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Digital Transformation of Tourism Services in Uzbekistan: Challenges, Opportunities and Future Development Prospects

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Abstract: This study examines the structural dynamics, economic effects and operational constraints of digital transformation in the tourism service sector of Uzbekistan. Following comprehensive market liberalisation and the adoption of the Digital Uzbekistan 2030 strategy, inbound arrivals reached 11.7 million in 2025 and tourism service export receipts reached USD 4.8 billion. The paper applies a mixed quantitative design comprising a purpose-built Digital Adoption Index (DAI), a microeconomic capital-budgeting model of a representative regional accommodation enterprise, an extended Cobb-Douglas production function for aggregate export receipts, and a SWOT-AHP diagnostic matrix. Data are drawn from the Statistics Agency under the President of the Republic of Uzbekistan, the Central Bank of the Republic of Uzbekistan, and a structured survey of 120 licensed tourism operators in Tashkent, Samarkand, Bukhara and Khorezm. Results indicate a national composite DAI of 0.498, masking pronounced asymmetry: air transport (0.836) and state e-governance (0.789) are digitally mature, whereas regional guest houses (0.263) and heritage attractions (0.351) remain weakly integrated. Enterprise-level modelling yields a three-year return on investment of 465 per cent with a 6.4-month payback period for a 35-room boutique hotel adopting a cloud property management system, a direct booking engine and integrated payment acceptance. Macroeconomic estimation indicates that raising the national digital maturity scalar from a baseline 0.55 to 0.78 by 2030 would generate approximately USD 1.37 billion in additional annual export receipts beyond an arrivals-driven baseline. Four systemic frictions are identified: cross-border payment fragmentation, connectivity asymmetry in secondary destinations, institutional data silos, and managerial digital literacy deficits. A three-pillar policy framework is proposed.

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1. Introduction

Tourism has become a principal instrument of macroeconomic diversification, structural employment creation and regional modernisation in the Republic of Uzbekistan. The country holds a distinctive competitive position in Central Asian cultural tourism, supported by more than 8,400 registered cultural and historical objects and by the concentration of Silk Road urban heritage in Samarkand, Bukhara, Khiva and Shakhrisabz, four sites inscribed on the UNESCO World Heritage List. Following the comprehensive liberalisation of the tourism market from 2017, including visa-free access for citizens of an expanding list of countries and the introduction of an electronic visa facility, inbound

arrivals rose from approximately 2.0 million in 2016 to 11.7 million in 2025 [1], [2]. Tourism service export receipts reached USD 4.8 billion in 2025, positioning the sector among the fastest-growing tourism economies worldwide in that year [3], [4].

Contemporary destination competitiveness, however, is no longer determined principally by static resource endowment. The scholarly consensus emerging from the smart tourism literature holds that competitive position increasingly reflects the density of integration between information and communication technologies, real-time data analytics, algorithmic personalisation and frictionless cross-border financial settlement [5], [6], [7], [8]. Within this framework a destination is understood not as a bounded geographic unit but as a socio-technical ecosystem in which value is co-created across interconnected digital touchpoints spanning inspiration, booking, in-situ experience and post-visit engagement [9], [10].

The Government of Uzbekistan has recognised this shift. Presidential Decree No. UP-6079 established the Digital Uzbekistan 2030 strategy, which sets targets for a unified national tourism platform, expansion of contactless payment acceptance, and automation of guest registration procedures [11]. Subsequent sectoral and regional digitisation instruments have extended these commitments [12]. Yet a persistent disjunction is observable between state-level digitisation programmes, which have achieved substantial penetration, and commercial uptake among regional tourism service providers, particularly small and micro enterprises operating in the accommodation and attraction segments.

This disjunction constitutes the empirical problem addressed here. Three questions follow. First, how is digital maturity distributed across the functional sub-sectors of the Uzbek tourism economy, and what is the aggregate national position? Second, what financial return accrues to a representative regional accommodation enterprise from investment in a contemporary digital operating stack? Third, what magnitude of aggregate export gain is attributable to accelerated digital capital accumulation, as distinct from growth in arrival volume alone?

Two hypotheses are advanced. H1 holds that regional small and medium tourism enterprises (SMTEs) realise disproportionate, rather than proportionate, returns on investment in cloud-based property management systems and automated booking engines, because such systems simultaneously reduce intermediation cost, raise achieved average rate through dynamic pricing, and lower administrative labour intensity. H2 holds that the elasticity of aggregate international tourism export receipts with respect to national digital infrastructure capital is positive and economically material after controlling for arrival volume.

The paper contributes in four respects. It constructs and applies a multidimensional Digital Adoption Index calibrated to the Uzbek tourism sector. It provides a transparent, fully parameterised enterprise-level capital-budgeting model whose assumptions can be independently varied. It specifies a macroeconomic production function incorporating a digital maturity scalar. And it integrates these quantitative results with a weighted SWOT-AHP diagnostic to derive an actionable policy framework. The remainder follows the IMRAD convention: Section II develops the theoretical framework, Section III specifies methods, Section IV reports results, Section V discusses implications and limitations, and Section VI concludes.

1.1 Theoretical Framework and Related Work

1.1.1 Smart tourism ecosystems

The smart tourism construct originates in the application of smart-city logic to destination management. Gretzel, Sigala, Xiang and Koo delineate smart tourism as comprising three layers: a smart destination infrastructure layer, a smart experience layer mediated by personalisation and context-awareness, and a smart business layer characterised by dynamic, data-driven value networks [5]. Buhalis and Amaranggana

extend this to the personalisation of services across the traveller journey, emphasising that data captured at one touchpoint acquires value principally through its availability at subsequent touchpoints [6]. Xiang, Tussyadiah and Buhalis subsequently reframed smart tourism explicitly as a digital transformation phenomenon with implications for destination governance rather than as a discrete technology adoption event [7].

Koo and colleagues operationalise smart tourism destination competitiveness as a function of technological infrastructure, information openness and stakeholder connectivity [9]. Ivars-Baidal and co-authors caution that many self-designated smart destinations exhibit technology deployment without corresponding governance integration, producing what they term smartness without system [10]. Empirical evaluation of mature smart destinations reinforces this caution, finding that measurable visitor-facing benefit often lags infrastructure deployment by several years [13]. Del Chiappa and Baggio demonstrate through network analysis that knowledge transfer within destination systems depends on the topology of inter-firm connections rather than on the technological endowment of individual firms [14]. A critical strand of the literature further warns that technological affordances in tourism arrive with concessions, including displaced labour and intensified platform dependence, that destination strategy should anticipate [15]. This literature collectively implies that a destination-level digital assessment must measure integration and data flow, not merely the presence of technology, and must disaggregate across actors of differing scale.

1.1.2 Technology acceptance at enterprise level

Enterprise-level adoption is approached through the Technology Acceptance Model, in which behavioural intention is determined by perceived usefulness and perceived ease of use [16], and its extension incorporating social influence and cognitive instrumental processes [17]. Applied to SMTEs in emerging tourism markets, the model predicts that adoption will lag where perceived usefulness is obscured by opaque returns and where perceived ease of use is depressed by limited managerial digital literacy. This prediction motivates the present study's emphasis on rendering enterprise returns explicit and computable, since a transparent return calculation directly addresses the perceived usefulness determinant.

1.1.3 Digital capital in aggregate production

At the macroeconomic level the analysis adopts the Cobb-Douglas production framework [18], extended by a technological maturity scalar in the manner now common in the digital economy literature. Treating digital infrastructure as a distinct factor of production, rather than as a component of undifferentiated physical capital, permits estimation of a separate output elasticity and therefore of the marginal return to digital investment specifically. Buhalis and Law trace the long trajectory of information technology in tourism management [19], and Law, Buhalis and Cobanoglu document its course in hospitality and tourism and note the persistent difficulty of isolating technology effects from concurrent capacity growth [20], a difficulty the present specification addresses by scaling the baseline to arrival volume before applying the digital term.

1.1.4 Research gap

Three gaps are apparent. First, empirical digital-maturity assessment of Central Asian tourism systems is scarce, and no published index disaggregates the Uzbek sector by functional sub-sector. Second, the smart tourism literature is predominantly destination-level and rarely supplies enterprise-level financial quantification of the kind an SMTE manager requires in order to authorise expenditure. Third, prior work on payment friction in emerging tourism markets has been largely descriptive rather than quantified. The present study addresses these gaps jointly, and in doing so responds to the call in the recent literature for multi-level analysis linking firm behaviour to destination outcomes [7], [10].

2. Materials and Methods

2.1 Research design

The study employs a mixed quantitative design combining structural index construction, microeconomic enterprise modelling, macroeconomic production function estimation, and multi-criteria decision analysis. The design is explanatory rather than experimental: no intervention is administered, and all estimates are therefore associational. Three theoretical models are combined operationally, with the smart tourism ecosystem framework structuring the index dimensions, the Technology Acceptance Model informing the survey instrument, and the extended production function governing the macroeconomic specification.

2.2 Data sources

Macroeconomic series for the period 2020 to 2025 were obtained from the Statistics Agency under the President of the Republic of Uzbekistan [1] and from the balance-of-payments statistics of the Central Bank of the Republic of Uzbekistan [2]. Connectivity and digital penetration indicators were obtained from the Ministry of Digital Technologies [12] and cross-checked against International Telecommunication Union series [21] and against the World Bank assessment of the national digital economy [22]. Electronic visa issuance volumes were obtained from the national e-visa portal. Comparative international benchmarks were drawn from UN Tourism and from the World Travel and Tourism Council [3], [4]. Primary enterprise data derive from a structured survey of 120 licensed tourism operators conducted across Tashkent, Samarkand, Bukhara and Khorezm, stratified by sub-sector and enterprise size, with a response rate of 78 per cent.

2.3 Digital Adoption Index

Technological integration is measured by a composite Digital Adoption Index bounded on the interval [0, 1]. The index is specified as a weighted linear combination of four functional dimensions: front-end user interface and experience (UI), back-office process automation (AUT), financial technology and payment integration (FIN), and data capture and analytical utilisation (DAT). For sub-sector i ,

$$DAI(i) = w1 \cdot UI(i) + w2 \cdot AUT(i) + w3 \cdot FIN(i) + w4 \cdot DAT(i) \quad (1)$$

where the dimension weights $w1 = 0.30$, $w2 = 0.25$, $w3 = 0.25$ and $w4 = 0.20$ sum to unity and were derived from pairwise comparison responses in the operator survey using the eigenvector method of the Analytic Hierarchy Process [23]. Each dimension score is the normalised mean of between four and seven binary or ordinal survey items. The national composite is the sector-share weighted mean,

$$DAI(national) = \sum s(i) \cdot DAI(i), \text{ with } \sum s(i) = 1 \quad (2)$$

where $s(i)$ denotes the share of sub-sector i in total licensed tourism service turnover. Reported dimension scales exhibited acceptable internal consistency, with Cronbach's alpha between 0.79 and 0.88.

2.4 Enterprise capital-budgeting model

Hypothesis H1 is tested through a deterministic capital-budgeting model of a representative regional boutique hotel of 35 rooms, the modal configuration among surveyed accommodation enterprises in Samarkand and Bukhara. The net annual benefit in year t is

$$NAB(t) = \Delta C(savings, t) + \Delta R(revenue, t) - OpEx(digital, t) \quad (3)$$

where ΔC denotes cost savings from reduced intermediation commission and reduced administrative labour, ΔR denotes incremental revenue from dynamic rate management and improved channel conversion, and $OpEx$ denotes recurring subscription, transaction and connectivity costs attributable to the digital stack. The cumulative three-year return and the payback period are

$$ROI(3yr) = [(\sum NAB(t), t = 1 \dots 3) - CapEx] \div CapEx \times 100 \% \quad (4)$$

$$PP = CapEx \div NAB(1) \quad (5)$$

Input parameters are reported in full in Table III so that readers may substitute alternative assumptions. The model is deliberately conservative in three respects: no terminal value is assigned to the digital assets, no price escalation is applied to the benefit streams, and the revenue uplift is held at the lower bound of the range reported in the revenue management literature.

2.5 Macroeconomic specification

Hypothesis H2 is examined through an extended Cobb-Douglas function for aggregate international tourism export receipts E ,

$$E = A \cdot K^{\alpha} \cdot L^{\beta} \cdot D^{\gamma} \quad (6)$$

where K is physical tourism capital, L is sectoral labour, D is the national digital maturity scalar proxied by DAI(national), and γ is the digital output elasticity. For projection purposes a baseline is first constructed by scaling 2025 receipts to the officially adopted 2030 arrivals target of 20 million [24], holding digital maturity at its trend path, after which the digital term is applied:

$$E(2030, accelerated) = E(2030, baseline) \times [D(accelerated) \div D(baseline)]^{\gamma} \quad (7)$$

The elasticity is calibrated at $\gamma = 0.44$, within the range reported for digital capital in service-sector production studies. Baseline digital maturity is set at 0.55 and the accelerated policy scenario at 0.78.

2.6 SWOT-AHP diagnostic

Qualitative strategic factors identified in the operator survey and in expert interviews were structured through a SWOT matrix and weighted by the Analytic Hierarchy Process [23]. Factor weights were elicited by pairwise comparison from a panel of eleven sector experts; the consistency ratio was 0.061, below the 0.10 acceptability threshold. Each factor received an impact score on a five-point scale, and the weighted vector is the product of normalised weight and impact score.

2.7 Methodological limitations

Four limitations bear on interpretation. The enterprise model is deterministic and single-case, and its results are illustrative of the modal configuration rather than generalisable to all accommodation enterprises. The macroeconomic elasticity is calibrated from the comparative literature rather than estimated from a national time series, which is too short following liberalisation to support reliable estimation of a separate digital term. The survey sample is confined to licensed operators in four regions and therefore under-represents unlicensed and rural providers. Finally, all results are associational and no causal claim is advanced.

3. Results

3.1 Macro-level tourism dynamics, 2020-2025

Table I summarises the statistical baseline. The recovery from the 2020 contraction, whose severity in tourism-dependent economies is documented in the pandemic literature [25], was rapid and was followed by growth substantially exceeding pre-pandemic trend. Inbound arrivals rose from 1.50 million in 2020 to 11.70 million in 2025, while export receipts rose from USD 0.42 billion to USD 4.80 billion over the same interval, a compound annual growth rate of 62.7 per cent. Average expenditure per foreign visitor rose from USD 280 to USD 411, indicating that growth reflected rising yield as well as rising volume. Internet penetration and electronic visa issuance expanded in parallel.

Table 1. Macro-level tourism and digital indicators, Uzbekistan, 2020-2025

Indicator	2020	2021	2022	2023	2024	2025	Source
Inbound foreign arrivals (million)	1.50	1.88	5.23	6.63	7.97	11.70	[1]

Indicator	2020	2021	2022	2023	2024	2025	Source
Tourism service export receipts (USD bn)	0.42	0.55	1.61	2.14	3.15	4.80	[2], [4]
Average spend per foreign visitor (USD)	280	292	308	323	395	411	Derived
Internet penetration rate (%)	71.0	73.2	76.5	79.8	83.2	86.5	[12], [21]
E-visa issuance (thousand)	142	198	385	562	820	1,150	e-visa.gov.uz

Note: 2025 arrivals figure is 11.68 million rounded to 11.70. Average spend is computed as export receipts divided by arrivals and is therefore an arithmetic derivation, not an independent survey estimate.

3.2 Sub-sectoral digital adoption

Application of equation (1) across seven functional sub-sectors reveals pronounced asymmetry in technological maturity (Table II). Air transport and electronic ticketing attain the highest composite score at 0.836, followed by state e-governance platforms at 0.789 and tier-1 branded hotels at 0.749. At the opposite extreme, regional guest houses and family accommodation register 0.263 and heritage attractions 0.351. The weakest dimension across the sector is analytical data utilisation, which falls below 0.20 in four of the seven sub-sectors, indicating that data are frequently captured for compliance purposes without being applied to operational decision-making.

Table 2. Sub-sectoral digital adoption index, Uzbek tourism sector, 2025

Tourism service sub-sector	UI	AUT	FIN	DAT	DAI(i)	Share s(i)
Air transport and e-ticketing	0.88	0.82	0.90	0.71	0.836	0.125
State e-governance (E-Visa, E-Mehmonxona)	0.82	0.88	0.74	0.69	0.789	0.090
Tier-1 hotels (4-5 star and branded)	0.79	0.74	0.81	0.62	0.749	0.120
Licensed inbound tour operators	0.52	0.42	0.56	0.28	0.457	0.170
Museums, heritage sites and galleries	0.46	0.30	0.41	0.18	0.351	0.100
Gastronomy and urban passenger transport	0.32	0.20	0.69	0.10	0.339	0.210
Regional guest houses and family stays	0.34	0.19	0.38	0.09	0.263	0.185
National composite DAI	—	—	—	—	0.498	1.000

Note: dimension weights w_1 – w_4 = 0.30, 0.25, 0.25, 0.20. Composites computed by equation (1); national composite by equation (2). UI = user interface; AUT = back-office automation; FIN = payment integration; DAT = data analytics utilisation.

The national composite of 0.498 therefore conceals a bimodal distribution. State administrative systems and internationally exposed transport and accommodation operators are digitally mature, while the regional private hospitality and attraction segments, which together account for approximately 48 per cent of sectoral turnover, remain weakly integrated. Because the traveller journey traverses both groups, the aggregate experience is constrained by the weaker segment irrespective of the strength of the stronger.

3.3 Enterprise-level financial returns

Table III reports the capital-budgeting model for the representative 35-room enterprise. Annual room revenue of USD 421,575 is computed from 35 rooms at 60 per cent occupancy and an average daily rate of USD 55. Under the stated assumptions the net annual benefit is USD 34,825 against a one-off capital outlay of USD 18,500, yielding a three-year cumulative return of 465 per cent and a payback period of 6.4 months. Hypothesis H1 is therefore supported for the modal configuration modelled.

Table 3. Enterprise digital investment model, 35-room regional boutique hotel (usd)

Model component	Parameter	Value
Baseline room revenue	35 rooms × 365 nights × 60% occupancy × USD 55 ADR	421,575
OTA commission paid (baseline)	45% of bookings via OTA at 18% commission	34,148
ΔC — commission saved	30% of OTA volume shifted to direct channel	10,244
ΔR — revenue uplift	6.4% RevPAR gain from dynamic rate management	26,981
ΔC — administrative labour saved	automated registration and reporting	1,800
OpEx(digital)	PMS and channel-manager subscriptions, gateway fees, connectivity	(4,200)
Net annual benefit, NAB	equation (3)	34,825
CapEx(digital)	PMS deployment, POS terminal, booking engine, Wi-Fi upgrade, training	18,500
Three-year ROI	equation (4)	465%
Payback period	equation (5)	6.4 months

Note: figures are model outputs under the stated parameters, not audited enterprise accounts. No terminal asset value, benefit escalation or financing cost is applied.

Sensitivity analysis indicates that the result is robust across a plausible parameter range. Reducing the RevPAR uplift to 3.0 per cent and the channel shift to 15 per cent lowers the three-year return to 168 per cent and extends payback to 13.4 months, which remains a materially attractive investment. The return becomes marginal only if the RevPAR uplift falls below approximately 1.2 per cent, a condition the revenue management literature does not support for enterprises moving from static to dynamic pricing.

3.4 Macroeconomic projection to 2030

Table IV reports the projection obtained from equations (6) and (7). Scaling 2025 receipts to the officially adopted 2030 arrivals target of 20 million yields a baseline of USD 8.21 billion. Raising the national digital maturity scalar from 0.55 to 0.78 applies a multiplier of 1.166, giving accelerated receipts of USD 9.57 billion and an increment of USD 1.37 billion attributable to digital capital accumulation rather than to arrival volume. Hypothesis H2 is therefore supported at the calibrated elasticity.

Table 4. Projected tourism service export receipts to 2030 under two digital scenarios

Scenario component	Value
2025 actual export receipts	USD 4.80 bn
2030 arrivals target	20.0 million
2030 baseline receipts (arrivals-scaled, trend digital maturity)	USD 8.21 bn
Digital maturity scalar, baseline D(baseline)	0.55
Digital maturity scalar, accelerated D(accelerated)	0.78
Digital output elasticity γ	0.44
Uplift multiplier, equation (7)	1.166
2030 accelerated receipts	USD 9.57 bn
Increment attributable to digital acceleration	USD 1.37 bn

Note: γ is calibrated from comparative service-sector estimates rather than estimated from a national time series; the increment scales approximately linearly with γ and should be read as an order-of-magnitude projection under stated assumptions.

3.5 SWOT-AHP strategic diagnostic

Table V reports the weighted diagnostic. Two readings are distinguished. On elicited weight, that is on the decision relevance assigned by the expert panel, the single most important factor in the matrix is restricted international payment gateway integration at 0.167, the highest weight of any strength, weakness, opportunity or threat. On weighted vector, which multiplies weight by impact score, the leading factor is the country's unique UNESCO heritage endowment at 0.764, ahead of payment gateway integration at 0.701. The two readings together support a specific strategic interpretation: Uzbekistan's principal asset is exogenous and already in place, whereas its principal actionable constraint is payment integration, which the panel judged more decision-relevant than any other factor precisely because it is remediable through policy. Aggregate internal factors (strengths 1.385, weaknesses 1.117) exceed aggregate external factors (opportunities 1.117, threats 0.728), indicating a destination whose competitive position rests more on endogenous capability than on market conditions.

Table 5. Swot-AHP decision matrix for digital tourism in Uzbekistan

Category	Strategic factor	Weight	Score	Weighted vector
Strengths	Unique UNESCO heritage assets and cultural capital	0.156	4.9	0.764
	State commitment via Digital Uzbekistan 2030	0.135	4.6	0.621
Weaknesses	Restricted international payment gateway integration	0.167	4.2	0.701
	Digital literacy gap among SMTE managers	0.104	4.0	0.416
Opportunities	High-yield digital nomad and ecotourism segments	0.146	4.5	0.657
	AI-driven itinerary personalisation and dynamic pricing	0.115	4.0	0.460
Threats	Cybersecurity and visitor data privacy exposure	0.094	4.3	0.404
	Urban-rural digital asymmetry within the destination	0.083	3.9	0.324
Total		1.000		

Note: weights from AHP pairwise comparison, eleven-member expert panel, consistency ratio 0.061. Weighted vector = weight $\times$ score.

4. Discussion

The results confirm that digital transformation operates as an economic multiplier in the Uzbek tourism economy, but they locate the binding constraint precisely: not in the absence of state digital capability, which is demonstrably strong, but in four systemic frictions concentrated at the interface between state systems, international markets and regional private providers.

4.1 Cross-border payment fragmentation

Domestic payment infrastructure has developed rapidly, with Uzcard, Humo, Payme and Uzum achieving broad national acceptance. This progress has not translated into equivalent acceptance of instruments familiar to non-CIS visitors. Regional guest houses in particular face merchant banking compliance requirements and regulated currency conversion spreads that in practice preclude direct acceptance of international card products and mobile wallets. Survey responses indicate that where a preferred

payment instrument cannot be used at the point of booking, non-CIS conversion falls by approximately 28 per cent.

An important qualification applies. The four largest source markets in 2025 were Kyrgyzstan, Tajikistan, Kazakhstan and Russia, which together account for the substantial majority of arrivals [1], [3]. For these visitors domestic and regional payment instruments are largely sufficient, and payment friction is therefore not a volume constraint. It is, however, a yield constraint, because per-visitor expenditure among non-CIS visitors materially exceeds the regional average. Payment reform should accordingly be justified on yield rather than on arrival volume, a distinction absent from much of the prevailing policy discussion.

4.2 Connectivity asymmetry

Fourth- and fifth-generation mobile broadband coverage supports satisfactory digital experience in primary urban centres. Secondary and tertiary destinations diverge sharply. Measured round-trip latency reaches approximately 120 milliseconds at yurt camps in the Kyzylkum Desert, at ecotourism sites in Zaamin and at cultural sites in Karakalpakstan. At this level cloud-hosted property management systems become unreliable and real-time location-based services are not practically deployable, which forecloses precisely the digital operating model that the enterprise results indicate to be most financially attractive. Connectivity investment is therefore a precondition for enterprise-level digitisation in these locations rather than a parallel objective.

4.3 Institutional data fragmentation

The state operates several high-performing but weakly interconnected systems, including the E-Visa facility and the E-Mehmonxona guest registration platform, alongside separate transport reservation systems maintained by Uzbekistan Airways and Uzbekistan Railways and independent ticketing arrangements at cultural sites. Because these systems do not exchange data, no actor holds an integrated view of the visitor journey. This is the structural condition that Ivars-Baidal and colleagues characterise as technology deployment without governance integration [10], and it explains the low analytical dimension scores observed in Table II: data are generated in volume but are not available at the point where operational decisions are taken.

4.4 Managerial digital literacy

The Technology Acceptance Model predicts that adoption will lag where perceived usefulness is obscured and perceived ease of use is low [16], [17]. Both conditions obtain among surveyed regional SMTE managers. The enterprise results reported here speak directly to the first condition, since a 6.4-month payback is a proposition that can be communicated without technical vocabulary. The second condition requires sustained capability building rather than information provision alone.

4.5 Policy framework

Three pillars follow from the diagnostic. The first is modernisation of cross-border payment gateways. This implies a financial technology regulatory sandbox for travel services operated jointly by the Ministry of Digital Technologies and the Central Bank; integration of local settlement banks with international merchant aggregators through open banking interfaces; removal of the currency conversion surcharge for registered heritage accommodation establishments; and mandatory disclosure of dynamic currency conversion terms at the point of sale.

The second pillar is an integrated open data architecture. A national smart tourism data layer should connect E-Visa, E-Mehmonxona, transport reservation systems and cultural site ticketing under a common visitor identifier, with a unified Silk Road Pass as the traveller-facing expression. Governance should specify access rights, retention periods and anonymisation standards before technical integration proceeds, since retrofitting governance to an operating data platform is considerably more difficult than specifying it in advance.

The third pillar is regional capability building. Given the enterprise returns documented in Table III, a partial capital subsidy combined with structured implementation support would plausibly be self-financing through increased tax receipts within the payback horizon, although a dedicated fiscal analysis would be required to establish this.

4.6 Limitations

Beyond the methodological limitations stated in Section III-G, three further constraints apply. The enterprise model represents one configuration in two cities and does not capture the heterogeneity of the national accommodation stock. The macroeconomic projection depends on an externally calibrated elasticity and on attainment of the 20 million arrivals target, neither of which is assured. And the SWOT-AHP weights reflect the judgement of an eleven-member expert panel whose composition, although sectorally balanced, is small.

4.7 Future research

Four directions follow. First, spatial econometric estimation of digital elasticity across Central Asian service sectors would replace the calibrated elasticity with an estimated one. Second, direct measurement of digital friction along the Silk Road corridor would convert the descriptive account of payment and connectivity constraints into a quantified index. Third, development of a localised machine-learning yield management prototype for small historical guest houses would test whether the modelled RevPAR uplift is realisable in practice. Fourth, an open-source channel management architecture designed for enterprises of this scale would address the cost barrier that commercial systems present.

5. Conclusion

This study examined the challenges, opportunities and empirical dynamics of digital transformation in the tourism service sector of Uzbekistan, integrating macroeconomic performance indicators, enterprise-level financial modelling and econometric projection within an IMRAD framework.

Three principal findings emerge. First, the national composite Digital Adoption Index of 0.498 conceals a bimodal distribution in which state e-governance and internationally exposed transport and accommodation operators are digitally mature while regional guest houses and heritage attractions are not; because the visitor journey traverses both, aggregate service quality is governed by the weaker segment. Second, investment in a contemporary digital operating stack yields a three-year return of 465 per cent and a payback period of 6.4 months for a representative 35-room regional enterprise, a result robust across a wide parameter range and sufficient to resolve the perceived-usefulness barrier to adoption. Third, raising national digital maturity from a baseline 0.55 to 0.78 by 2030 is projected to generate approximately USD 1.37 billion in additional annual export receipts beyond an arrivals-driven baseline of USD 8.21 billion.

The binding constraints are not technological capability but cross-border payment fragmentation, connectivity asymmetry in secondary destinations, institutional data fragmentation and managerial digital literacy. Addressing them requires the three-pillar framework advanced here: modernised cross-border financial technology gateways, an integrated open data architecture expressed through a unified Silk Road Pass, and sustained capability building among regional enterprises. The empirical results reported here provide the foundation for the author's prospective doctoral research programme.

REFERENCES

- [1] Statistics Agency under the President of the Republic of Uzbekistan, "Statistical report on tourist flows and inbound visitors, January–December 2025," Tashkent, Uzbekistan, 2026. [Online]. Available: <https://stat.uz>
- [2] Central Bank of the Republic of Uzbekistan, "Balance of payments, international investment position and external debt of the Republic of Uzbekistan for 2025," Tashkent, Uzbekistan, 2026.

- [3] UN Tourism, "World Tourism Barometer: Central Asian regional focus," UN Tourism Publications, Madrid, Spain, 2026.
- [4] World Travel and Tourism Council, "Travel and tourism economic impact research 2026: Uzbekistan country report," WTTC, London, U.K., 2026.
- [5] U. Gretzel, M. Sigala, Z. Xiang, and C. Koo, "Smart tourism: foundations and developments," *Electron. Markets*, vol. 25, no. 3, pp. 179–188, Sep. 2015, doi: 10.1007/s12525-015-0196-8.
- [6] D. Buhalis and A. Amaranggana, "Smart tourism destinations enhancing tourism experience through personalisation of services," in *Information and Communication Technologies in Tourism 2015*, I. Tussyadiah and A. Inversini, Eds. Cham, Switzerland: Springer, 2015, pp. 377–389.
- [7] Z. Xiang, I. Tussyadiah, and D. Buhalis, "Smart tourism and digital transformation: implications for destination management," *Ann. Tourism Res.*, vol. 88, 103173, May 2021, doi: 10.1016/j.annals.2021.103173.
- [8] B. Neuhofer, D. Buhalis, and A. Ladkin, "Smart technologies for personalized experiences: a case study in the hospitality domain," *Electron. Markets*, vol. 25, no. 3, pp. 243–254, Sep. 2015.
- [9] C. Koo, S. Shin, U. Gretzel, W. C. Hunter, and N. Chung, "Conceptualization of smart tourism destination competitiveness," *Asia Pacific J. Inf. Syst.*, vol. 26, no. 4, pp. 561–576, Dec. 2016.
- [10] J. A. Ivars-Baidal, M. A. Celdrán-Bernabeu, J.-N. Mazón, and Á. F. Perles-Ivars, "Smart destinations and the evolution of ICTs: a new scenario for destination management?," *Curr. Issues Tourism*, vol. 22, no. 13, pp. 1581–1600, 2019.
- [11] President of the Republic of Uzbekistan, "Decree No. UP-6079 on approval of the strategy 'Digital Uzbekistan 2030' and measures for its effective implementation," Tashkent, Uzbekistan, Oct. 2020.
- [12] Ministry of Digital Technologies of the Republic of Uzbekistan, "Report on the implementation progress of the strategy 'Digital Uzbekistan 2030'," Tashkent, Uzbekistan, 2024.
- [13] F. Femenia-Serra and J. A. Ivars-Baidal, "Do smart tourism destinations really work? The case of Benidorm," *Asia Pacific J. Tourism Res.*, vol. 26, no. 4, pp. 365–384, 2021.
- [14] G. Del Chiappa and R. Baggio, "Knowledge transfer in smart tourism destinations: analyzing the effects of a network structure," *J. Destination Marketing Manage.*, vol. 4, no. 3, pp. 145–150, Sep. 2015.
- [15] S. Gössling, "Tourism, technology and ICT: a critical review of affordances and concessions," *J. Sustainable Tourism*, vol. 29, no. 5, pp. 733–750, 2021.
- [16] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quart.*, vol. 13, no. 3, pp. 319–340, Sep. 1989.
- [17] V. Venkatesh and F. D. Davis, "A theoretical extension of the technology acceptance model: four longitudinal field studies," *Manage. Sci.*, vol. 46, no. 2, pp. 186–204, Feb. 2000.
- [18] C. W. Cobb and P. H. Douglas, "A theory of production," *Amer. Econ. Rev.*, vol. 18, no. 1, pp. 139–165, Mar. 1928.
- [19] D. Buhalis and R. Law, "Progress in information technology and tourism management: 20 years on and 10 years after the internet," *Tourism Manage.*, vol. 29, no. 4, pp. 609–623, Aug. 2008.
- [20] R. Law, D. Buhalis, and C. Cobanoglu, "Progress on information and communication technologies in hospitality and tourism," *Int. J. Contemp. Hospitality Manage.*, vol. 26, no. 5, pp. 727–750, 2014.
- [21] International Telecommunication Union, "Measuring digital development: facts and figures 2025," ITU Publications, Geneva, Switzerland, 2025.
- [22] World Bank, "Uzbekistan country economic update: harnessing the digital economy," World Bank Group, Washington, DC, USA, 2025.
- [23] T. L. Saaty, "How to make a decision: the analytic hierarchy process," *Eur. J. Oper. Res.*, vol. 48, no. 1, pp. 9–26, Sep. 1990.
- [24] Cabinet of Ministers of the Republic of Uzbekistan, "Tourism development strategy of the Republic of Uzbekistan to 2030," Tashkent, Uzbekistan, 2023.
- [25] M. Sigala, "Tourism and COVID-19: impacts and implications for advancing and resetting industry and research," *J. Bus. Res.*, vol. 117, pp. 312–321, Sep. 2020.