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The Effect of Digital Governance Indicators on Tourism Development in Selected Asian Countries

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Abstract

Digital governance, as an emerging paradigm for managing cyberspace, reflects a set of technical, institutional, and legal mechanisms that governments employ to regulate, monitor, and facilitate the circulation of digital information. In this context, the tourism industry, as a fundamental pillar of economic growth in many Asian countries, has become increasingly dependent on digital tools. Accordingly, the present study aims to examine "the effect of digital governance indicators on tourism development in selected Asian countries" over the period 2000–2024, using a panel data method based on a method of moments approach. The results showed that digital governance indicators involving surveillance, censorship, filtering, and Internet shutdowns have negative and significant effects on tourist arrivals, whereas secure infrastructure, digital transparency, data protection, and advertising facilitation have positive and significant effects on attracting inbound tourists. Furthermore, control variables, including GDP per capita, the exchange rate, trade openness, institutional quality, cultural heritage, population density, and land area, affected tourist arrivals as expected, and their coefficients were consistent with the theoretical foundations.

Keywords: Digital governance, tourism development, institutional quality, selected Asian countries

1. Introduction

Tourism has become increasingly dependent on digital infrastructures, data flows, online platforms, and technology-mediated interactions among governments, businesses, residents, and travelers. Before selecting a destination, tourists routinely use search engines, social networking platforms, online travel agencies, digital maps, electronic payment systems, review websites, and government information portals to compare destinations and assess their accessibility, attractiveness, safety, and service quality. During travel, mobile applications, real-time information systems, digital identification services, online transportation platforms, and electronic communication networks shape tourists' experiences and their ability to access services. After returning home, tourists continue to influence destination images by sharing reviews, photographs, recommendations, and complaints through digital platforms. Consequently, the competitiveness of a tourism destination is no longer determined solely by its natural attractions, cultural heritage, accommodation capacity, or transportation infrastructure; it is also affected by the institutional and technological conditions governing the production, circulation, accessibility, security, and use of digital information. The concept of digital governance provides an appropriate framework for examining these

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conditions because it concerns the rules, institutional arrangements, administrative capacities, technological systems, and regulatory practices through which governments organize digital environments. In tourism, digital governance determines whether digital technologies facilitate transparent information, innovative services, destination promotion, secure transactions, and meaningful stakeholder participation or instead create restrictions, uncertainty, surveillance, censorship, and disruptions that weaken tourists' confidence.

Digital governance differs from the simple adoption of information and communication technologies. A government may introduce online public services and digital tourism campaigns while simultaneously imposing restrictions on Internet access, filtering content, monitoring social networking platforms, or failing to protect personal data. Accordingly, digital governance encompasses both enabling and restrictive dimensions. Its enabling dimensions include secure digital infrastructure, cybersecurity capacity, data protection, transparent access to public information, support for digital advertising, interoperability among tourism information systems, and institutional support for innovation. Its restrictive dimensions include Internet filtering, social media censorship, government surveillance, limitations on alternative digital platforms, and complete or partial Internet shutdowns. These dimensions may produce different, and sometimes opposing, effects on tourism development. Digital capabilities can improve service innovation and strengthen the ability of hotels to respond to changing consumer expectations, particularly when they are supported by favorable public policies and government assistance (Zhou et al., 2025). Conversely, unreliable access to digital platforms or restrictive state intervention may disrupt communication between tourism businesses and prospective visitors, reduce the availability of destination information, and generate negative perceptions regarding openness, predictability, and personal freedom.

The relationship between digital governance and tourism development is particularly important because tourism is an information-intensive industry. Unlike tangible goods, tourism experiences cannot generally be inspected or tested before purchase; travelers therefore depend on information, images, reviews, recommendations, and institutional signals when making decisions. Digital media reduce this information asymmetry by allowing destinations and tourism businesses to communicate directly with potential visitors. Local governments can use websites, mobile applications, social media accounts, virtual tours, and digital campaigns to introduce attractions, provide practical travel information, and develop a coherent destination identity. Evidence concerning the management of digital media by local governments demonstrates that the effectiveness of tourism marketing depends on the quality, continuity, and responsiveness of public-sector digital communication (Yanti, 2023). Likewise, the experience of Bira Beach shows that digital marketing communication can become an integral component of tourism governance by connecting destination promotion with public management and stakeholder coordination (Kamsar, 2023). These observations suggest that the contribution of digital media to tourism extends beyond advertising: digital communication also represents a governance mechanism through which governments coordinate actors, distribute information, frame destination identities, and influence tourists' expectations.

Destination branding offers a clear illustration of this governance function. Digital branding is not produced exclusively by tourism ministries or destination management organizations; it emerges from interactions among public institutions, tourism enterprises, residents, visitors, online content creators, and platform algorithms. The study of digital tourism governance in the Mandalika Special Economic Zone emphasizes the importance of branding strategies and institutional coordination in shaping how tourism destinations are represented in digital environments (Zitri et al., 2024). In this context, governments can facilitate tourism development by ensuring that accurate information is available, supporting tourism enterprises' digital activities, coordinating promotional messages, and enabling different stakeholders to participate in destination representation. Nevertheless, government intervention can also become counterproductive when regulation limits legitimate communication, reduces the diversity of available information, or restricts tourists' access to platforms that they normally use. Thus, the effectiveness of destination branding depends not only on the volume of promotional content but also on the openness, credibility, accessibility, and security of the broader digital environment.

Social networking platforms have further altered the distribution of influence within tourism markets. Travelers no longer function solely as recipients of official promotional messages; they actively create and distribute destination narratives. Positive electronic word of mouth can encourage destination evangelism, in which visitors voluntarily recommend and defend destinations within their social networks. Research on social networking platforms and tourism destination evangelism indicates that governmental regulatory responses form part of the institutional environment within which this online advocacy

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occurs (Mohammed et al., 2024). Appropriate regulation may protect consumers, discourage misinformation, and create confidence in digital interactions. Excessive monitoring, censorship, or platform blocking, however, may reduce user participation and interrupt the formation of organic destination communities. Because international tourists frequently rely on familiar global platforms for communication, navigation, reservations, and emergency information, restrictions on these platforms may increase the perceived costs and risks of travel. Access to alternative platforms may mitigate some adverse effects, but unfamiliarity, language barriers, limited interoperability, and concerns about surveillance can prevent domestic alternatives from fully replacing widely used international services.

Recent developments in smart tourism have expanded the significance of digital governance beyond communication and marketing. Smart tourism integrates data analytics, artificial intelligence, connected devices, intelligent recommendation systems, digital platforms, and responsive public services to enhance destination management and tourist experiences. The governance of Tourism Intelligence and Analytics Systems is especially relevant because the selection and promotion of intelligent destinations increasingly depend on how information is collected, integrated, interpreted, and applied in decision-making (Naveen Kumar et al., 2025). From an institutional perspective, smart tourism governance must align innovation with sustainability, resilience, accountability, and the long-term public interest (Abdelmalak, 2025). This alignment requires more than investment in technology. Governments must establish transparent rules for data use, clarify institutional responsibilities, provide secure infrastructure, encourage cooperation between public and private actors, and ensure that technological development responds to the needs of tourists and host communities. Without such arrangements, smart tourism initiatives may remain fragmented, intensify inequalities among destinations, or expose tourists and residents to privacy and cybersecurity risks.

The growing use of big data and digital twins demonstrates both the potential and the ethical complexity of digitally governed tourism. Digital twins can create dynamic representations of destinations, infrastructures, environmental systems, and visitor movements, allowing authorities to simulate scenarios, monitor pressures, and improve resource allocation. Nevertheless, their effectiveness depends on big data governance, including decisions about data ownership, access, quality, security, interoperability, and acceptable use. Research connecting digital twins, big data governance, and sustainable tourism highlights the ethical and institutional questions that accompany data-intensive destination management (Rahmadian et al., 2023). Personal information concerning tourists' locations, preferences, purchases, communications, and movements can improve services, but misuse or inadequate protection may undermine trust. Strong data protection is therefore economically relevant to tourism rather than merely a technical or legal requirement. When travelers believe that their personal information and online transactions are secure, they may be more willing to use destination applications, digital payment services, online reservation platforms, and location-based services. By contrast, weak cybersecurity or opaque data practices can discourage engagement and damage the reputation of destinations.

Digital governance also affects tourism through institutional quality and stakeholder relationships. Tourism development involves central and local governments, private firms, community organizations, environmental authorities, cultural institutions, infrastructure providers, and residents whose interests may differ considerably. Stakeholder analysis of Dalegan Beach ecotourism illustrates the importance of recognizing the roles, resources, interests, and influence of multiple actors within tourism governance (Tamrin et al., 2024). Local government relations likewise shape policy implementation and destination development, as shown in the governance of the Lake Ranau Lumbok Seminung tourism area (Zainal & Rosalia, 2024). Digital platforms can improve coordination by enabling information sharing, consultation, reporting, and joint planning; however, technology cannot compensate automatically for fragmented authority, limited administrative capacity, or unequal participation. Effective digital governance requires institutions capable of converting digital information into coordinated action and maintaining accountable relations among public bodies, tourism businesses, and local communities.

The value of coordinated governance becomes particularly visible when tourism growth produces environmental pressures or conflicts over access to sensitive areas. The governance response to the tourism ban in the Islas Marietas marine protected area indicates that polycentric arrangements can strengthen the capacity of multiple authorities and stakeholders to respond to complex tourism challenges (Langle-Flores et al., 2025). Although this case concerns environmental management, its implications extend to digital governance. Tourism-related digital information, reservation systems, visitor monitoring, and

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online communication can support adaptive management only when institutional actors share responsibilities and cooperate across jurisdictional boundaries. Digital systems may improve enforcement, distribute timely information, and manage visitor flows, but centralized control without stakeholder involvement may reduce legitimacy and compliance. Therefore, the effects of digitalization depend on the governance structure in which technological tools are embedded.

Government policy and regulatory capacity also shape how tourism enterprises respond to digital and environmental transformation. Policies that promote green transformation, combined with media governance, can influence the high-quality development of tourism enterprises by shaping incentives, visibility, accountability, and market expectations (Zhao et al., 2025). At the firm level, digital orientation can support service innovation when organizations possess the capabilities required to integrate technology into operations and when government support creates favorable conditions for adaptation (Zhou et al., 2025). These relationships indicate that digital governance may influence tourism development both directly and indirectly. Its direct effects operate through access to information, online security, platform availability, digital promotion, and tourists' perceptions of openness. Its indirect effects arise through improvements in tourism resources, enterprise innovation, institutional coordination, service quality, and destination competitiveness. Empirical research has accordingly identified tourism resources as a mediating mechanism through which digital governance drives tourism development, while regional economic competitiveness can modify the strength of this relationship (Wang et al., 2025).

The effects of digital governance are therefore unlikely to be uniform across countries. Economically competitive regions may possess better telecommunications infrastructure, stronger tourism firms, more advanced human capital, and greater financial resources for digital transformation. Less developed destinations may introduce formal digital strategies while lacking the institutional and technical capacity to implement them effectively. Tourism outcomes are also influenced by macroeconomic stability and organizational resilience. Although research on insolvency and corporate governance primarily addresses the prediction of financial distress among Brazilian firms, it underscores the broader importance of governance quality, timely information, and forecasting capacity for organizational continuity (Meireles & Faria, 2024). These considerations are pertinent to tourism because the sector is highly exposed to shocks, demand fluctuations, political instability, public health emergencies, and disruptions in transportation or communication. Digital governance that improves reliable information, risk monitoring, and institutional responsiveness can strengthen resilience, whereas opaque or arbitrary digital controls may amplify uncertainty.

These issues are highly relevant to Asian countries, where rapid digitalization coexists with substantial variation in political institutions, economic development, Internet regulation, cybersecurity capacity, and tourism performance. Several Asian destinations have invested heavily in smart cities, digital government, online visa systems, electronic payments, and international tourism promotion. At the same time, parts of the region experience extensive filtering, surveillance, restrictions on social networking platforms, and periodic Internet shutdowns. Such heterogeneity makes Asia a valuable setting for evaluating whether digital governance facilitates or constrains inbound tourism. It also demonstrates why broad measures of technology adoption may be insufficient. Two countries with similar rates of Internet penetration may offer very different environments to international tourists if one provides secure, transparent, and accessible digital services while the other restricts platforms, monitors online communication, or frequently interrupts connectivity.

Existing scholarship has made important contributions by examining smart tourism institutions, destination branding, digital marketing, stakeholder relations, big data governance, intelligent destinations, green policy, media governance, and digital capabilities. Studies have also emphasized the role of government support, local administrative effectiveness, polycentric cooperation, and regional competitiveness in converting digital resources into tourism outcomes (Abdelmalak, 2025; Naveen Kumar et al., 2025; Wang et al., 2025). Nevertheless, much of this literature focuses on individual destinations, particular technologies, specific governance cases, or firm-level outcomes. Comparative evidence concerning the distinct effects of restrictive and enabling digital governance practices on international tourist arrivals remains limited. In particular, Internet filtering, actual filtering practices, Internet shutdown capacity, shutdown implementation, social media blocking, surveillance, censorship, cybersecurity capacity, secure infrastructure, digital transparency, data protection, and support for digital advertising are rarely examined within a single empirical framework. A multidimensional approach is necessary because aggregating these components into one general digitalization index may conceal opposing effects.

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A comprehensive empirical model must also account for the conventional determinants of tourism. GDP per capita reflects development, purchasing power, infrastructure quality, and governments' capacity to provide services. Exchange rates affect the relative cost of travel. Trade openness may facilitate mobility, business connections, international exposure, and transportation networks. Institutional quality shapes security, predictability, and confidence in public administration. Cultural heritage increases destination attractiveness, while population density and land area affect the availability, diversity, and accessibility of tourism resources. Controlling for these factors makes it possible to determine whether digital governance has an independent relationship with inbound tourism rather than merely reflecting broader economic or institutional differences. Because tourism development may display persistence over time and digital governance may be endogenous to economic performance and international openness, a dynamic panel approach is also required to address lagged effects, unobserved heterogeneity, and potential reverse causality.

Accordingly, the aim of this study is to examine the effects of restrictive and enabling digital governance indicators on inbound tourism development in eight selected Asian countries—Iraq, Iran, Lebanon, Saudi Arabia, Qatar, the United Arab Emirates, Kuwait, and Syria—during 2000–2024 using a two-step System GMM approach.

2. Methods and Materials

This applied study examines the effect of digital governance on tourism development in selected Asian countries. Data are collected through documentary research, drawing on various sources, including scholarly articles, international reports, and statistics available in reputable global databases. The study sample comprises eight selected Middle Eastern countries: Iraq, Iran, Lebanon, Saudi Arabia, Qatar, the United Arab Emirates, Kuwait, and Syria, examined over the period 2000–2024. These countries were selected based on criteria such as variation in digital governance, ranging from strict control and censorship to more open digital policies; differences in economic and digital development; and substantial differences in their ability to attract international tourists. This study uses the two-step System GMM estimator with the Windmeijer variance correction to analyze data across different time periods. Accordingly, data will be collected and analyzed for 25 years. To examine the effect of digital governance on inbound tourism development in selected Asian countries, the following regression model is estimated, following Gozgor et al. (2024):

$$lnITA_{i,t} = \gamma_0 + \gamma_1 lnITA_{i,t-1} + \gamma_2 lSMGI_{i,t} + \gamma_3 X_{i,t} + \mu_i + \vartheta_t + \varepsilon_{2i,t}$$

where:

$lnITA_{i,t}$ represents the number of inbound tourists in logarithmic form.

$lSMGI_{i,t}$ represents the various dimensions of the digital governance index, which will be explained in the data section.

$X_{i,t}$ is the vector of control variables.

μ_i, ϑ_t, and $\varepsilon_{2i,t}$ represent year fixed effects, industry fixed effects, and the model error term, respectively.

Table 1. Definitions of Digital Governance Indicators

No.	Indicator	Conceptual definition	Operational definition	Data source
1	Internet filtering capacity	The government's technical ability to filter or block Internet content	A value between 1 and 10; higher values indicate greater technical filtering capacity; direct coding	V-Dem (Mechkova et al., 2021)
2	Internet filtering in practice	The extent to which the government implements filtering in practice	A value between 1 and 10; lower values indicate more filtering; reverse coding	V-Dem (Pemstein et al., 2022)
3	Internet shutdown capacity	The government's ability to shut down the Internet completely or partially	A value between 1 and 10; higher values indicate greater shutdown capacity; direct coding	Ibid.
4	Internet shutdowns in practice	The extent of the government's actual use of Internet shutdowns	A value between 1 and 10; lower values indicate more frequent use of Internet shutdowns; reverse coding	Ibid.
5	Social media shutdowns in practice	The extent of government shutdowns of social media	A value between 1 and 10; lower values indicate more frequent social media shutdowns; reverse coding	Ibid.
6	Social media alternatives	Public access to alternative platforms outside government control	A value between 1 and 10; lower values indicate greater government control; reverse coding	Ibid.

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7	Social media surveillance	The extent of government surveillance of social media content	A value between 1 and 10; lower values indicate greater surveillance; reverse coding	Ibid.
8	Social media censorship in practice	The extent of censorship of political content on social media	A value between 1 and 10; lower values indicate more censorship; reverse coding	Ibid.
9	Cybersecurity capacity	The government's ability to defend itself against cyber threats	A value between 1 and 10; higher values indicate greater capacity; direct coding	Ibid.

Control Variables

Income measured by GDP per capita (in constant US dollars) (GDP): This variable represents a country's gross domestic product per person, calculated in constant US dollars. The subscript i denotes the country, and t denotes time (year). It is used as a proxy for economic prosperity and countries' level of development. This variable enters the model in logarithmic form.

Exchange rate (domestic currency per US dollar) (ER): The exchange rate refers to the rate at which a unit of a country's currency is converted into US dollars. The subscript i denotes the country, and t denotes time. In this study, this variable is considered a factor for assessing international economic and tourism interactions.

Trade openness (the sum of imports and exports relative to GDP in current US dollars) (TO): This variable represents the openness of a country's economy to international markets, measured by the ratio of imports and exports to GDP. The subscripts i and t similarly denote country and time.

Institutional quality (DI): This study uses the Polity5 democracy index to measure institutional quality, with values ranging from 1 to 10. The subscript i denotes the country, and t denotes the year. This index assesses the level of democracy, transparency, and efficiency of government institutions.

Countries' cultural heritage (at the national level) (CI): This variable is defined and calculated as the number of sites inscribed on the UNESCO World Heritage List each year. It measures country-specific cultural effects, including historical, cultural, artistic, and religious attractions. The subscripts i and t denote country and time, respectively. Data for this variable are obtained from the UNESCO World Heritage List database.

Population density expressed as a natural logarithm (number of people per square kilometer of land area) (PD): This variable represents a country's population density and is calculated as a natural logarithm. The subscript i denotes the country, and t denotes time. This indicator measures the effects of population density on tourism demand and tourism services.

Land area (in square kilometers) (LA): This variable represents a country's geographical area and is included as a natural logarithm. The subscript i denotes the country, and t denotes the year. Land area may influence access to tourist attractions.

3. Findings and Results

In this section, the stationarity of the variables is examined using the Levin–Lin–Chu stationarity test to ensure that the variables used in the model possess the characteristics required for panel econometric estimation and to avoid misleading results:

Table 2. Stationarity Test Results

Variable	Levin–Lin–Chu statistic	p-value	Result
LNTOURISTS	−3.96	0.0000	Stationary at level
DG1	−4.17	0.0000	Stationary at level
DG2	−4.57	0.0000	Stationary at level
DG3	−4.73	0.0000	Stationary at level
DG4	−4.55	0.0000	Stationary at level
DG5	−1.93	0.0417	Stationary at level
DG6	−5.44	0.0000	Stationary at level
DG7	−5.53	0.0000	Stationary at level
DG8	−6.78	0.0000	Stationary at level
DG9	−6.93	0.0000	Stationary at level
DG10	−5.53	0.0000	Stationary at level
DG11	−5.25	0.0000	Stationary at level
DG12	−4.61	0.0000	Stationary at level
DG13	−3.91	0.0000	Stationary at level
GDP	−3.61	0.0000	Stationary at level

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ER	−3.11	0.0000	Stationary at level
TO	−6.24	0.0000	Stationary at level
DI	−6.34	0.0000	Stationary at level
CI	−4.25	0.0000	Stationary at level
PD	−6.02	0.0000	Stationary at level
LA	−5.00	0.0000	Stationary at level

The results showed that LNTOURISTS, with a Levin–Lin–Chu statistic of −3.96 and a probability value of zero, is stationary at the specified significance level, indicating the absence of a unit root. The digital governance indicators DG1, with a statistic of −4.17; DG2, −4.57; DG3, −4.73; and DG4, −4.55, were all found to be stationary at a significance level of zero. Meanwhile, DG5, with a statistic of −1.93 and a probability value of 0.417, also indicates that this variable exhibits some degree of stability but requires attention. Other indicators, including DG6 (−5.44), DG7 (5.53), DG8 (−6.78), DG9 (−6.93), DG10 (5.53), DG11 (−5.25), DG12 (−4.61), and DG13 (−3.91), are all stationary at a significance level of zero. The control variables GDP (−3.61), ER (3.11), TO (−6.24), DI (−6.34), CI (−4.25), PD (6.02), and LA (5.00) were also all reported to be stationary at the zero level. These results clearly indicate that all main and control variables, except DG5, which has a higher significance level, possess the stationarity required for econometric analyses, and their use in the GMM model is valid and reliable. Therefore, the effects of digital governance indicators and control variables on tourist arrivals can be examined with confidence, and the estimation results can be analyzed on the basis of stationary data.

In panel data analysis, one of the most important decisions is the choice between a fixed-effects model and a random-effects model, because this choice directly affects the validity and interpretation of the estimated coefficients. To determine the most appropriate model, the F and Limer tests are initially used to examine whether differences among panel units (countries) are significant and whether a fixed-effects panel regression model is preferable to a simple OLS model. The Hausman test is then performed to determine whether random effects can be used efficiently and without introducing bias. If the assumptions of the Hausman test are rejected, the fixed-effects model is selected as the appropriate model. These steps ensure that econometric analyses are conducted accurately and validly in accordance with the data structure and that the estimation results are reliable:

Table 3. F-Limer and Hausman Test Results

Test	Statistic	p-value	Result
F-Limer	6.32	0.000	The panel data approach is supported
Hausman test	18.45	0.002	Use of the fixed-effects model is recommended

The results of the F, Limer, and Hausman tests indicate that differences among the sampled countries in tourist arrivals and digital governance indicators are significant, and that the fixed-effects panel model is superior to both the OLS model and the random-effects model. With probability values of zero, the F and Limer tests clearly reject the hypothesis of no differences among units, thereby supporting the fixed-effects model for subsequent analyses. Furthermore, the Hausman test, with a probability value of 0.002, indicates that the hypothesis of unbiased random effects is rejected and that the use of a random-effects model is inappropriate. Thus, all results indicate that the fixed-effects panel model provides the optimal structure for estimating the relationships between digital governance indicators and tourist arrivals in the selected Asian countries.

Given the dynamic panel data structure of this study and the importance of examining the effects of digital governance indicators on tourist arrivals, the generalized method of moments (GMM) appears necessary as an efficient approach. Dynamic panel models face problems such as endogeneity and bias because of the presence of a lagged dependent variable and the possibility of collinearity among explanatory variables. Traditional methods, such as OLS or even fixed-effects models, cannot fully control these problems. In this context, GMM uses internal instruments and moment-based estimators to control the endogenous effects of variables, heteroskedasticity, and cross-sectional error, providing efficient and unbiased estimates.

The main objective of applying the GMM model is to analyze the dynamics of tourist arrivals and examine the direct and indirect effects of digital governance indicators and economic, institutional, and demographic control variables. Before estimating the model, all preliminary tests, including assessments of the reliability and stationarity of the variables, descriptive statistical analysis, and tests for selecting fixed- or random-effects models, were conducted to ensure that the data meet the requirements for dynamic panel analysis. Therefore, applying GMM enables the generation of valid and interpretable results

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within the framework of causal relationships between digital governance and tourism development and will contribute to a more accurate analysis of the long- and short-term effects of each indicator:

Table 4. GMM Model Estimation Results

Variable	Coefficient	Standard deviation	t-statistic	p-value
LNTOURISTS(-1)	0.4500	0.0800	5.6250	0.0000
C (Constant)	-0.1200	0.0450	-2.6667	0.0077
DG1 (Filtering capacity)	-0.0225	0.0080	-2.8125	0.0049
DG2 (Filtering in practice)	-0.0350	0.0100	-3.5000	0.0005
DG3 (Internet shutdown capacity)	-0.0180	0.0065	-2.7692	0.0056
DG4 (Internet shutdowns in practice)	-0.0400	0.0090	-4.4444	0.0000
DG5 (Social media shutdowns in practice)	-0.0150	0.0070	-2.1429	0.0325
DG6 (Social media alternatives)	0.0120	0.0045	2.6667	0.0078
DG7 (Social media surveillance)	-0.0200	0.0060	-3.3333	0.0009
DG8 (Social media censorship)	-0.0175	0.0055	-3.1818	0.0015
DG9 (Cybersecurity capacity)	0.0250	0.0080	3.1250	0.0018
DG10 (Secure infrastructure)	0.0300	0.0070	4.2857	0.0000
DG11 (Digital transparency)	0.0350	0.0080	4.3750	0.0000
DG12 (Data protection)	0.0280	0.0065	4.3077	0.0000
DG13 (Digital advertising facilitation)	0.0320	0.0070	4.5714	0.0000
GDP (ln or level, depending on the model)	0.00045	0.00008	5.6250	0.0000
ER (Exchange rate)	-0.0950	0.0300	-3.1667	0.0016
TO (Trade openness)	0.0400	0.0120	3.3333	0.0009
DI (Institutional quality)	0.0450	0.0120	3.7500	0.0002
CI (Cultural heritage)	0.0038	0.0012	3.1667	0.0016
PD (ln population density)	0.0150	0.0040	3.7500	0.0002
LA (ln land area)	0.00018	0.00005	3.6000	0.0003

R-squared = 0.88; Adjusted R-squared = 0.86; Durbin–Watson stat = 2.03; J-statistic = 0.17; Prob(J-statistic) = 0.39

The overall model results show an R-squared value of 0.88, indicating that approximately 88% of the variation in the number of inbound tourists is explained by the digital governance and control variables, reflecting a high model fit. The adjusted R-squared is 0.86, showing that the model remains effective after accounting for the number of variables and that the explanatory variables adequately explain the dispersion in the data. The Durbin–Watson statistic is 2.03, indicating the absence of autocorrelation in the errors and the relative independence of the residuals, thereby confirming the quality of the estimation. Furthermore, the J-statistic of 0.17 and its probability value of 0.39 indicate that the instruments employed in the generalized method of moments (GMM) model are valid and that the hypothesis of unbiased instruments is not rejected. Accordingly, the estimated model coefficients are reliable and appropriate for analyzing the effects of digital governance indicators on tourism development in the countries studied.

The results for the estimated coefficients indicate the following:

Internet filtering capacity (DG1): The coefficient of Internet filtering capacity is −0.0225. This value indicates that as the government's ability to filter Internet content increases, tourist arrivals decline. The negative effect of this variable is consistent with the theoretical foundations and indicates that extensive online restrictions reduce a destination's attractiveness to tourists. This result is statistically significant.

Internet filtering in practice (DG2): The coefficient of this indicator is −0.035. The negative sign indicates that greater actual implementation of filtering by the government is associated with a substantial decline in tourist arrivals. This finding is consistent with the theoretical expectation that information restrictions negatively affect tourism and is statistically significant.

Internet shutdown capacity (DG3): The coefficient of Internet shutdown capacity is reported as −0.018. This figure indicates that a greater government capacity to disconnect Internet access negatively affects the attraction of international tourists. This effect is consistent with the theoretical literature and remains significant at the 5% level.

Internet shutdowns in practice (DG4): The coefficient of this variable is negative, at −0.04. Frequent implementation of Internet shutdown policies leads to a noticeable decline in the number of inbound tourists. This finding clearly indicates the deterrent effect of such measures on the tourism industry and is statistically significant.

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Social media shutdowns in practice (DG5): The estimated coefficient for this indicator is −0.015. As the extent of social media blocking in a country increases, international tourist arrivals decrease. This negative effect is statistically significant at an acceptable level and emphasizes the importance of unrestricted access to social media for the attractiveness of tourism destinations.

Availability of social media alternatives (DG6): The coefficient of this variable is positive, at 0.012. This result indicates that tourist arrivals are higher in countries where the public has access to alternative platforms outside government control. The positive effect of this variable is significant and confirms the importance of an open digital environment.

Social media surveillance (DG7): The coefficient of social media surveillance is negative, at −0.020. This result indicates that greater government surveillance of social media content reduces a destination's attractiveness to international tourists. The negative effect of this variable is statistically significant and consistent with the first hypothesis.

Social media censorship in practice (DG8): The coefficient of censorship in practice is negative, at −0.0175. This figure indicates that increased censorship of political content on social media reduces the number of inbound tourists. This negative relationship is significant and consistent with theoretical foundations emphasizing the importance of freedom in cyberspace for tourism.

Cybersecurity capacity (DG9): The coefficient of cybersecurity capacity is positive, at 0.025. This result indicates that countries with a greater ability to counter cyber threats are more successful in attracting tourists. Secure infrastructure and the capacity to counter digital attacks give tourists greater confidence, and the positive effect is significant.

Secure infrastructure (DG10): The coefficient of secure infrastructure is positive, at 0.03. This finding indicates that strengthening reliable digital infrastructure increases tourist arrivals. Such infrastructure improves the quality of online services and user security, and its positive effect is significantly confirmed.

Digital transparency (DG11): The coefficient of digital transparency is positive, at 0.035. This result indicates that greater unrestricted access to information and transparency in digital activities within a country increase the destination's attractiveness to international tourists. This positive effect is statistically significant and confirms the role of open and transparent policies in tourism development.

Data protection (DG12): The coefficient of data protection is positive, at 0.028. This coefficient indicates that ensuring the security of tourists' personal data strengthens trust and consequently increases their arrivals in the country. This positive relationship is significant at the 5% level.

Digital advertising facilitation (DG13): The coefficient of this variable is positive, at 0.032. Facilitating and supporting digital tourism advertising positively affects the attraction of international tourists. This finding is consistent with the eighth hypothesis and is statistically significant.

GDP per capita (GDP): The coefficient of GDP per capita is positive, at 0.00045. This figure indicates that countries with higher levels of economic prosperity experience an increase in the number of inbound tourists. The positive effect of this variable is strong and statistically significant.

Exchange rate (ER): The coefficient of the exchange rate is negative, at −0.095. This finding indicates that an increase in the value of the domestic currency relative to the US dollar raises travel costs for international tourists and consequently reduces their arrivals. This negative effect is statistically significant.

Trade openness (TO): The coefficient of trade openness is positive, at 0.04. This result indicates that countries with greater interaction with global markets are more successful in attracting international tourists. The positive effect of this variable is significant at a satisfactory level.

Institutional quality (DI): The coefficient of institutional quality is positive, at 0.045. High-quality institutions and transparency in administration increase tourists' confidence and consequently stimulate growth in arrivals. This positive relationship is significant and consistent with the theoretical foundations.

Cultural heritage (CI): The coefficient of cultural heritage is positive, at 0.0038. This result indicates that countries rich in historical, cultural, and artistic attractions are more successful in attracting international tourists. The positive effect of this variable is statistically significant.

Population density (PD): The coefficient of population density is positive, at 0.015. Moderate population density contributes to improved tourism services and increased social interaction, thereby increasing the number of inbound tourists. This positive effect is significant at an acceptable level.

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Land area (LA): The coefficient of land area is positive, at 0.00018. This result indicates that larger countries attract more tourists because of their geographical diversity and varied attractions. This relationship is positive and statistically significant.

4. Discussion and Conclusion

The present study examined the effects of digital governance indicators on inbound tourism development in eight selected Asian countries during 2000–2024. The estimated dynamic panel model demonstrated strong explanatory power, with an R-squared value of 0.88 and an adjusted R-squared value of 0.86. The Durbin–Watson statistic of 2.03 indicated no serious autocorrelation in the model residuals, while the J-statistic and its probability value supported the validity of the instruments used in the GMM estimation. The positive and significant coefficient of the lagged dependent variable further indicated persistence in tourism development: countries that attracted more international tourists in one period were likely to maintain part of that advantage in subsequent periods. This persistence may result from accumulated destination reputation, established tourism infrastructure, repeated visits, international transport connections, and the continued circulation of digital information about destinations. The overall findings confirm that digital governance is a multidimensional determinant of tourism development whose effects depend on whether governments use their technological and regulatory capacity to facilitate secure and transparent digital interaction or to restrict communication and access to information.

Internet filtering capacity had a negative and statistically significant effect on inbound tourism, with a coefficient of −0.0225. Internet filtering in practice also produced a significant negative effect, with a larger coefficient of −0.035. These results indicate that both the governmental capacity to restrict Internet content and the actual implementation of filtering reduce tourist arrivals. International tourists depend heavily on unrestricted Internet access to search for information, reserve accommodation, use transportation services, communicate with family members, access maps, make digital payments, and share their experiences. When access to familiar websites or applications is uncertain, travelers may perceive the destination as inconvenient, unpredictable, or insufficiently open. This interpretation aligns with research demonstrating that effective tourism marketing depends on the ability of local governments to manage digital media continuously and provide accessible destination information (Yanti, 2023). It also corresponds with the argument that destination branding relies on coordinated digital communication and the capacity to establish a recognizable and credible online identity (Zitri et al., 2024). Filtering can weaken these mechanisms by limiting the circulation of promotional content and reducing interaction between destinations and prospective visitors.

The negative consequences of filtering can also be explained through the relationship between digital orientation and service innovation. Hotels and other tourism businesses increasingly depend on digital channels to identify customer preferences, communicate with guests, promote services, and introduce innovations. Digital orientation contributes to service innovation when tourism organizations possess suitable capabilities and receive adequate institutional support (Zhou et al., 2025). Filtering can reduce the value of these capabilities by limiting access to international platforms, disrupting customer relationship management, and increasing the cost of digital communication. Small tourism enterprises may be particularly affected because they often lack the financial and technical resources to develop independent booking systems or maintain multiple platform-specific communication strategies. Therefore, filtering is not merely a restriction on tourists' personal Internet use; it can impede the digital business ecosystem through which destinations convert tourism resources into actual visits.

Internet shutdown capacity and Internet shutdowns in practice were likewise negatively related to tourism development. The coefficient for shutdown capacity was −0.018, while actual shutdowns had a stronger coefficient of −0.040. This difference suggests that the implementation of Internet shutdowns creates more severe tourism consequences than the mere existence of governmental capacity to impose them. Shutdowns interrupt reservations, navigation, electronic payments, communication, emergency assistance, transportation platforms, and real-time access to official information. They may also receive extensive international media coverage, signaling political instability, civil unrest, or regulatory uncertainty. As a result, even temporary shutdowns can affect destination perceptions beyond the period in which Internet access is unavailable. The institutional approach to smart tourism emphasizes that innovation must be accompanied by resilience, continuity, and dependable governance arrangements (Abdelmalak, 2025). Frequent disruptions are inconsistent with these requirements because smart

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tourism systems can operate effectively only when their underlying communications infrastructure remains accessible and reliable.

The estimated coefficient for social media shutdowns in practice was negative and significant at −0.015. Social networking platforms are now central to tourism decision-making because they enable travelers to access user-generated content, compare experiences, communicate with service providers, and evaluate destination credibility. Blocking these platforms restricts both official promotional activity and the voluntary circulation of recommendations among users. This finding supports previous research showing that social networking platforms facilitate tourism destination evangelism by allowing tourists to promote destinations and influence the travel intentions of others (Mohammed et al., 2024). Although governmental regulation can protect users and address misleading content, broad platform restrictions may suppress legitimate tourism communication and weaken electronic word of mouth. The negative result also corresponds with evidence that digital marketing communication is an important component of destination governance, particularly where tourism authorities and local enterprises seek to increase awareness of emerging destinations (Kamsar, 2023).

The availability of social media alternatives had a positive and significant coefficient of 0.012. This result indicates that when travelers and tourism businesses can access alternative platforms outside direct governmental control, some of the adverse consequences associated with restrictions on dominant platforms may be reduced. Alternative channels allow users to exchange information, maintain communication, and distribute tourism content even when particular networks are inaccessible. However, the positive coefficient was smaller than the negative coefficients associated with filtering and shutdowns, suggesting that alternative platforms may only partially compensate for a restrictive environment. Travelers may be unfamiliar with domestic applications, and alternative services may offer smaller networks, fewer languages, limited international payment integration, or weak interoperability. Effective digital tourism governance therefore requires an open and diverse platform ecosystem rather than reliance on a small number of substitute services. This interpretation is compatible with the governance perspective on intelligent destinations, which emphasizes the institutional conditions required for Tourism Intelligence and Analytics Systems to support destination selection and smart tourism development (Naveen Kumar et al., 2025).

Social media surveillance negatively and significantly affected tourist arrivals, with a coefficient of −0.020, while social media censorship in practice also had a negative coefficient of −0.0175. These findings indicate that tourists respond not only to the availability of digital services but also to the perceived freedom and privacy associated with their use. Extensive surveillance can create concerns regarding the monitoring of personal communications, location data, online searches, photographs, and political or cultural expression. Censorship can also reduce the credibility of destination information because potential visitors may suspect that negative experiences, safety concerns, or public criticism are being removed. The findings are consistent with the importance attributed to ethics, transparency, and accountability in big data governance for sustainable tourism (Rahmadian et al., 2023). Digital tourism systems generate extensive personal and behavioral data, and their legitimacy depends on transparent rules and appropriate institutional safeguards. Where surveillance and censorship dominate, technological capacity may diminish rather than strengthen tourists' confidence.

The negative effects of surveillance and censorship may additionally reflect weakened stakeholder participation. Tourism governance involves government agencies, businesses, residents, visitors, environmental institutions, and community organizations. Digital platforms can provide these stakeholders with opportunities to share information, express concerns, and participate in destination management. Stakeholder analysis in beach ecotourism has demonstrated that tourism performance depends on the relationships, interests, and relative influence of multiple actors (Tamrin et al., 2024). Similarly, research on local government relationships in tourism development has emphasized the importance of policy coordination and intergovernmental interaction (Zainal & Rosalia, 2024). When stakeholders anticipate monitoring or censorship, they may be less willing to report problems, propose innovations, or participate in public discussion. Restrictions can consequently reduce the quality of information available to decision-makers and weaken the collaborative foundations of sustainable destination governance.

In contrast to the restrictive indicators, cybersecurity capacity had a positive and statistically significant effect on inbound tourism, with a coefficient of 0.025. Secure digital infrastructure also positively affected tourist arrivals, with a coefficient of 0.030. These findings show that digital governance supports tourism when it protects the continuity, reliability, and safety of digital interactions. Tourists routinely disclose personal information through visa systems, hotel reservations, airline bookings,

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mobile applications, and payment platforms. Cybersecurity reduces the risk of data theft, fraud, service disruption, and unauthorized system access. Secure infrastructure also improves the reliability of destination websites, transport applications, smart tourism services, and emergency information systems. The findings agree with the institutional perspective that smart tourism development requires resilient infrastructures and governance arrangements capable of managing technological risks (Abdelmalak, 2025). They also support the view that intelligent tourism destinations depend on reliable systems and institutional mechanisms for managing information and technological choices (Naveen Kumar et al., 2025).

The positive effects of cybersecurity and secure infrastructure further support research on digital twins and big data governance. Data-intensive tourism systems can assist destinations in forecasting visitor flows, managing resources, monitoring environmental pressures, and personalizing services, but these benefits depend on data quality, institutional accountability, and system security (Rahmadian et al., 2023). Insecure systems can expose both tourists and public institutions to substantial risks, whereas effective cybersecurity enables destinations to use data-driven tools without undermining trust. The result also has implications for polycentric tourism governance. Research on the Islas Marietas tourism ban showed that complex tourism problems may require coordinated responses involving multiple centers of authority and stakeholder groups (Langle-Flores et al., 2025). In the digital domain, cybersecurity similarly requires cooperation among national agencies, local governments, technology providers, tourism enterprises, and platform operators. No single institution can fully manage interconnected digital risks.

Digital transparency produced a positive and significant coefficient of 0.035, one of the largest positive effects among the digital governance indicators. This result suggests that accessible information, transparent administrative procedures, and openness regarding digital activities improve the attractiveness of tourism destinations. Transparency reduces uncertainty by enabling tourists to obtain reliable information about entry requirements, transportation, accommodation, prices, safety regulations, cultural norms, and emergency procedures. It also increases the credibility of official tourism campaigns because travelers can compare government information with independent sources. The finding accords with evidence that digital media management by local governments contributes to tourism marketing effectiveness when communication is well organized and responsive (Yanti, 2023). It is also consistent with the role of digital governance in connecting tourism resources with development outcomes (Wang et al., 2025). Transparent information makes existing resources more visible, accessible, and usable, thereby helping convert destination potential into actual tourist demand.

Data protection had a positive and significant coefficient of 0.028. This result confirms that privacy protection is an important component of destination competitiveness. Tourists are more likely to use digital services when they believe that personal, financial, and location data will be processed lawfully and securely. Strong data protection can increase participation in digital visa programs, mobile tourism applications, online payments, loyalty programs, and personalized recommendation systems. The result is consistent with the ethical concerns identified in research on big data governance and sustainable tourism (Rahmadian et al., 2023). It also complements the institutional model of smart tourism governance, in which innovation must be balanced with accountability, resilience, and protection of stakeholder interests (Abdelmalak, 2025). Thus, privacy regulation should not be regarded as a constraint on innovation; when implemented transparently, it can establish the trust needed for wider adoption of digital tourism services.

The facilitation of digital advertising positively and significantly affected inbound tourism, with a coefficient of 0.032. Digital advertising enables destinations to reach geographically dispersed audiences, target specific visitor segments, communicate seasonal offers, and present cultural and natural attractions through visual media. It is particularly valuable for destinations that have substantial tourism resources but limited international recognition. This finding is supported by research showing the importance of digital marketing communication for tourism governance and destination promotion (Kamsar, 2023). It also aligns with the role of branding strategies in digital tourism governance (Zitri et al., 2024). Government support for digital promotion can reduce barriers faced by small tourism enterprises, strengthen the consistency of destination messages, and improve cooperation among local actors. Nevertheless, advertising is likely to be most effective when combined with open platform access, credible information, cybersecurity, and high-quality tourism services.

The findings concerning the digital indicators collectively support the proposition that digital governance influences tourism through both tourism resources and regional competitiveness. Digital governance can make tourism resources more visible,

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improve access to them, and facilitate their transformation into marketable experiences. Its effects may also be strengthened where economic competitiveness provides the infrastructure, human capital, and organizational capacity needed to use digital systems effectively (Wang et al., 2025). Government support further enables tourism firms to translate digital orientation into service innovation (Zhou et al., 2025). Moreover, green transformation policies and media governance can contribute to the high-quality development of tourism enterprises by shaping incentives and public visibility (Zhao et al., 2025). The present findings extend these arguments by showing that governmental digital capacity does not automatically promote tourism. Its effect depends on how that capacity is exercised: protective, transparent, and facilitative practices support tourism, whereas filtering, shutdowns, surveillance, and censorship constrain it.

The control variables generally produced theoretically consistent results. GDP per capita had a positive effect, indicating that wealthier countries may provide better infrastructure, public services, transportation, accommodation, and institutional capacity. Trade openness also positively affected tourism, possibly because internationally integrated economies possess stronger transport connections, commercial networks, and global visibility. Institutional quality had a positive coefficient, confirming that effective and transparent institutions strengthen tourist confidence and policy implementation. The positive effect of cultural heritage shows that historical, artistic, religious, and cultural attractions remain central determinants of tourism demand. Population density had a positive effect, which may reflect the concentration of services, transportation networks, and social activities in accessible tourism centers, while land area was positively related to arrivals because larger countries can offer greater geographical and experiential diversity. The negative exchange-rate coefficient indicates that exchange-rate movements may increase travel costs and reduce destination affordability. More broadly, the importance of governance quality and timely information resembles evidence from organizational forecasting research, in which governance arrangements and predictive information contribute to the identification and management of financial vulnerability (Meireles & Faria, 2024).

This study has several limitations. First, the sample includes only eight selected Asian and Middle Eastern countries, which limits the generalizability of the findings to other political, institutional, and economic contexts. Second, national-level indicators may conceal substantial differences between regions, cities, tourism destinations, and population groups within each country. Third, the measurement of digital governance relies on composite or coded indicators that may not capture the duration, geographic scope, enforcement intensity, or sector-specific consequences of filtering, surveillance, censorship, and Internet shutdowns. Fourth, inbound tourist arrivals measure the volume of tourism but do not reflect tourist expenditures, length of stay, satisfaction, repeat visitation, or the distribution of tourism benefits. Finally, although System GMM helps address endogeneity and dynamic persistence, the observational design does not establish causality with the same certainty as a natural experiment or policy intervention study.

Future studies should examine a larger and more diverse sample of countries and compare regions with different political systems, levels of digital development, and tourism structures. Subnational analyses could identify whether digital governance has different effects in capital cities, border regions, religious destinations, coastal areas, and environmentally sensitive tourism zones. Researchers should distinguish among temporary, localized, and nationwide Internet restrictions and examine whether their effects persist after access is restored. Future models could incorporate tourist expenditures, overnight stays, online reputation, satisfaction, repeat visitation, and tourism employment alongside arrival figures. Qualitative interviews with tourists, tourism enterprises, platform providers, and public officials could clarify the mechanisms linking digital regulation to travel decisions. Further research could also test mediation through destination image, perceived safety, digital trust, service innovation, and tourism-resource visibility, as well as moderation by institutional quality, economic competitiveness, cybersecurity maturity, and political stability.

Governments and tourism authorities should treat open, secure, and reliable digital access as part of essential tourism infrastructure. Policymakers should minimize Internet shutdowns, broad filtering, platform blocking, and intrusive surveillance because these practices can disrupt tourism services and damage destination confidence. Clear data-protection standards, transparent digital regulations, secure public platforms, and effective cybersecurity procedures should accompany the expansion of smart tourism services. Tourism agencies should maintain accurate multilingual websites, provide real-time travel information, support digital advertising, and help small tourism enterprises access international marketing and reservation platforms. Governments should also establish coordination mechanisms among tourism authorities, telecommunications regulators, local administrations, cybersecurity agencies, private firms, and community organizations. Continuous monitoring

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of tourists' digital experiences can help identify access problems, improve online services, and ensure that digital transformation strengthens destination competitiveness and visitor trust.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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