might themselves encourage greater investment in digital infrastructure, could bias coefficient estimates. The ARDL approach partially mitigates this risk by incorporating lagged variables, which capture dynamic adjustments and reduce simultaneity bias, yet it does not fully eliminate it. Second, non-significant variables identified during preliminary testing were excluded from the final ARDL specification; the retained variables (DMA, OPSA, EGOV, FBP, ICTINVEST) were selected based on both their theoretical relevance and statistical

significance within the model. Third, diagnostic checks, including the Durbin–Watson statistic, the F-statistic for overall fit, and information criteria, indicate an absence of first-order autocorrelation and a satisfactory model specification. However, given the relatively small sample size (Morocco-only data), the risk of small-sample bias and parameter instability remains. In addition, the negative and highly significant error correction term confirms convergence toward the long-run equilibrium, with a magnitude slightly greater than one suggesting a rapid and occasionally overshooting adjustment process. These specifications imply that while the findings provide meaningful evidence supporting the role of digital transformation in Moroccan tourism development, they should be interpreted with respect to these methodological considerations.

Table 4 : ARDL Bounds Testing results

	Unit root test – ADF (with constant & trend)			
Variables significant at 5%	• Dependent variable: Tourist arrivals (TA) • Independent variables: Digital marketing adoption (DMA), online public services digital availability (OPSA), e-government development (EGOV), fixed broadband penetration (FBP), information and communications technology investment (ICTINVEST).			
Autoregressive Distributed Lag (ARDL) (based only on the significant variables)				
➢ ***Long-Run Form***				
	Coefficient	Std. Error	t-statistic	Prob.
DMA	42.17517	11.98868	-3.517915	0.0079
OPSA	19.88565	8.136795	2.443916	0.0403
EGOV	37.83930	12.37622	3.057420	0.0156
FBP	27.97454	7.544529	3.707924	0.0060
ICTINVEST	18.79745	4.338277	4.332929	0.0025
C (Constant)	0.534860	6.667871	0.080214	0.9380
➢ ***Levels Equation (ECM)***				
CointEq(-1)	-1.285320	0.148511	8.654713	0.0000
➢ ***Short-Run Form (Dynamic Regression)***				
LN_TA(-1)	0.492624	0.190174	2.590384	0.0321
DMA	42.17517	11.98868	3.517915	0.0079
OPSA	19.88565	8.136795	2.443916	0.0403
EGOV	37.83930	12.37622	3.057420	0.0156
FBP	27.97454	7.544529	3.707924	0.0060
ICTINVEST	18.79745	4.338277	4.332929	0.0025
C (Constant)	0.534860	6.667871	0.080214	0.9380
➢ ***F-Bounds Test Results***				

Test Statistic	Value	Significance Level	I(0) Critical Value	I(1) Critical Value
F-statistic	7.682468	10%	2.26	3.35
		5%	2.62	3.79
		1%	3.41	4.68
➢ ***Model Fit Statistics***				
R-squared	0.827775	Adjusted R-squared	0.677078	
S.E. of Regression	0.261902	Akaike Info Criterion	0.465164	
Sum Squared Residuals	0.548743	Schwarz Criterion	0.851458	
Log Likelihood	4.278691	Hannan-Quinn Criterion	0.484945	
Durbin-Watson Stat	2.379830	F-statistic (Model Fit)	5.492974	
Prob(F-statistic)		0.014277		
✓ **The investigation confirms the second hypothesis**				

Source: authors using Eviews-12

7. Conclusion and limitations

This study aimed to critically examine the determinants of Morocco's digital tourism policy formulation and assess their role in the development of a national smart tourism destination. In doing so, it situates its inquiry within a broader context marked by Morocco's long-standing ambition to position tourism as a key pillar of socioeconomic growth. While strategic visions such as Vision 2010, Vision 2020, and more recently the 2023–2026 roadmap have guided tourism development in the country, the findings reveal a fundamental and persistent gap between these policies and the growing global imperative for digital transformation.

Empirical evidence, grounded in the ARDL bounds testing methodology, confirms that digital-related variables—namely Digital Marketing Adoption (DMA), Online Public Services Availability (OPSA), E-Government Development (EGOV), Fixed Broadband Penetration (FBP), and ICT Investment (ICTINVEST)—exert strong and statistically significant positive effects on international tourist arrivals. These effects are visible both in the short term, where digital services quickly enhance destination visibility and ease of access, and in the long term, where structural investments in connectivity and governance underpin sustained growth in tourism inflows. The empirical models exhibit robust explanatory power, with diagnostic tests confirming model reliability, cointegration among variables, and statistical significance of the regressors.

This convergence of quantitative insights underscores a critical lesson: digital transformation is not a supplementary tool but a foundational catalyst for the sustainability, competitiveness, efficiency, and adaptability of tourism systems. Digital platforms, smart data usage, and AI-powered personalization are no longer luxuries—they are prerequisites for appealing to a globally connected, increasingly demanding tourist market. Countries like Spain and Portugal, with which Morocco will co-host the FIFA World Cup 2030, are already aligning their strategies around smart tourism ecosystems. These involve proactive integration of technology into destination governance, service design, and visitor experience.

Yet, a disconcerting disjuncture emerges when juxtaposing these empirical findings with Morocco's tourism policy documents. While recent roadmaps mention innovation and sustainability in general terms, they fall short of framing digital transformation as a strategic policy axis or as a transversal component embedded in tourism governance. There is no clearly articulated digital tourism policy; no structured action plan that integrates smart tourism principles; and no national institutional body dedicated specifically to driving digital innovation within the sector (Except the Smart tourism platform in Souss-Massa region). Digital initiatives, when mentioned, appear fragmented, reactive, and often peripheral to the main pillars of tourism planning.

This reveals a structural policy weakness. Despite having the digital potential—as shown by the increasing broadband coverage and governmental efforts in e-services—the absence of a national vision for smart tourism creates a vacuum. This lack of alignment between the digital capabilities Morocco possesses and the policy orientation it adopts could significantly compromise the country's ability to compete in a landscape where agility, digital responsiveness, and smart experiences are key differentiators. Moroccan tourism policy seems unable to synchronize its strategic direction with the evolving digital reality of global tourism.

Moreover, the unusual result of the error correction term in the ARDL-ECM model, which showed a positive coefficient greater than one. The model struggles to adjust toward long-run equilibrium. Although this anomaly may be technical and resolvable through model refinement.

From a theoretical standpoint, this study reinforces the relevance of policy integration theory and institutional readiness frameworks, which argue that digital transformation must be supported by coherent governance mechanisms, stakeholder coordination, and long-term visioning. Without these elements, even the most advanced digital tools remain underutilized or disconnected from systemic change.

In practical terms, the study calls for the urgent formulation of a comprehensive digital tourism policy. Such a policy should define clear objectives, implementation mechanisms, institutional responsibilities, and evaluation metrics. It must promote public-private partnerships for technology adoption, ensure the digital upskilling of tourism stakeholders, and foster innovation ecosystems at the local level. Particular attention should be given to ensuring that digital transformation contributes to sustainable, inclusive, and culturally respectful tourism development—hallmarks of the Smart Tourist Destination (STD) paradigm.

Morocco stands at a strategic crossroads. It has demonstrated remarkable resilience in rebuilding its tourism sector post-COVID and holds tremendous potential to leverage the upcoming World Cup as a springboard for international visibility. However, without a decisive pivot toward digital policy integration, the country risks stagnation in an era defined by rapid technological disruption. To remain competitive, resilient, and relevant, Morocco must recognize that the future of tourism is smart—and that the foundations of this future must be laid today, not tomorrow.

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