

Digital Technologies and Tourism Development in Western Libya

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DOI: <https://doi.org/10.51244/IJRSI.2026.1309000036>

Received: 06 September 2026; Accepted: 11 September 2026; Published: 03 October 2026

ABSTRACT

This study examines the role of digital technologies in developing tourism in Western Libya within an economy seeking to diversify beyond oil dependence. It addresses the gap between the region's rich cultural, archaeological and natural resources and its limited institutional, infrastructural and promotional readiness. Using a descriptive and correlational design, the study analyses questionnaire data from 320 valid respondents representing tourism stakeholders, public institutions, hotels, travel agencies and related organisations. The data were processed using descriptive statistics, Pearson correlations, Cronbach's alpha and a test-retest procedure. The findings show that 63.1% of respondents perceive internet services as weak, 66.3% report insufficiently diversified promotional channels and 67.5% consider tourism absorption capacity inadequate. Although 84.7% report awareness of local tourism attractions, this awareness has not been effectively translated into integrated tourism products or digital promotion. Pearson correlations reveal positive but modest associations between telecommunications infrastructure, internet-service quality and the use of modern communication media. The study recommends coordinated digital governance, improved connectivity, public-private partnerships, local capacity building and carefully managed international technical cooperation. The results are exploratory and correlational; they do not constitute causal econometric forecasts.

Keywords: Tourism development; digital transformation; smart tourism; tourism planning; Western Libya.

INTRODUCTION

Digital technologies have become important determinants of competitiveness, productivity and sustainability in tourism. Their role extends beyond the automation of administrative tasks to include destination promotion, online booking, digital payment, geographic information, social-media communication and the management of visitors' experiences. The development of smart tourism therefore depends not only on technological equipment but also on institutional coordination, digital skills, reliable infrastructure and effective destination governance.

This issue is particularly relevant to Libya. The Libyan economy remains strongly dependent on oil and gas, which makes the diversification of income sources and employment a major development priority. Tourism could contribute to this objective because the country possesses substantial coastal, archaeological, cultural, mountain, desert and oasis resources. Western Libya is especially significant in this regard. The region includes Tripoli, Al Khums, Sabratha, Leptis Magna, the Western Mountain and Ghadames, and combines Mediterranean landscapes, internationally recognised archaeological sites, cultural heritage and desert tourism potential.

Despite these assets, tourism development in Western Libya remains constrained by political and institutional fragmentation, security concerns, limited infrastructure, weak promotional coordination and insufficient use of modern technologies. The region's tourism resources have not yet been transformed into integrated, accessible and competitive products supported by reliable information, digital booking, interactive maps and coordinated

destination management.

The study therefore asks: to what extent can modern technologies contribute to tourism development in Western Libya, and what type of strategic planning is required for their effective deployment? It examines three research hypotheses. H1 proposes a positive and significant association between strategic planning for technology adoption and tourism development. H2 concerns the perceived insufficiency and lack of unity of the existing strategic-planning framework. H3 proposes that perceived weaknesses in tourism performance, competitiveness and demand are associated with weaknesses in tourism-development strategies.

The study combines a historical and documentary review, a descriptive assessment of tourism assets and digital readiness and a quantitative field survey. Data were collected through a questionnaire administered to 320 valid respondents from tourism institutions, hotels, travel agencies, companies and professional organisations in Western Libya. The data were analysed using descriptive statistics, Pearson correlations, Cronbach's alpha, a test-retest procedure and tests comparing observed proportions with a 50% reference proportion.

The article is organised as follows. Section 2 reviews the literature on digital transformation and smart tourism. Section 3 examines the Libyan tourism sector and the specific potential of Western Libya. Section 4 presents the field study and descriptive results. Section 5 discusses reliability, correlations, hypothesis tests and future development options. The conclusion summarises the main findings and their policy implications.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Contemporary tourism research has moved beyond viewing technology as a technical instrument for reducing costs or automating administrative tasks. Digital tools increasingly affect the organisation of the tourism value chain, destination management and consumer behaviour (Porter & Millar, 1985; Werthner et al., 2015).

Tourism is an information-intensive activity. Its competitiveness depends on the speed of information circulation, the construction of destination images and the management of visitors' experiences. Within this context, the literature distinguishes between two stages of digital development. The first is e-tourism, which focuses on the computerisation of commercial operations, online booking and the reduction of dependence on traditional intermediaries. The second is smart tourism, which represents a wider ecosystem integrating the Internet of Things, artificial intelligence, big data, local governance and destination-management systems (Gretzel et al., 2015).

The concept of the smart destination has emerged from this development. A smart destination is not simply a destination equipped with digital devices. It is an organisational and institutional system seeking to combine technological innovation, accessibility, sustainability, governance and quality of life for residents with improved visitor experiences (Buhalis, 2020). Smart tourism therefore requires not only infrastructure but also institutional coordination, professional skills, data governance and the ability of local actors to participate in decision-making.

Three major theoretical perspectives are relevant to this study. The first is the efficiency perspective, which focuses on the ability of digital technologies to reduce transaction costs, accelerate information flows, improve the monitoring of promotional performance and facilitate communication between suppliers and tourists (Buhalis & Law, 2008).

The second is the Resource-Based View. From this perspective, data, digital skills, analytical capacity and technological infrastructure can become strategic resources. When these resources are rare, difficult to imitate and effectively organised, they may contribute to competitive advantage (Buhalis & Inversini, 2014).

The third is a critical phenomenological perspective. This approach warns that excessive automation may commodify the tourism experience and reduce the human, cultural and relational dimensions of hospitality. Digital systems should therefore support human interaction and cultural communication rather than eliminate them (Wang et al., 2025).

Empirical research has documented the influence of digital platforms, social media and electronic word-of-mouth on destination image and consumer behaviour (Werthner et al., 2015; Mariani & Matarazzo, 2021). Virtual and augmented reality can also function as pre-visit stimuli by enabling potential visitors to experience destinations virtually and reduce uncertainty before travelling (Tussyadiah et al., 2018).

The experiences of Tunisia and Algeria are particularly relevant to Libya. Studies of Tunisia indicate that the adoption of electronic booking systems has been constrained by financial regulations, payment limitations and fragmented databases (Bejaoui & Ben Youssef, 2019). Research on Algeria similarly suggests that the absence of a unified public strategy may lead to isolated private initiatives without substantial aggregate impact (Bouguerra & Olayan, 2021; Djanane & Hireche, 2024).

The regional comparison indicates that technology alone cannot transform tourism. Digital transformation requires public–private partnerships, institutional coordination, reliable infrastructure, skills and an enabling regulatory environment. These requirements are particularly relevant to Libya, where tourism development is affected by political fragmentation, security risks, limited institutional continuity and dependence on oil revenues.

The research gap addressed by this study concerns the feasibility of smart tourism in a rentier economy facing institutional and political transition. The originality of the study lies in examining the perceived digital readiness of Western Libya, the obstacles to technological adoption and the institutional conditions necessary for transforming scattered tourism assets into integrated destinations.

The Libyan Tourism Sector

Studying the Libyan tourism sector and the conditions of its digital transformation provides an essential basis for understanding the transition from traditional destination management to a smarter and more sustainable tourism model. Such an approach requires an integrated diagnosis of the sector's historical development, tourism assets, technological opportunities, institutional constraints and regional readiness.

Historical Development and Alternative Indicators

The development of the Libyan tourism sector has been characterised by instability, institutional fragmentation and limited continuity in public policy. Libya nevertheless possesses a substantial tourism resource base built on three interconnected pillars: the Mediterranean coastline, cultural and archaeological heritage, and extensive desert landscapes.

The country contains five UNESCO World Heritage sites: Sabratha, Leptis Magna, Cyrene, Ghadames and Tadrart Acacus. These resources have historically remained closer to latent assets than to a fully organised tourism industry.

The development of the sector can be divided into three broad phases. The first was the period before 2011, characterised by limited growth, weak central coordination, a modest hotel base and insufficient international connectivity. The second phase, from 2011 to 2020, was marked by armed conflict, security instability and institutional fragmentation. These conditions contributed to the deterioration of Libya's international image as a tourism destination and discouraged the engagement of airlines, insurance companies and global travel agencies.

The third phase, from 2021 onwards, has witnessed partial and selective recovery. This recovery appears to have been driven by regional travel, specialised tourism, business-related mobility and risk-calculated travel. However, the available statistics remain fragmented, and their institutional continuity is limited.

In this context, online indicators can provide complementary information. Search volumes, website visits, social-media engagement, online booking requests and electronic reviews can help identify potential demand, geographic areas of interest and destination-image trends. These indicators do not replace official statistics, but they may supplement them when conventional tourism data are incomplete or irregular.

Digitisation and the Promotional Structure

Modern technologies are no longer merely supplementary instruments. They increasingly shape the production, promotion and management of tourism destinations. Search engines, digital maps and online information systems reduce uncertainty by helping potential visitors assess routes, distances, available services and travel conditions.

An official tourism website should therefore function as an integrated communication and service platform rather than as a static information page. It should provide multilingual information, destination maps, accommodation information, booking possibilities, payment solutions, safety information and links to local tourism providers.

Social media and Web 2.0 tools also change the relationship between tourism institutions and visitors. User-generated content, electronic word-of-mouth, video platforms, online reviews and digital communities can contribute to the construction of destination image. They can also assist crisis communication and help replace negative stereotypes with reliable visual and cultural narratives.

However, digital promotion is effective only when supported by reliable services. A destination cannot create a sustainable digital reputation if visitors encounter poor connectivity, inadequate transport, limited accommodation, unreliable information or weak security. Digital marketing should therefore be integrated with physical infrastructure, service quality and institutional coordination.

Western Libya and Digital Readiness

Western Libya represents one of the most suitable regions for an initial tourism-development programme. It concentrates substantial demographic, institutional and administrative resources and benefits from proximity to the Tunisian border. This location provides opportunities for cross-border tourism, transit tourism, business tourism and regional circuits.

The region contains several complementary tourism products. The coastal areas around Tripoli, Misrata, Sabratha and Zuwara offer opportunities for maritime, recreational and family tourism. Sabratha and Leptis Magna provide archaeological and cultural resources. The Western Mountain offers historic settlements, traditional architecture and Amazigh cultural landscapes. Ghadames represents an important oasis and desert tourism destination.

The region could therefore be organised as a connected, multi-season destination rather than as a collection of isolated sites. Such a model could increase length of stay, visitor expenditure and the geographical distribution of tourism benefits.

The transition to this model faces important challenges. These include fragmented regulatory responsibilities, unclear coordination between the Ministry of Tourism, municipalities and professional organisations, security risks, limited tourism insurance, weak foreign investment and insufficiently specialised human resources.

The creation of a smart destination consequently requires more than the installation of digital equipment. It requires flexible governance, public-private cooperation, reliable digital infrastructure, professional content, local training and the transformation of isolated sites into integrated, bookable and reviewable tourism products.

APPLIED STUDY

Building on the structural diagnosis of the tourism sector, this section presents the field study and the statistical analysis of respondents' views. It examines the perceived relationship between digital readiness, tourism planning, promotion, infrastructure and destination competitiveness.

Research Design, Instrument Reliability and Sample Characteristics

The field study transfers the theoretical framework of digital transformation and smart tourism into an empirical examination of the operational environment of Western Libya. A descriptive-analytical design was adopted to explore the distribution of digital-enabling factors and their perceived relationship with tourism promotion and destination competitiveness.

The study population consisted of stakeholders, employees and administrative and technical officials connected with the tourism sector in Western Libya. These included personnel from the Ministry of Tourism and Traditional Industries, municipalities, tourism companies, hotels, travel agencies and professional organisations.

The geographical scope extended from the Mediterranean coast in the north to the margins of Hamada al-Hamra and the Ghadames oasis in the south, and from the Libyan–Tunisian border in the west to Al Khums in the east. The region was selected because it combines coastal, archaeological, cultural, mountain, desert and oasis resources.

The questionnaire was divided into three sections. The first collected demographic and professional information. The second addressed tourism resources, strategic planning and sectoral constraints. The third examined the integration of modern technologies into promotion, communication and tourism services.

To assess content validity, the preliminary questionnaire was submitted to a five-member academic panel with expertise in tourism, economics, environmental engineering and management from the universities of Tripoli and Zawia. The questionnaire was revised in light of their comments.

For primary data collection, 400 questionnaires were initially targeted. A total of 350 were retrieved. After inspection, 30 forms were excluded because of missing data or inconsistent responses, leaving 320 valid questionnaires. The valid-response rate relative to the initial target was therefore 80%.

The study used a purposive, non-probability sampling procedure designed to reach respondents with direct knowledge of tourism administration, hospitality, travel services, tourism promotion and digital transformation. Respondents were recruited from the Ministry of Tourism and Traditional Industries, local municipalities, hotels, tourism companies, travel agencies and professional organisations operating in Western Libya. The questionnaire was administered directly and electronically between March and May 2025, through printed questionnaires and an electronic form. Because a complete sampling frame and the exact distribution of tourism stakeholders in Western Libya were not available, the sample cannot be considered statistically representative of all stakeholders in the region. Nevertheless, the 320 valid responses provide an adequate empirical basis for the descriptive and correlational analyses conducted in this study. The findings should therefore be interpreted as evidence of the perceptions and assessments of the surveyed respondents rather than as statistically generalisable estimates for the entire tourism sector in Western Libya.

A test-retest procedure was conducted on a pilot group over a two-week interval. The resulting coefficient was 0.7431, indicating moderate-to-good temporal stability. The exact statistic used for this procedure should be reported as Pearson's r , an intraclass correlation coefficient or another coefficient, depending on the SPSS output.

The overall Cronbach's alpha was 0.631 for the reported 23-item questionnaire. This value indicates modest internal consistency and is only marginally above the lower threshold sometimes used in exploratory research. It should not be interpreted as evidence of strong reliability. The relatively low coefficient may reflect the multidimensional structure of the questionnaire, which combines demographic characteristics, tourism awareness, strategic planning, digital infrastructure, promotion and service conditions.

Accordingly, the alpha coefficient is treated as a limitation. Future research should calculate reliability coefficients separately for conceptually distinct subscales, examine item–total correlations and revise items with weak performance. Demographic variables should be treated as descriptive or control variables and should not be included automatically in the same latent scale as digital-readiness items.

Table 1. Demographic and Professional Characteristics of the Sample

Variable	Category	Frequency	Percentage
Gender	Male	242	75.6
	Female	78	24.4
	Total	320	100
Age	20–30 years	114	35.6
	31–40 years	117	36.6
	41–50 years	69	21.6
	51 years and over	20	6.2
	Total	320	100
Marital status	Single	152	47.5
	Married	168	52.5
	Total	320	100
Educational level	Secondary	96	30
	University	190	59.4
	Postgraduate	34	10.6
	Total	320	100
Position	Administrative staff	225	70.3
	Head of department	64	20
	Director	31	9.7
	Total	320	100
Monthly income	LYD 500	93	29.1
	LYD 750	139	43.4
	LYD 1,000	51	15.9
	LYD 1,500 and above	37	11.6
	Total	320	100

Note: Frequencies and percentages are the principal descriptive statistics. The questionnaire is available from the authors upon reasonable request.

Source: Authors' elaboration.

The sample is characterised by a predominance of male respondents, who represent 75.6% of the total. Respondents aged 20–40 account for 72.2%, indicating a relatively young workforce. University graduates represent 59.4% and postgraduate respondents 10.6%. Administrative staff account for 70.3%, heads of departments for 20% and directors for 9.7%.

The income distribution indicates that 72.5% of respondents reported monthly income categories of LYD 750 or below. This pattern suggests a potential constraint on job attractiveness and retention. However, the questionnaire did not directly measure staff turnover, organisational loyalty or recruitment difficulties. These implications should therefore be treated as plausible interpretations rather than as directly established effects.

Awareness and Performance

Before presenting the results, it is important to distinguish descriptive indicators from hypothesis tests. Frequencies and percentages describe the distribution of respondents' perceptions and preferences. They do not, by themselves, confirm or reject relational hypotheses. The hypothesis tests are based on the relevant response proportions and, where applicable, on composite variables and Pearson correlation coefficients.

For a correlation test, the null hypothesis is $H_0: \rho = 0$, meaning that there is no linear association in the population. The alternative hypothesis is $H_1: \rho \neq 0$, or a directional equivalent when theoretically justified. At the 5% significance level, $p \leq 0.05$ leads to rejection of the null hypothesis. When $p > 0.05$, the null

hypothesis is not rejected; this does not prove that it is true. Statistical significance is interpreted together with the direction, magnitude and practical relevance of the coefficient.

Table 2 shows that 84.7% of respondents, corresponding to 271 individuals, reported knowledge of tourist-attraction areas in Western Libya. This is a positive indicator of perceived awareness of the region's tourism assets. However, the questionnaire does not directly measure whether this awareness is translated into investment, destination planning or promotional activity. The result should therefore be interpreted as evidence of reported knowledge rather than as proof of an operational tourism strategy.

Table 2. Knowledge of Tourist Attractions and Preferred Tourism Types

Indicator	Category	Frequency	Percentage
Knowledge of attractions	Yes	271	84.7
	No	49	15.3
	Total	320	100
Preferred tourism type	Therapeutic	24	7.5
	Desert	153	47.8
	Recreational	82	25.6
	Cultural	47	14.7
	Other	14	4.4
	Total	320	100
Preferred destination	Tripoli	101	31.6
	Leptis Magna	67	20.9
	Sabratha	95	29.7
	Ghadames	41	12.8
	Western Mountain	7	2.2
	Other places	9	2.8
	Total	320	100

Source: Authors' elaboration.

Desert tourism was the most frequently selected preference, accounting for 47.8% of responses, followed by recreational tourism at 25.6% and cultural tourism at 14.7%. This distribution indicates that respondents attach particular importance to the desert as a potential tourism product. It does not, by itself, establish international competitiveness, which would require comparative market data, visitor numbers, revenues, accessibility indicators and destination benchmarking.

Tripoli received the highest share of destination preferences at 31.6%, followed by Sabratha at 29.7%, Leptis Magna at 20.9%, Ghadames at 12.8% and the Western Mountain at 2.2%. These preferences suggest four possible axes for integrated destination planning: the metropolitan and business hub, the Roman archaeological sites, the desert and oasis system, and the cultural landscapes of the Western Mountain. Further research is needed to determine whether these preferences correspond to actual visitor demand.

Table 3. Sector Appraisal and Demand Determinants

Indicator	Category	Frequency	Percentage
Tourism level	Excellent	22	6.9
	Good	179	55.9
	Weak	119	37.2
	Total	320	100
Influence of income on travel	No	10	3.1
	To some extent	93	29.1
	Yes	217	67.8
	Total	320	100

Means of destination awareness	Cultural centres	141	44.1
	Tourism companies abroad	73	22.8
	Friends and personal relationships	106	33.1
	Total	320	100
Planning smart projects	Foreign experts	197	61.6
	Local specialists	102	31.9
	Other	21	6.5
	Total	320	100

Source: Authors' elaboration.

A majority of respondents, 55.9%, assessed the current level of tourism as good, while 37.2% considered it weak and 6.9% excellent. The relatively large share reporting weak performance suggests a perceived gap between available tourism assets and their operational development.

Income was considered an important influence on travel decisions by 67.8% of respondents. This result indicates that respondents perceive household purchasing power and broader economic conditions as relevant to tourism demand. It does not estimate the causal effect of income on actual travel behaviour.

Cultural centres were identified as the main source of destination awareness by 44.1% of respondents, followed by friends and personal relationships at 33.1% and tourism companies abroad at 22.8%. This distribution suggests that respondents rely primarily on cultural and interpersonal channels, while foreign tourism companies play a less prominent role.

The preference for foreign experts in planning smart tourism projects, expressed by 61.6% of respondents, may indicate a perceived shortage of specialised local expertise and a demand for external knowledge transfer. It should not, however, be interpreted as evidence that foreign consultants are inherently superior to local specialists. Excessive dependence on external consultants may weaken local institutional learning, produce recommendations insufficiently adapted to Libya's administrative and security context and limit the development of durable national capacities.

A more sustainable approach would combine targeted international expertise with the progressive transfer of knowledge to Libyan universities, public institutions, municipalities, professional organisations and local firms. International consultants should support rather than substitute for local expertise and institutional ownership.

Technological and Promotional Environment

The results in Table 4 show that medium and weak evaluations dominate several aspects of the tourism environment. Public tourism facilities were rated good by 52.8% of respondents and weak by 42.8%. Restaurant and café services received a more favourable assessment, with 70% of respondents rating them good. The treatment of tourists outside tourist sites was assessed as good by 58.4% and excellent by 33.1%.

These results suggest that social hospitality constitutes a relative strength of the destination. However, a positive social environment does not compensate for the absence of information, guidance and booking systems.

Table 4. Tourism Services, Promotional Infrastructure and Communication

Indicator	Category	Frequency	Percentage
Public tourism facilities	Excellent	14	4.4
	Good	169	52.8
	Weak	137	42.8
	Total	320	100
Restaurant and café services	Excellent	18	5.6

	Good	224	70
	Weak	78	24.4
	Total	320	100
Treatment of tourists outside sites	Excellent	106	33.1
	Good	187	58.4
	Weak	27	8.5
	Total	320	100
Maps and tourist guides	No	110	34.4
	To some extent	159	49.7
	Yes	51	15.9
	Total	320	100
Number of communication media used	One	133	41.5
	Two	124	38.8
	Three or more	63	19.7
	Total	320	100
Use of technologies in promotion	Excellent	21	6.6
	Good	143	44.7
	Weak	156	48.7
	Total	320	100

Source: Authors' elaboration.

Almost half of the respondents, 49.7%, stated that maps and tourist guides were available only to some extent, while 34.4% reported that they were unavailable. This suggests limited access to guidance and orientation tools. It is consistent with a weak digital information environment, although the study did not directly audit the availability or quality of all physical and digital guidance systems.

A total of 66.3% of respondents indicated that Western Libya did not enjoy diversified promotional means. Television was identified as the most influential current medium by 65.6%, followed by printed materials and brochures at 15.9% and radio at 11.9%. These figures suggest that traditional media remain dominant and that the transition towards interactive digital communication remains limited.

Regarding the number of media used, 41.5% of respondents reported that institutions used one communication medium, 38.8% reported two media and 19.7% reported three or more. Technology use in promotion was assessed as weak by 48.7% and good by 44.7%. Although the modal response was “weak”, the distribution was relatively divided rather than unanimous.

The results indicate that the promotional system remains insufficiently diversified. They do not, however, prove the complete absence of digital promotion, because the questionnaire measures reported perceptions and practices rather than auditing every tourism institution.

Table 5 provides further information about the digital environment. A majority of 63.1% of respondents assessed current internet services as weak. Moreover, 50.6% reported that telecommunications infrastructure was available only to some extent, while 39.1% indicated that it was unavailable in a form capable of supporting smart tourism services.

Table 5. Digital Communication and Absorption Capacity

Indicator	Category	Frequency	Percentage
Internet services	Excellent	17	5.3
	Good	101	31.6
	Weak	202	63.1

	Total	320	100
Telecommunications infrastructure	Yes	33	10.3
	To some extent	162	50.6
	No	125	39.1
	Total	320	100
Company websites present	Yes	167	52.2
	No	153	47.8
	Total	320	100
Current tourism demand satisfactory	Yes	108	33.8
	No	212	66.2
	Total	320	100
Absorption capacity sufficient	Yes	104	32.5
	No	216	67.5
	Total	320	100

Source: Authors' elaboration.

These indicators suggest that weak internet and telecommunications services may constrain direct booking, real-time enquiries, online reputation management and other digital tourism functions. However, the questionnaire does not directly measure the technical performance of booking systems or the frequency of online transactions. The findings should therefore be interpreted as evidence of perceived infrastructure constraints.

A total of 52.2% of respondents reported the presence of websites for tourism companies operating in the region. The questionnaire did not assess their technical quality, interactivity, multilingual capacity, booking functionality or updating frequency. Website presence should therefore not automatically be interpreted as effective digital transformation.

The findings also indicate a gap between the region's tourism assets and its perceived digital, service and absorption readiness. A total of 66.2% judged current tourism demand unsatisfactory, while 67.5% considered the region's absorption capacity insufficient in terms of hotels, tourism villages and transport networks.

Statistical Interpretation, Hypothesis Testing and Future Development Vision

The results presented in the previous section reveal a significant contrast between the tourism potential of Western Libya and the limited readiness of its digital, promotional and service environment. Respondents reported a high level of awareness of tourism attractions, but they also identified weaknesses in internet services, telecommunications infrastructure, promotional diversification, current tourism demand and absorption capacity.

This section moves from descriptive analysis to statistical interpretation. It first examines the reliability of the questionnaire and the relationships among selected technological variables. It then clarifies the hypothesis-testing procedure and interprets the results without confusing statistical association with causality. Finally, it proposes a future development vision based on digital governance, infrastructure, promotion, human-capital development, public-private cooperation and local institutional ownership.

The empirical analysis is exploratory, descriptive and correlational. Frequencies and percentages describe respondents' perceptions and reported practices. Pearson's correlation coefficient measures the direction and

strength of linear association between two variables; it does not establish that one variable causes another. Correlation therefore provides evidence of association, not proof of causality. The interpretation of statistical tests must also distinguish between rejecting a null hypothesis and proving the truth of a research hypothesis.

Reliability, Correlations and Hypothesis Testing

The questionnaire's overall Cronbach's alpha was 0.631 for the reported 23 items. This value indicates modest internal consistency and should be treated as a limitation rather than as evidence of strong reliability. Cronbach's alpha measures the degree to which questionnaire items are interrelated, but it does not establish that all items measure one single construct or that the instrument possesses construct validity.

The relatively modest coefficient may reflect the heterogeneous structure of the questionnaire. The instrument combines demographic characteristics, knowledge of tourism attractions, tourism preferences, strategic planning, digital infrastructure, promotional practices, service conditions and tourism demand. These dimensions are related to the general topic of the study, but they do not necessarily measure the same latent variable.

The item-level results support this interpretation. The items concerning knowledge of attractions, preferred destinations, the influence of income on travel decisions, access to tourist sites and the planning of smart tourism projects display weak item–total correlations. They appear to measure contextual or descriptive aspects of tourism rather than the same underlying construct as the items relating to technological readiness and digital promotion.

The item concerning preferred destinations would increase the overall coefficient from 0.631 to approximately 0.666 if it were deleted. This suggests that the item is less closely aligned with the general scale. However, the decision to remove an item should not be based solely on an increase in alpha. Its theoretical importance, wording, response format and relationship with the conceptual framework should also be considered.

The questionnaire should therefore be understood as multidimensional. In future research, reliability should be calculated separately for the dimensions of strategic planning, digital infrastructure, promotional technology, tourism services, destination competitiveness and institutional readiness. Exploratory or confirmatory factor analysis and alternative reliability coefficients could also be used to assess the structure of the instrument more rigorously.

The test-retest procedure was conducted on a pilot group over a two-week interval and produced a coefficient of 0.7431. This result suggests moderate-to-good temporal stability. It measures a different property from Cronbach's alpha: test-retest reliability concerns the stability of responses over time, whereas alpha concerns the internal consistency of items at a given point in time.

Table 6. Item–Total Correlations and Reliability Statistics

Measured item	Item–total correlation	Reliability if item deleted
Age	0.305	0.607
Marital status	0.347	0.61
Educational level	0.229	0.619
Position	0.257	0.615
Monthly income	0.246	0.617
Knowledge of tourist attraction areas	0.007	0.635
Preferred tourism places	0.029	0.666
Perceived level of tourism	0.285	0.613
Influence of income on travel decisions	0.042	0.636
Access to tourist sites	0.066	0.641
Planning of smart tourism projects	0.129	0.629
Diversified promotional means	0.254	0.618

Most influential promotional medium	0.241	0.64
Satisfaction with tourist demand	0.241	0.619
Tourism absorption capacity	0.208	0.621
Public tourism facilities	0.301	0.611
Restaurant and café services	0.361	0.602
Treatment of tourists outside tourist sites	0.382	0.603
Use of modern technologies in promotion	0.339	0.61
Use of available promotional media	0.282	0.614
Assessment of internet services	0.186	0.621
Use of modern communication media	0.361	0.602
Telecommunications infrastructure	0.186	0.621

Source: Authors' elaboration.

Pearson correlation analysis was used to examine the relationships among selected technological variables. The null hypothesis for each correlation test was: $H_0: \rho = 0$ where ρ denotes the population correlation coefficient. The alternative hypothesis was that a statistically significant association existed between the variables. The significance level was set at 5%. The strongest reported association was between telecommunications infrastructure and the use of modern communication media: $r = 0.344$, $p < 0.01$

This is a positive but modest correlation. Respondents who assessed telecommunications infrastructure more favourably also tended to report greater use of modern communication media. The result is consistent with the view that technological adoption requires a minimum infrastructural base. However, it does not demonstrate that infrastructure improvements alone cause the adoption of modern communication tools. Institutional capacity, financing, security, technical skills and managerial commitment may also influence both variables.

The correlation between telecommunications infrastructure and internet-service assessment was also positive and statistically significant: $r = 0.336$, $p < 0.01$

This finding suggests that respondents' perceptions of internet quality are related to their perceptions of the wider telecommunications environment. The relationship remains modest and may also be affected by affordability, electricity supply, service providers and technical management. The use of modern communication media was positively associated with the use of available promotional means: $r = 0.341$, $p < 0.01$

This result suggests that institutions using a broader range of communication channels also tend to report greater use of modern media. It supports the importance of promotional diversification, but it does not establish a causal sequence between the two variables.

Table 7. Pearson Correlation Matrix

Variable	Telecommunications infrastructure	Modern communication media	Internet services	Modern promotional means
Telecommunications infrastructure	1	0.344**	0.336**	0.217**
Modern communication media	0.344**	1	0.295**	0.341**
Internet services	0.336**	0.295**	1	0.167**
Modern promotional means	0.217**	0.341**	0.167**	1

Note: ** $p < 0.01$, two-tailed tests.

Source: Authors' elaboration.

The hypothesis tests compare observed response proportions with a 50% reference proportion. The exact procedure should be identified in the final version as a one-sample binomial test, one-sample proportion test or another procedure, depending on the SPSS output.

The first test concerns knowledge of tourist attraction areas. The observed proportion of “Yes” responses was 84.7%, corresponding to 271 of the 320 respondents. Since the significance value was below 0.001, the null hypothesis that the proportion equals 50% is rejected. The evidence therefore indicates that reported awareness of tourism attractions is significantly higher than 50%. This result should not be described as a rejection of awareness. It also does not constitute a direct test of H1, which concerns the relationship between strategic planning for technology adoption and tourism development.

For the use of modern technologies in promotion, approximately 51% of respondents provided a favourable or acceptable assessment, while approximately 49% assessed the use as weak. The significance value was $p = 0.696$, which exceeds the 5% threshold. The null hypothesis is therefore not rejected. The data do not provide sufficient evidence that one response direction clearly dominates the other. This result should not be described as “partial acceptance” unless that concept was defined in advance.

Regarding the comprehensive use of modern communication media, approximately 68% of respondents reported that such media were not used comprehensively. With $p < 0.001$, the null hypothesis of an equal 50–50 distribution is rejected. The result provides strong evidence that respondents perceive digital communication as incomplete and insufficiently integrated.

For promotional diversity, 66.3% of respondents reported that Western Libya did not enjoy diversified promotional means. Since $p < 0.001$, negative perceptions are significantly more frequent than the 50% reference proportion. This result indicates that respondents perceive the promotional system as insufficiently diversified. It does not prove that all promotional activities are absent or that all institutions depend exclusively on traditional media.

For absorption capacity, 67.5% of respondents reported that the region did not possess sufficient capacity. With $p < 0.001$, the negative response is significantly more frequent than 50%. This result indicates a widely shared perception that accommodation, transport and related services are insufficient to receive substantial tourism flows. It remains a perception-based indicator and does not replace an objective inventory of hotel beds, vehicles, restaurants, visitor centres and other facilities.

For website availability, 52.2% of respondents reported that tourism companies had websites, while 47.8% reported otherwise. The significance value was $p = 0.467$, which exceeds 0.05. The null hypothesis is therefore not rejected. The sample does not provide sufficient evidence that website availability differs significantly from the 50% reference proportion. This result indicates a nearly balanced digital presence, but it does not establish whether the websites are active, multilingual, regularly updated or connected to booking and payment systems.

Finally, 66.2% of respondents considered current tourism demand unsatisfactory. With $p < 0.001$, the negative response is significantly more frequent than 50%. This finding indicates that respondents perceive current demand as weak or below potential. It should not be interpreted as a direct statistical estimate of actual tourist arrivals or tourism expenditure.

Table 8. Summary of Statistical Tests

Test	Variable	Observed result	P-value	Statistical decision	Interpretation
Awareness test	Knowledge of tourist attractions	84.7% “Yes”	<0.001	Null hypothesis rejected	Reported awareness is significantly higher than 50%
Technology	Use of modern	Approximately	0.6	Null	No statistically significant

-use test	technologies in promotion	51% favourable	96	hypothesis not rejected	predominance of either response direction
Digital-integration test	Comprehensive use of modern media	Approximately 68% negative	<0.001	Null hypothesis rejected	Digital communication is perceived as incomplete
Promotional-diversity test	Diversified promotional means	66.3% “No”	<0.001	Null hypothesis rejected	Negative perceptions of promotional diversity predominate
Absorption-capacity test	Sufficient tourism capacity	67.5% “No”	<0.001	Null hypothesis rejected	Tourism capacity is perceived as insufficient
Website-availability test	Tourism-company website available	52.2% “Yes”	0.467	Null hypothesis not rejected	Website availability does not differ significantly from 50%
Demand-satisfaction test	Current demand satisfactory	66.2% “No”	<0.001	Null hypothesis rejected	Negative perceptions of current demand predominate

Source: Authors’ elaboration.

Future Development Vision

The empirical results indicate that Western Libya’s tourism challenge is not primarily the absence of tourism assets. It concerns the institutional, infrastructural, promotional and human capacities required to convert these assets into accessible, bookable, sustainable and competitive tourism products.

The region possesses archaeological sites, coastal areas, mountain landscapes, desert environments, oasis settlements and cultural traditions. However, the survey indicates weaknesses in internet services, communication infrastructure, promotional diversification, guidance tools and absorption capacity. The transition towards a smart destination should therefore be understood as a coordinated institutional process rather than as the simple acquisition of digital equipment.

A national tourism governance mechanism could coordinate the Ministry of Tourism and Traditional Industries, municipalities, hotels, travel agencies, tourism companies, professional organisations and universities. Its responsibilities could include the formulation of a national digital-tourism strategy, coordination of public and private tourism databases, development of interoperability standards, supervision of destination-management systems and monitoring of online service quality.

The proposed Supreme Council for Digital Tourism and Smart Destinations could fulfil this function if its mandate, authority, financing and relationship with existing institutions were clearly defined. Its creation should not increase administrative fragmentation. Its value would depend on its capacity to clarify responsibilities, coordinate existing structures and establish measurable performance indicators.

The preference for foreign experts, expressed by 61.6% of respondents, may reflect a perceived shortage of specialised local expertise. International partnerships could support destination planning, digital architecture, cybersecurity, database integration, heritage-site management and training. However, foreign consultants should not permanently replace Libyan institutions.

Excessive dependence on external expertise could weaken local institutional learning, create technological and contractual dependence, generate recommendations insufficiently adapted to Libya’s administrative and security context and reduce the role of Libyan universities and firms. International consultants should therefore work within a framework of local ownership and knowledge transfer. Their contracts should include training, technical documentation, mentoring, cooperation with local institutions and the progressive transfer of system management.

The appropriate objective is not to choose between foreign and local expertise. It is to establish a complementary model in which international technical assistance supports the development of permanent Libyan capacity. Smart-destination development requires governance, accessibility, sustainability and institutional capability in addition to technology.

The weakness of internet services reported by 63.1% of respondents and the limited availability of telecommunications infrastructure indicate that connectivity should be treated as a priority. Measures should focus on improving broadband and mobile services, extending fibre-optic networks where feasible, strengthening connectivity at major archaeological and tourism sites and creating reliable visitor-information facilities.

The recommendation to introduce 5G networks should be treated as a medium- or long-term option depending on cost, technical feasibility and geographical coverage. The immediate priority is reliable, affordable and secure connectivity rather than a particular generation of mobile technology.

A unified national tourism portal could integrate hotels, restaurants, travel agencies, tour guides, transport operators, archaeological sites, cultural institutions and local events. It should provide multilingual information, interactive maps, opening times, access conditions, accommodation details, booking functions, payment options, safety information and user reviews.

The dominance of television, identified by 65.6% of respondents as the most influential current promotional medium, shows that traditional channels remain important. Digital promotion should therefore complement rather than simply replace television, radio and printed material.

A contemporary promotional strategy should include official multilingual social-media accounts, high-quality video content, virtual tours, electronic word-of-mouth monitoring, partnerships with local content creators, targeted campaigns for specialised tourism markets, digital reputation management and transparent crisis communication.

Desert tourism, selected by 47.8% of respondents, provides a basis for exploring oasis, ecological, cultural and adventure products. This percentage indicates respondent preference but does not establish international market demand. The commercial viability of these products should be examined through market research, pilot programmes, accessibility assessments and visitor data.

Human-capital development is equally important. Training should address digital-platform management, online booking, tourism geographic information systems, destination branding, multilingual communication, digital marketing, online reputation management, data protection, cybersecurity, sustainable tourism and community-based tourism.

The income distribution suggests that employment conditions may influence the capacity of tourism organisations to attract and retain qualified staff. However, the present study does not directly measure labour turnover, organisational loyalty or recruitment difficulties. These relationships should be examined in future studies through specific employment and organisational indicators.

The expected effects of digital reform should be presented as conditional rather than guaranteed. In the short term, reforms could improve destination visibility, information access, communication between visitors and providers, stakeholder coordination and the availability of maps, guides and booking tools. In the medium term, they could contribute to service improvement, product diversification, longer visitor stays, stronger links with local suppliers and improved access to specialised tourism markets.

Long-term effects on tourist arrivals, tourism revenues and GDP would depend on security, infrastructure, institutional stability, financing, human capital and access to international markets. The present study does not include a time-series model, a causal econometric specification or a statistically identified forecasting framework. It therefore cannot substantiate precise claims that digital reforms would increase tourist arrivals by 15–20%, by 80–100% or raise tourism's contribution to GDP to 10–15%.

Such figures may be retained only as illustrative policy scenarios, provided that the assumptions, benchmark countries, time horizon and calculation method are presented separately. They should not be described as econometric projections.

GENERAL CONCLUSION

This study examined the role of digital technologies in developing tourism in Western Libya within an economy seeking to diversify beyond oil dependence. The region possesses substantial coastal, archaeological, cultural, mountain, desert and oasis resources, but the survey results reveal a significant gap between this potential and the readiness of the digital, promotional and service environment.

Among the 320 respondents, 84.7% reported awareness of tourism attractions in Western Libya, and desert tourism was the most frequently selected tourism type, accounting for 47.8% of responses. Nevertheless, 63.1% assessed internet services as weak, 66.3% reported insufficient promotional diversification, 67.5% considered tourism absorption capacity inadequate and 66.2% judged current tourism demand unsatisfactory. Television remained the dominant reported promotional medium, while the presence of company websites did not necessarily imply effective digital transformation.

The statistical analysis identified positive but modest associations between telecommunications infrastructure, internet-service assessment and the use of modern communication media. However, these correlations indicate association rather than causation. The questionnaire's Cronbach's alpha of 0.631 also indicates modest internal consistency and constitutes a limitation, whereas the test-retest coefficient of 0.7431 suggests moderate-to-good temporal stability. The results should therefore be interpreted as exploratory evidence based on respondents' perceptions rather than as causal estimates or econometric forecasts.

The study recommends an integrated digital-tourism strategy based on stronger coordination between the Ministry of Tourism, municipalities, tourism businesses, professional organisations and universities. Priority should be given to reliable connectivity, multilingual digital information, interactive maps, booking systems, digital promotion, tourism training and the development of integrated coastal, archaeological, mountain, desert and oasis products.

International expertise may support technical design and knowledge transfer, but it should not replace local institutions. External assistance must be combined with training, documentation, mentoring and the

progressive transfer of responsibility to Libyan universities, public bodies and firms.

The expected effects of digital reform should be presented conditionally. Improvements in arrivals, revenues and GDP contribution would depend on security, infrastructure, institutional stability, financing, human capital and market access. The present study does not provide an econometric model capable of quantifying these effects. Western Libya can nevertheless develop a competitive and sustainable tourism sector if digital transformation is combined with effective governance, local capacity building and an integrated strategy for converting tourism resources into accessible and value-generating products.

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