



ORIGINAL RESEARCH ARTICLE

Identification and Evaluation of an Advanced Tourism Ecosystem Management Model in the Cultural Heritage and Tourism Organization of Khuzestan Province

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ARTICLE INFO

Article History:

Received: 2025-12-24

Revised: 2026-02-10

Accepted: 2026-02-27

Published Online: 2026-03-01

Keywords:

Tourism Management, Knowledge Management, Advanced Tourism Ecosystem, Cultural Heritage and Tourism Organization of Khuzestan Province.

Number of Reference: 42

Number of Figures: 3

Number of Tables: 12

DOI:



ABSTRACT

This research aims to identify and evaluate an advanced tourism ecosystem management model in the Cultural Heritage and Tourism Organization of Khuzestan Province. The study is an applied-developmental one. Based on targeted sampling, 15 managers from the Cultural Heritage and Tourism Organization of Khuzestan Province were interviewed, and in the quantitative section, all heads, managers, and employees working in the organizational sections, whose number is unlimited and according to the Kohne formula is 211, were considered. The qualitative data analysis was performed using the ATLAS.ti software, and for validation, structural equation modeling methods were used in the SMARTPLS software. In the qualitative stage, the identification of 6 main themes, 26 central themes, and 160 initial codes showed that advanced tourism ecosystem management is a multidimensional, network-based phenomenon that depends on the interaction of various organizational and environmental layers. Overall, the results indicate that achieving an advanced tourism ecosystem in Khuzestan Province is not a one-time project but a gradual process requiring institutional commitment, investment in digital infrastructure, human capital empowerment, and synergy between public and private sectors. The proposed model can provide a basis for intelligent policymaking, efficient resource allocation, and enhancing the province's competitiveness at the national and international levels, paving the way for sustainable development and enhancing the status of Khuzestan tourism. ©authors

► **Citation:** Mohammadi Azad, M., Kangarani Farahani, A., & Aghadavood, R. (2025). Identification and Evaluation of an Advanced Tourism Ecosystem Management Model in the Cultural Heritage and Tourism Organization of Khuzestan Province. *The International Journal of Metaverse & Virtual Transformation (IJMVT)*, 2(1): 01-19.

Introduction

The tourism industry has emerged in recent decades as a key driver of economic, social, and cultural development in countries worldwide. This industry not only plays a pivotal role in job creation and revenue generation (Cui, 2022; Zubiaga et al, 2026), but has also been recognized as an effective tool for strengthening cultural identity, public diplomacy, and sustainable development (Zhang et al., 2025). International documents, including reports from the United Nations World Tourism Organization, emphasize the importance of smart governance, digital innovation, and integrated management in tourism development.

However, technological advancements, shifts in tourist demand patterns (Zhang et al., 2023), increased competition among destinations, and the emergence of new digital technologies have fundamentally transformed the nature of tourism management. In this context, traditional tourism management approaches, based on hierarchical structures and siloed decision-making, are no longer sufficient to address the complexities of this evolving industry (Vaz et al., 2025).

In recent tourism management literature, the concept of a "tourism ecosystem" has been introduced as a novel framework to understand the intricate interactions among various stakeholders in this field (Yuvaraj et al., 2025). The tourism ecosystem is a dynamic set of stakeholders interconnected on an interactive and networked platform. Today, with the emergence of the metaverse and immersive technologies, these interactions have expanded from the physical realm to the phygital (physical-digital) space (Smith et al., 2024). In this approach, value creation takes shape through co-creation on virtual platforms and augmented reality. Therefore, managing a tourism ecosystem requires a systemic, network-based, and coordinated perspective among its components (Alford et al., 2020).

Khuzestan Province, as a strategic province in the Islamic Republic of Iran, boasts diverse and unique tourism potential. With valuable historical heritage sites such as the ancient Chogha Zanbil ruins, historical water structures in Shushtar, Elamite and Achaemenid cultural artifacts, ethnic diversity and cultural rituals, natural attractions like marshes, the Karoun River, and pristine mountainous areas, the province has the capacity to become a significant tourism pole in the country. Despite this, Khuzestan's share of the national and international tourism market does not match its available potential (Rehimi et al., 2023; Khater, 2026).

Challenges such as a lack of smart infrastructure, inadequate platforms for creating digital twins of historical sites, and ineffective use of virtual reality tools for cultural heritage reconstruction have resulted in the full potential of this province not being realized (Brown et al, 2023). Limitations in private sector participation, and ineffective use of new technologies have prevented the full realization of the province's potential capacities (Bashkoh Agirlu et al., 2022; Pai et al, 2026).

The Cultural Heritage, Tourism, and Handicrafts Organization of Khuzestan Province, as the main policy, planning, and oversight body for tourism activities, plays a central role in organizing and developing this sector (Ghasemi et al, 2023). However, its management structure is largely based on traditional patterns and is not as focused on network and ecosystem management. Global trends indicate that the most successful tourist destinations are those that have created advanced tourism ecosystems, facilitating effective interactions among various stakeholders and leveraging new technologies to enhance tourist experiences and optimize decision-making (Daneshpour et al, 2022).

The concept of «Advanced Tourism Ecosystem Management» oversees an approach where coordination among stakeholders, the utilization of the Internet of Things (IoT), blockchain, virtual and augmented reality, data-driven management, and the creation of immersive experiences for tourists are integrated (Abedi et al., 2022). This approach is considered a prerequisite for tourism destinations to enter the metaverse. In this framework, the governing organization acts as a facilitator, coordinator, and regulator, focusing on creating interactive platforms, private sector participation, and empowering local communities rather than

centralized control (Lee et al, 2024). Such an approach requires a native model tailored to the cultural, social, economic, and institutional conditions of Khuzestan Province (Shirmohammadi, 2025).

Accordingly, the main issue of the present study is the lack of a native, integrated, and forward-looking framework for advanced tourism ecosystem management in the General Directorate of Cultural Heritage, Tourism, and Handicrafts of Khuzestan Province; a framework that can simultaneously cover the requirements of network governance, stakeholder interaction, the use of modern digital technologies, and the cultural, institutional, and economic requirements of the province. Therefore, the purpose of this study is to identify, explain, and evaluate the components, dimensions, and requirements of the "Advanced Tourism Ecosystem Management Model" appropriate to the conditions of Khuzestan Province and the position of its governing organization, in order to provide a scientific basis for improving policy-making capacity, inter-sectoral coordination, and digital transformation in the field of tourism. In this regard, the present study seeks to answer the fundamental question of what dimensions, components, and indicators does the advanced tourism ecosystem management model in the Cultural Heritage, Tourism, and Handicrafts Organization of Khuzestan Province have, and to what extent, from the perspective of experts, is this model capable of explanation, validation, and application in the development of smart tourism and entry into new digital and metaverse ecosystems?

Literature Review

literature indicates that while numerous studies have been conducted on tourism development, smart tourism, destination marketing, and digital transformation, there are few research efforts specifically focused on designing and evaluating a tourism ecosystem management model at the provincial level, with an emphasis on Iran's institutional structures. It is still unclear what drivers are shaping the advanced tourism ecosystem in the province and how the necessary infrastructure for providing metaverse-based tourism services can be established through the deployment of new technologies. Many domestic studies still adopt a partial and descriptive approach and have paid less attention to designing integrated and operational models. Furthermore, the models presented in foreign studies are not directly applicable to the province of Khuzestan due to differences in institutional and cultural contexts (Gössling et al, 2024). Therefore, there is a significant theoretical and practical gap in this field (Coelho de Souza Filho et al., 2025).

From a theoretical perspective, the main research question is to identify and define the dimensions, components, and indicators of advanced tourism ecosystem management within the organizational context of Khuzestan province, and propose a comprehensive model for its identification and evaluation. In other words, it remains unclear what drivers shape the advanced tourism ecosystem in the province, what mechanisms strengthen stakeholder interactions, what infrastructure is required for data-driven and smart management, and what are the implications of implementing such a model for sustainable tourism development.

From an applied perspective, the main challenge is that decision-makers and managers of Khuzestan's Cultural Heritage and Tourism Organization lack a coherent framework to assess the current situation and plan for the enhancement of the tourism ecosystem. The absence of specific indicators, the lack of prioritization of key factors, and the absence of performance measurement mechanisms for the ecosystem have resulted in policies and programs that are often scattered and short-term. Consequently, there is a need to design a model that is theoretically sound and also feasible for implementation and evaluation at the provincial level (Newsome et al., 2025).

Moreover, technological advancements and changes in tourist behavior post-COVID-19 have further emphasized the importance of leveraging digital tools, interactive platforms, and innovative solutions (Wu et al., 2025). Today's tourists are more interested in personalized experiences, easy access to information, digital interactions, and participation in creating experiences (Wu et al., 2023).

Today's tourists are more interested in personalized experiences, easy access to information, digital interaction, and participation in creating experiences compared to the past (Wu et al., 2023). Therefore, a sophisticated tourism ecosystem should be able to provide an integrated and interactive experience for tourists, relying on new technologies, while also creating conditions for economic and social growth in local communities (Collado-Agudo et al., 2023).

Given this context, the central question of this research is: "How can the model of managing the advanced tourism ecosystem be identified, designed, and evaluated within the Cultural Heritage and Tourism Organization of Khuzestan Province?" This research aims to systematically identify the main components and dimensions of this model, explain the relationships between them, and ultimately provide a framework for evaluating and measuring its implementation in the province. The results of this research can be significant in several ways: first, developing the theoretical literature on tourism ecosystem management in the Iranian context; second, offering a native and practical model for managers and policymakers in Khuzestan Province; third, providing a basis for data-driven and integrated decision-making in the tourism sector; and fourth, contributing to enhancing the province's competitive position in the national and international tourism market. Thus, this research strives to take a step towards transitioning from traditional to network and ecosystem-based management in the tourism industry of Khuzestan Province.

A Review of Theoretical Foundations of Ecosystem and Systemic Approach

The concept of "ecosystem" was first used in biological sciences to describe a network of living organisms and their surrounding environment. However, it has entered management and economic literature in recent decades. In management, an ecosystem refers to a set of independent yet interdependent actors that, through interaction, synergy, and co-creation of value, form a dynamic system (Lai et al., 2024).

In business ecosystem theory, organizations operate in a network of multifaceted relationships, rather than linear structures of value chain. This perspective is based on system theory, which views an organization as an "open system"; a system that interacts with, is influenced by, and influences its environment. According to the theory of open systems, an organization's survival and growth depend on continuous adaptation to environmental changes and maintaining dynamic balance between internal components and external factors. In the field of tourism, a systemic approach is more important; as tourism is inherently a multi-sectoral, multi-stakeholder, and interdisciplinary phenomenon. A tourist destination comprises a network of accommodation service providers, transportation, cultural attractions, government institutions, local communities, investors, and tourists. From this perspective, successful tourism management will be achieved when it can establish constructive interactions among these elements within a harmonious ecosystem (Choe et al., 2022).

Tourism Ecosystem Theory

The concept of the "tourism ecosystem" emerges from the integration of business ecosystem theory and destination management theory. Within this framework, tourism is defined as a network of actors who, through collaboration, competition, and co-creation, shape the tourist experience. In the tourism ecosystem, value is created not only by the managing organization but also through interactions between tourists, service providers, and other stakeholders. This approach is based on the dominant service logic, emphasizing the consumer's participatory role in the value-creation process (Zada et al., 2025).

The main dimensions of the tourism ecosystem include:

- Key actors (government, private sector, local communities, tourists)
- Physical and digital infrastructure
- Networks of interactions and institutional relationships
- Governance and regulation
- Innovation and technology

In advanced ecosystems, institutional coordination, data exchange, continuous innovation, and collaborative decision-making are of particular importance (Phan et al., 2026).

Tourism Destination Management

One of the theoretical pillars of this research is the theory of tourism destination management.

Destination management refers to a set of actions aimed at planning, marketing, developing, and coordinating tourism activities in a specific region. In modern destination management models, the following aspects are emphasized:

- Policy integration
- Stakeholder participation
- Destination branding
- Tourist experience-focused
- Environmental and social sustainability

Within this framework, destination management organizations play a facilitative and coordinating role. However, in the ecosystem approach, this role goes beyond coordination and evolves into network management and interactive leadership (Chakraborty, 2024).

Smart Tourism and Digital Transformation

The advancements in information and communication technologies have introduced the concept of "Smart Tourism." Smart tourism emphasizes the use of new technologies to enhance the tourist experience, optimize destination management, and increase competitiveness. The dimensions of smart tourism include:

- Digital infrastructure
- Big data analytics
- Interactive platforms
- Personalized services
- Intelligent decision-making systems

Digital transformation in tourism is not merely about technology adoption, but also signifies changes in business models, organizational processes, and stakeholder interactions. An advanced tourism ecosystem cannot be achieved without digital infrastructure and data-driven management (Boes et al, 2016).

By summarizing the theoretical foundations and background of the research, it can be said that although numerous studies have been conducted in the field of tourism development, smart tourism, destination management, and digital transformation, there is still a serious gap in providing a local, integrated, and evaluable model for managing an advanced tourism ecosystem at the provincial level, especially in the institutional and cultural context of Iran. Most of the previous research has either focused on individual dimensions such as technology, marketing, or infrastructure, or has lacked an operational framework to explain the relationships between stakeholders, governance mechanisms, data-driven requirements, and metaverse capacities; on the other hand, the models presented in foreign studies are also not directly applicable to the conditions of Khuzestan province due to structural, managerial, and social differences. Therefore, the necessity of conducting the present research to fill this knowledge and practical gap becomes apparent; In other words, this study attempts to identify, design, and evaluate the dimensions, components, and indicators of advanced tourism ecosystem management, and to provide a native and applicable framework for the General Directorate of Cultural Heritage, Tourism, and Handicrafts of Khuzestan Province; a framework that can both help develop the theoretical literature in this field in Iran and provide a basis for smart policymaking, stakeholder coordination, development of digital infrastructure, and promotion of the province's tourism competitiveness.

Method

This research is situated philosophically within the interpretive paradigm, in terms of logic, it is inductive, and from the perspective of its purpose, it is applied, and in terms of its type, it

is mixed (qualitative-quantitative). The initial model was developed using grounded theory methodology. The potential participants were all experts in the Khuzestan Province Tourism Organization. The sampling method was targeted, and individuals were selected from this group to participate in the qualitative section of the research and take part in the interview process. Targeted sampling was used to determine the samples of this research and to select this group of experts. In this research, the primary data source was the interview, so the initial interviews were exploratory and descriptive, and gradually, after each interview, the interview data was coded, and through the constant comparative method, theoretical codes emerged through open coding, and this process was repeated for 15 interviews, leading to the emergence of main and sub-categories; it is worth noting that the central categories were densely and saturatively coded based on theoretical sampling. The duration of each interview was between 30 to 50 minutes. For the qualitative data analysis of the research using grounded theory, ATLAS TI software was utilized. In this design, the data analysis process was carried out in three stages: open coding, central coding, and selective coding.

In continuation, after identifying the initial indicators and evaluating the advanced ecosystem management model for tourism in the Cultural Heritage and Tourism Organization of Khuzestan province, data collection was carried out through a questionnaire based on a five-point Likert scale for the final validation of the research model. To determine the content validity ratio of the questionnaire, the designed questionnaire was provided to 10 specialists in this field. A content validity ratio of 0.79 was considered acceptable. After calculating the content validity ratio, the result was 0.81, indicating that all questions in the questionnaire had the necessary validity.

Cohen's sample size calculation is based on advanced statistical analysis to determine an adequate sample size for statistical tests such as t-test or ANOVA. This method focuses on effect size, significance level (α), and test power ($1-\beta$). Its goal is to ensure that the sample is sufficient to detect a meaningful effect in group comparisons.

Input parameters:

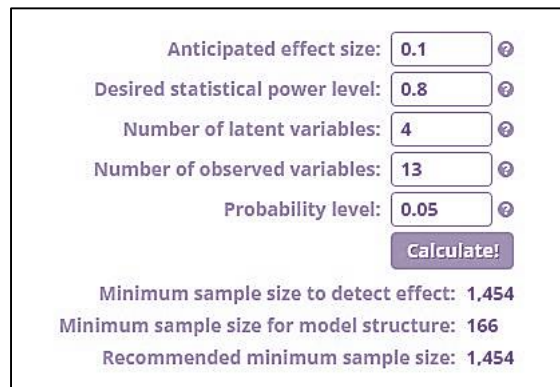
Cohen:

Effect size

Significance level (α)

Test power ($1-\beta$)

Type of statistical test



Anticipated effect size: 0.1

Desired statistical power level: 0.8

Number of latent variables: 4

Number of observed variables: 13

Probability level: 0.05

Calculate!

Minimum sample size to detect effect: 1,454

Minimum sample size for model structure: 166

Recommended minimum sample size: 1,454

Figure 1. Sampling based on Cohen's formula at the site (<https://www.danielsoper.com/>)

Based on the calculations, the sample size ranged from 166 to 1454. According to the electronic survey distribution, 211 questionnaires were collected. The structural equation modeling software SMARTPLS was used to fit the pattern.

Findings

Table 1 presents the demographic characteristics of the interview participants.

Table 1. Demographic Characteristics of Interview Participants

	Gender	Age	Education	Job Position	Work Experience
1	Man	42	MA	Manager	8
2	Man	48	MA	Manager	10
3	Woman	39	MA	Deputy	5
4	Man	51	MA	Manager	15
5	Man	49	PhD	Manager	9
6	Woman	48	PhD	Manager	11
7	Man	37	MA	Expert	7
8	Woman	49	MA	Manager	10
9	Woman	46	MA	Deputy	6
10	Woman	47	MA	Expert	9
11	Man	52	MA	Manager	13
12	Man	46	PhD	Manager	12
13	Man	39	MA	Expert	8
14	Woman	47	MA	Expert	14
15	Man	44	MA	Manager	9

For open coding, all interviews were entered into the Atlasti software. Necessary reviews were conducted and the relevant codes were extracted. Coding was labeled based on the interviews, and the researcher has tried to adhere to the individuals' insights as much as possible to avoid any potential and unintentional bias. Throughout the coding process, the researcher maintained the theoretical sensitivity grounded in the principles of data theory-based foundational research, doing so to enhance the richness of the study. Subsequently, based on the dimensions of the foundational data model of Strauss and Corbin (1998), the categorization of identification codes is presented in Tables 2 to 6.

Table 2. Open coding of qualitative data (causal conditions)

Primary Category	Core Category	Selective Category
Primary data collection from tourists	Data Management	Causal conditions
Storing data in appropriate databases		
Extracting useful information from data		
Keeping data up-to-date and accurate		
Transferring data between organizational units		
Protecting data against disasters and unauthorized access		
Existence of appropriate technical systems	Information Technology	
Using data management software		
Internet access for data systems		
Interconnectivity between internal organizational systems		
Protecting technology systems from cyber attacks		
Presence of a technical team for system maintenance		
Employees' data handling skills	Employee Status	
Perception of organizational justice		
Alignment of responsibilities with educational background		
Employee motivation for participation and pursuing organizational goals		
Collaboration among employees		
Job satisfaction status		
Incoming tourist statistics for the region	Tourist Status	
Tourists' region or country of origin		
Duration of tourists' stay		
Tourist surveys		
Tourists' behavior and interaction with the environment		
Organizational departmentalization	Organizational Structure	
Decision-making input levels in the organization		
Communication methods between departments		
Core organizational policies in data management		
Active participation of departments in processes		
Technical structure of data management systems		

Table 3. Qualitative Data Encoding (Strategies)

Primary Category	Core Category	Selective Category
Using incoming tourist data for decision-making	Data-Driven Decision Making	Strategies
Analyzing the number and timing of tourist visits		
Changing policies based on new data		
Using data to evaluate departmental performance		
Forecasting tourist flows using data		
Preparing data-driven reports for managers	Improving Financing	
Attracting investment from private and foreign sectors		
Planning to increase revenue from cultural heritage services		
Creating tourism businesses in the region		
Receiving financial support from the government and related bodies		
Increasing the annual budget for tourism activities	Customer Relationship Management	
Creating independent financial resources from tourism service sales		
Responding promptly to tourists' questions		
Providing timely and quality services		
Creating 24/7 online customer relationship management		
Collecting tourist feedback	Tourism Branding	
Assessing tourist satisfaction with services		
Building long-term relationships with visiting tourists		
Using feedback to improve services		
Designing Khuzestan's tourism identity		
Publishing attractive content on social media	Intersectoral Participation	
Using cultural heritage in branding		
Creating slogans or tourism packages for Khuzestan		
Collaborating with media to promote the brand		
Organizing cultural-tourism events to attract attention		
Collaborating with tourism businesses	Organizational Training and Learning	
Collaborating with universities for research and development		
Community participation in tourism activities		
Collaborating with the Ministry of Tourism and related institutions		
Collaborating with cultural and environmental organizations		
Creating tourism networks among departments	Benchmarking Successful Regions	
Training managers in tourism and data management		
Training employees in tourism skills		
Creating continuous training programs		
Knowledge sharing among organizational departments		
Assessing employee skills		
Building a culture of learning and continuous improvement		
Studying the tourism successes of other regions		
Benchmarking successful management models		
Using experiences from other regions		
Adapting successful models to Khuzestan's conditions		
Creating information networks with successful regions		
Assessing adaptability		

Table 4. Qualitative Data Encoding (Consequences)

Primary Category	Core Category	Selective Category
Increasing revenue from cultural heritage services	Revenue Generation and Profitability	Consequences
Attracting private-sector investment for development		
Increasing high-revenue tourism tours		
Increasing the number of incoming tourists		
Raising service prices due to improved quality		
Creating cultural and commercial side activities related to tourism		
Increasing local businesses	Regional Sustainable Development	
Preserving natural resources in tourism areas		
Reducing pollution caused by tourism activities		
Creating job opportunities for local people		
Supporting local agriculture and culture in tourism		
Developing sustainable infrastructure		
Supporting handicrafts		
Supporting local foods		
Community participation in the tourism development process	Tourist Satisfaction	
Providing better and timely services		
Friendly and easy communication with tourists		
Respecting tourists' rights and security		
Providing sufficient information about heritage and services		
Creating unique cultural experiences		
Responding to feedback and improving services		

Increasing the province's attractiveness for tourists	Tourism Image Enhancement	
Improving the presentation of Khuzestan's culture and heritage		
Raising the province's global tourism ranking		
Improving the province's image in domestic and international media		
Increasing visits to world heritage sites		
Creating a unique tourism identity for Khuzestan		

Table 5. Qualitative Data Encoding (Contextual Conditions)

Primary Category	Core Category	Selective Category
Border location of the region	Geographical Location	Contextual Conditions
Ease of access to major tourist cities		
Being situated on national or international tourism routes		
Proximity to historical areas		
Geographical and climatic conditions		
Existence of main and secondary roads to the region		
Availability of hotels, inns, and other accommodations	Tourism Infrastructure	
Status of terminals and airports		
Availability of suitable transportation in the region		
Access to healthcare and public health services		
Security level in tourist areas		
Availability of cultural and tourist guidance services		
Internet access in tourist areas		
Number of national and world heritage sites in the region	Cultural Heritage Status	
Level of protection and maintenance of heritage sites		
Heritage attractiveness for tourists		
Holding cultural events around heritage sites		
Education about heritage for the community and tourists		
Upgrading and restoring old heritage sites		
Government macro-policies in tourism	Governmental Conditions	
Allocated budget for tourism		
Suitable laws for tourists		
Cooperation with the Ministry of Tourism and other institutions		
Development projects in tourist areas		
Government support for the Cultural Heritage Organization		
Community acceptance level of tourists	Social Culture	
Existence of hosting culture and hospitality toward tourists		
Community awareness of cultural heritage		
Community participation in tourism activities		
Local beliefs affecting tourism		
How people interact with tourists in the region		

Table 6. Coding of Qualitative Data (Intervening Conditions)

Primary Category	Core Category	Selective Category
Dividing data based on source and purpose	Data Analysis Process	Intervening Conditions
Identifying behavioral patterns of tourists		
virtual platforms		
Preparing useful reports for decision-making		
Updating the model based on new data		
Assessing the accuracy and validity of collected data		
Relations between the country and tourism countries		
International tourism policies		
Impact of sanctions on tourist arrivals		
International agreements with neighboring countries		
Impact of religious conditions on tourist entry		
Impact of political changes on tourism		
Impact of wars on tourist flows		
Managers approving management policies		
Allocation of financial and human resources		
Participatory management of managers with employees	Managerial Support	
Ideological support for data-driven management		
Collaboration of senior managers in projects		
Evaluation of managers' performance in implementing the model		
Impact of exchange rates on tourism costs		Economic Conditions
Impact of inflation on prices of tourism services		
Amount of investment in the tourism sector		
How to price accommodation, guiding services, and other services		
Financial policies effective for government tourism		
Level of community income and purchasing power		
Status of the marketing strategy for attracting tourists		
Use of social networks		Advertising and Marketing

augmented reality	
Status of cooperation with domestic and foreign media	
Status of attracting target tourists	
Creating attractive and cultural content	
Reviewing tourists' feedback on advertisements	

After the conclusion of data analysis and evaluation, the final research model is presented as follows:

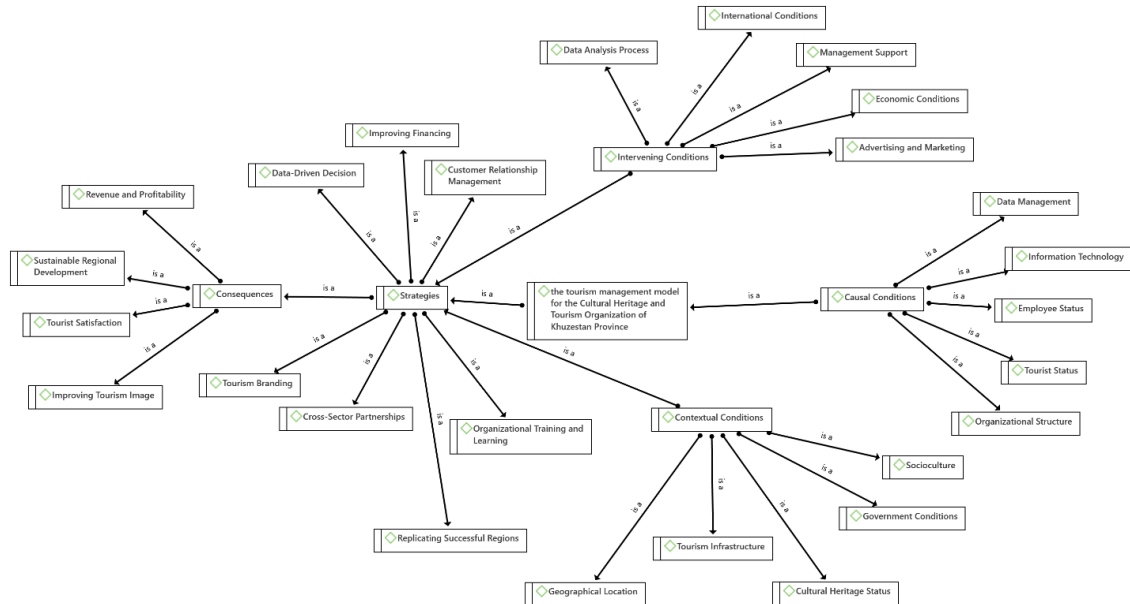


Figure 2. Advanced Tourism Ecosystem Management Model Identification and Evaluation Data Structure in the Cultural Heritage and Tourism Organization of Khuzestan Province (Output of ATLAS.TI software)

Pattern Fitting by Partial Least Squares Method

Demographic Characteristics of the Community

Table 7. Quantitative Demographic Characteristics of the Community

Characteristic	Percent	Frequency	Classification
Gender	70	148	Male
	30	63	Female
	100.00	211	Total
Age	51	108	20-30
	27	57	31-40
	16	34	41-50
	6	12	Above 51
	100.00		Total

The purpose of describing the main research variables was achieved through the use of indicators such as mean, standard deviation, and others. These indicators are presented in Table 8.

Table 8. Descriptive Statistics of Research Variables

Variables	Elongation	Skewness	Mean	Variance	Minimum	Maximum
Causal conditions	0.002	0.766	3.790	0.490	2	5
Contextual Conditions	-0.584	1.461	3.546	0.446	1.67	5
Interfering Conditions	-0.263	-0.058	4.0842	0.231	2.67	5
Strategies	0.566	-0.216	3.825	0.225	3	5
Consequences	0.314	-0.496	3.6729	0.339	2.75	5

Given the average values obtained, it is evident that the (high) option was more prevalent among the responses. The highest average is related to the causal factors compared to the rest. Also, based on the skewness and kurtosis values, the obtained values are in the range (2, 2-). The data shows symmetry and is normally distributed. Since PLS analysis is derived from linear regression, the assumptions related to the data in regression should also be considered in this approach (Bagozzi, 2012).

Partial Least Squares technique and research hypothesis testing

Each of the research hypotheses was separately analyzed using the Partial Least Squares technique. Additionally, the overall research model was also tested using the same technique in the end.

$$SRMR = 0.056$$

$$NFI = 0.91$$

$$d_ULS = 0.84$$

$$d_G = 0.62$$

In order to examine the overall fit of the model, fit indices were calculated in SmartPLS software. The SRMR index value was 0.056, which was less than the threshold value of 0.08 and indicated a good fit of the model. The NFI index value was also reported to be 0.91, indicating a good fit of the model. In addition, the d_ULS and d_G indices values were 0.84 and 0.62, respectively, which also indicated a good fit of the overall model.

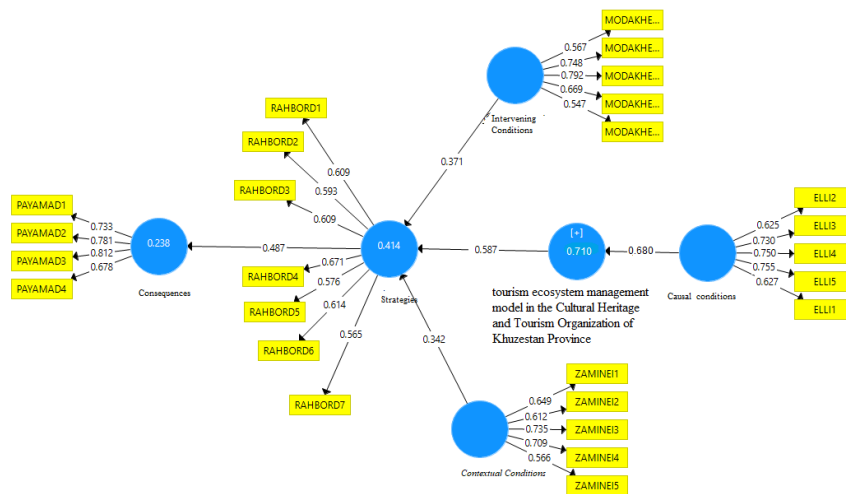


Figure 2. Factor loadings research model (external model)

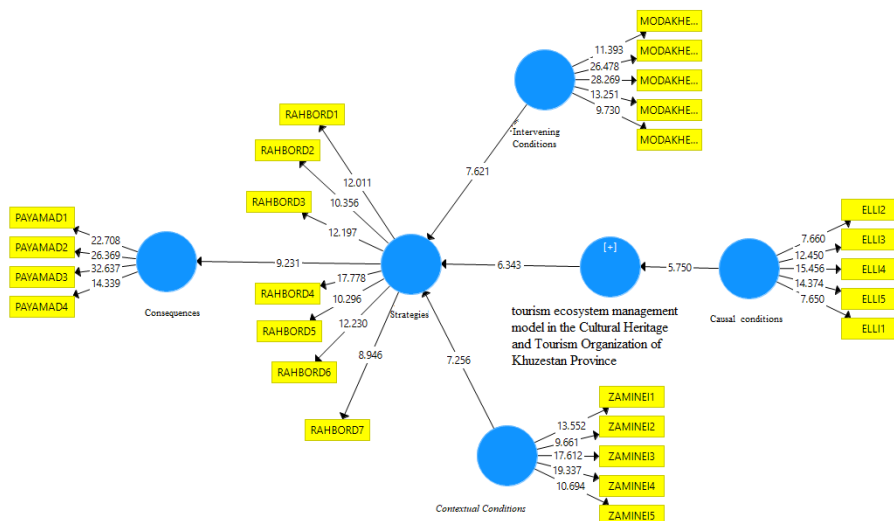


Figure 3. Bootstrapping of Statistical Model (Research External Model)

Convergent Validity

Convergent validity was examined using Cronbach's alpha, extracted mean variance (AVE), composite reliability (CR), and Rho index. The following relationships are established:

$$CR > 0.7$$

$$CR > AVE$$

$$AVE > 0.5$$

Table 9. Convergent Validity and Reliability of Research Variables

Variables	AVE	CR	Cronbach's alpha
Causal conditions	0.6	0.833	0.761

Contextual Conditions	0.687	0.825	0.736
Interfering Conditions	0.651	0.828	0.769
Strategies	0.678	0.734	0.793
Consequences	0.659	0.833	0.774
Central Phenomenon	0.682	0.845	0.736

According to the results of Table 10, Cronbach's alpha for all variables is greater than 7.0, thus confirming the reliability of all variables. The extracted mean variance (AVE) is always greater than 0.5, thus confirming convergent validity. The composite reliability (CR) is also greater than AVE and 7.0, and each of the model's structures has adequate validity and reliability. Also, the homogeneous reliability coefficient (Rho) has been obtained as higher than 7.0.

Divergent validity (Fornell and Lakar method)

The construct-to-construct relationship is compared to the relationship of a construct with its indices; in such a way that acceptable divergent validity of a model indicates that a construct has a greater interaction with its indices than with other constructs. The main characteristic of this matrix is that the main diagonal is all 1. Then, the values on the main diagonal of the matrix are replaced with the square root of the variance values described in AVE, and finally, Table 11 is presented.

Table 11. *Fornell and Lakar method*

	Causal conditions	Contextual Conditions	Interfering Conditions	Strategies	Consequences	Central Phenomenon
Causal conditions	0.774					
Contextual Conditions	0.551	0.828				
Interfering Conditions	0.478	0.598	0.806			
Strategies	0.418	0.474	0.536	0.823		
Consequences	0.513	0.509	0.587	0.470	0.811	
Central Phenomenon	0.613	0.591	0.480	0.401	0.503	0.825

As shown in Table 11, the values on the main diagonal of the matrix are greater than all the values in the corresponding column, indicating that the model has a suitable positive semi-definite property. In this section, based on the results obtained from the partial least squares calculation according to the factor loadings and bootstrapping, the research hypotheses are examined:

Table 12. *Examination of research hypotheses and model path analysis*

Hypothesis	t-statistic	Path Coefficient	Significance level	Status
The antecedent conditions significantly affect the main construct.	5.750	0.680	0.000	Confirmation
The main construct significantly affects the strategies.	6.343	0.587	0.000	Confirmation
The strategies significantly affect the outcomes.	9.223	0.487	0.000	Confirmation
The intervening conditions significantly affect the strategies.	7.256	0.342	0.000	Confirmation
The contextual conditions significantly affect the strategies.	7.621	0.371	0.000	Confirmation

Based on the results obtained from the structural equation model, the path coefficient was found to be greater than 3.0 in all hypotheses. The significance level was also less than 0.05 (0.000) in all hypotheses. Therefore, with a confidence level of 95%, we can say that all hypotheses are supported. The application of the structural equation model for testing causal relationships confirmed the theoretical consistency of the model derived from data-driven. This approach aligns with the recommendations of methodological researchers who emphasize combining qualitative and quantitative methods to enhance the validity of constructs (Hair et al., 2019). Confirming meaningful relationships between causal conditions, strategies, and outcomes demonstrates that advanced ecosystem management in the province of Khuzestan is a coherent and measurable structure, not a collection of scattered factors.

Discussion

Based on the research title and the smart tourism ecosystem approach, the qualitative method of Grounded Theory data analysis was utilized using ATLAS.ti software. In this process, 6 main categories, 26 axial categories, and 160 open codes were identified, elucidating the complex structure of entering the Metaverse era. The causal conditions include data management, information technology, staff status, tourist status, and organizational structure. Contextual conditions include geographical location, tourism infrastructure, cultural heritage status, governmental conditions, and socio-cultural culture. Intervening conditions consist of the data analysis process, international conditions, management support, economic conditions, and advertising and marketing. The identified strategies are data-driven decision-making, financial improvement, customer relationship management, tourism branding, inter-sectoral participation, organizational learning and education, and benchmarking successful regions. Finally, the model outcomes were determined to be revenue generation and profitability, regional sustainable development, tourist satisfaction, and improvement of the tourism image.

In the next step, the Structural Equation Modeling (SEM) was employed to test the causal relationships among variables and evaluate the overall model fit. The results of this analysis indicated that the proposed research model has a good fit with the data, and the predicted relationships among causal, contextual, intervening, strategic, and outcome variables of smart tourism management are statistically significant. Furthermore, the examination of quantitative fit indices, including absolute, comparative, and parsimonious indices, indicated that all these indices fall within standard and acceptable ranges. This confirms the structural adequacy and explanatory power of the model. The results of factor analysis and structural equations show that the tourism management model designed for the Cultural Heritage, Handicrafts, and Tourism Organization of Khuzestan Province not only possesses theoretical coherence but also has high reliability and practical applicability. This favorable fit condition facilitates the use of the proposed model as a scientific and executive framework for policy-making, planning, and preparing the necessary infrastructure for entering the Metaverse era in Khuzestan Province and can serve as a suitable basis for future studies and managerial decisions in this field.

The findings of the present study showed that advanced and smart tourism ecosystem management in the Cultural Heritage, Handicrafts, and Tourism Organization of Khuzestan Province is a multi-level phenomenon influenced by the simultaneous interaction of intra-organizational and extra-organizational factors. This result aligns with the "digital business ecosystem" approach, which defines the organization within a network of interdependent actors and makes its survival contingent on co-evolution with other actors in both physical and virtual spaces (Moore, 1993; Adner, 2017). In this framework, the organization responsible for tourism is not an independent entity but a regulatory core in a network of relationships between the government, private sector, local communities, and tourists on digital platforms.

In the qualitative phase, the identification of 6 main categories, 26 axial categories, and 160 open codes showed that advanced tourism ecosystem management is a multi-dimensional, network-based phenomenon dependent on the interaction of different organizational and environmental layers. In this framework, "causal conditions," including data management, information technology, staff status, tourist status, and organizational structure, were identified as the driving engines for the formation of the advanced ecosystem and readiness for the Metaverse. The prominence of data management and information technology indicates that the transition from traditional management to ecosystem management and entry into the era of virtual reality in Khuzestan Province is not possible without establishing data-centric infrastructures, the Internet of Things (IoT), and the digitization of processes. Furthermore, staff status and organizational structure show that tech-savvy human capital

and a flexible, agile structure are prerequisites for realizing smart decision-making and network interaction within the Metaverse. Attention to tourist status also emphasizes experience-centricity and value co-creation in new tourism ecosystems based on immersive interactions.

The prominence of "data management" and "information technology" as primary causal conditions aligns with the literature on smart tourism and the Metaverse. Researchers emphasize that today's competitive destinations, for creating "Digital Twins" and offering services in virtual spaces, rely on data-centric infrastructures, big data analytics, and the integration of digital platforms (Gretzel et al., 2015). Smart and Metaverse-based tourism is not merely about using technology but signifies a transformation in the logic of decision-making and value creation in the "Phygital" (physical-digital) space. Buhalis and Amaranggana (2015) also demonstrate that leveraging smart technologies and augmented reality increases efficiency, service personalization, and enhances the immersive tourist experience.

In the context of Khuzestan Province, this finding indicates that moving towards an advanced ecosystem and readiness for the Metaverse requires investment in digital infrastructures, integrated tourism information systems, and predictive analysis of tourist behavior. Without such infrastructure, strategies such as data-driven decision-making, customer relationship management, or creating virtual experiences will be implemented incompletely. The findings showed that "inter-sectoral participation" and "management support" are key factors in realizing digital strategies. This result aligns with network governance theory, which emphasizes horizontal cooperation among actors and replacing hierarchical control with participatory interaction on shared platforms (Provan & Kenis, 2008). In the tourism sector, the success of smart destinations depends on coordination among diverse stakeholders; since no single organization is capable of managing all dimensions of the tourist experience in both virtual and physical spaces alone (Fyall, Garrod, & Wang, 2012). In Khuzestan Province, the diversity of actors, from government organizations to the private sector and technology startups, doubles the necessity of establishing network governance mechanisms. The research model showed that without senior management support and the creation of participatory platforms, development strategies for entering the Metaverse era will not yield sustainable results.

One of the key outcomes of the model was "tourist satisfaction" and "improvement of tourism image." This finding aligns with Service-Dominant Logic and the theory of value co-creation in the digital context, which views value as the result of interaction between the provider and the consumer in online and offline spaces (Vargo & Lusch, 2008). In tourism, the travel experience is the result of the tourist's interaction with the environment, services, and the host community, which today is enriched through the use of virtual and augmented reality. Therefore, the advanced tourism ecosystem must facilitate the active participation of tourists in creating digital and immersive experiences.

Customer relationship management and tourism branding, which emerged as strategies in this study, can be interpreted precisely in this regard. Destination branding is not merely a promotional image but a reflection of the real experience and tourists' perceptions of interacting with cultural symbols in virtual space (Pike & Page, 2014). Consequently, improving the tourism image of Khuzestan Province requires alignment between the brand promise and the quality of the actual and virtual experience provided. The findings showed that "regional sustainable development" is one of the fundamental consequences of establishing an advanced ecosystem. This result aligns with the sustainable tourism framework, which emphasizes balance among economic, social, and environmental dimensions (UNWTO, 2018). Khuzestan Province, with its valuable cultural heritage and sensitive natural resources, requires a model that guides physical and virtual tourism development within the framework of resource conservation and local community empowerment.

Literature indicates that an ecosystem approach and the use of Metaverse technologies can contribute to fairer distribution of benefits, increased social capital, and enhanced regional resilience (Hall, 2011). Therefore, the economic outcomes of the model, if properly managed using digital tools, can lead to improved social welfare and long-term sustainability.

At the level of "contextual conditions," components such as the province's geographical location, tourism infrastructure, cultural heritage status, governmental conditions, and socio-cultural culture play a foundational role. Khuzestan Province, with its climatic diversity, unique historical heritage, and diverse cultural capacities, possesses significant potential for recreation within the Metaverse context; however, realizing these potentials requires improving communication infrastructures, aligning government policies with the digital economy, and strengthening the culture of hospitality and social participation. The findings show that the advanced ecosystem is not formed in an organizational vacuum but within the specific institutional and social context of the province; therefore, any managerial intervention for digitization must be designed in accordance with local requirements.

"Intervening conditions," including the data analysis process, international conditions, senior management support, economic conditions, and advertising and marketing, play a moderating and reinforcing role in the path of realizing smart strategies. In particular, senior management support and the maturity of data analysis and big data processes were identified as key levers for overcoming organizational resistance to new technologies and solidifying Metaverse-centric approaches. Additionally, the susceptibility of tourism to international and economic conditions shows that Khuzestan's tourism ecosystem operates in close conjunction with transnational developments and economic fluctuations, thus requiring flexibility and strategic scenario planning for presence in global virtual markets. The role of digital advertising and marketing is also considered a determining factor in the efficiency of the ecosystem by strengthening the destination image and connecting with target markets online.

In response to these conditions, a set of "strategies" was extracted that form the backbone of the advanced and smart tourism ecosystem management model: data-driven decision-making, financial improvement, customer relationship management, tourism branding, inter-sectoral participation, organizational learning and education, and benchmarking successful regions. Data-driven decision-making, as the central strategy, links information technology and the Internet of Things with operational policy-making, facilitating optimal resource allocation and the design of personalized and immersive experiences. Financial improvement and diversification of income sources are conditions for the sustainability of development projects and tourism startups. Customer relationship management and tourism branding focus on enhancing user experience and destination image on digital platforms, while inter-sectoral participation strengthens the network logic of the ecosystem. Organizational learning and benchmarking successful regions also provide institutional mechanisms for institutionalizing innovation and continuous improvement on the path of digital transformation.

The expected outcomes of establishing these strategies within the advanced ecosystem include revenue generation and profitability, regional sustainable development, tourist satisfaction, and improvement of the province's tourism image. The findings indicate that economic, social, and perceptual outcomes operate synergistically; such that increased tourist satisfaction from physical and virtual experiences and improved destination image act as drivers for attracting more demand and boosting revenue generation, and this cycle, if managed correctly, can lead to regional sustainable development. Thus, the proposed model is not merely a theoretical framework but a roadmap for creating shared value at the provincial level and preparing it for the new era of tourism.

In the quantitative phase, the use of structural equation modeling facilitated the empirical testing of relationships among causal, contextual, intervening, strategic, and outcome variables. The results of the overall model fit showed that the conceptual structure extracted from the

Grounded Theory phase possesses internal coherence and empirical adequacy, and the defined causal paths possess the required statistical significance. In particular, the positive and significant effect of causal conditions on strategies, as well as the mediating role of strategies in transmitting effects to outcomes, confirms the theoretical logic of the technology-based model. Furthermore, the impact of contextual and intervening conditions on strengthening or weakening the intensity of causal relationships highlights the importance of a systemic view and avoiding one-dimensional approaches. In other words, advanced and smart tourism ecosystem management in Khuzestan is the result of the simultaneous interaction of the organization's internal capacities and external requirements in the digital age.

Conclusion

The present research was designed and implemented with the objective of «identifying and evaluating an advanced tourism ecosystem management model in the Cultural Heritage, Tourism, and Handicrafts Organization of Khuzestan Province». It aimed to provide a systematic view of the mechanisms shaping the advanced tourism ecosystem at the provincial level by adopting a combined approach.

In the first step, relying on qualitative data-driven and analysis methods in ATLAS.ti software, the conceptual structure of the model was extracted from field data. In the second step, using structural equation modeling, the causal relationships among constructs were tested and the overall model fit evaluated. This methodological synergy resulted in a final model with both deep and indigenous exploratory support and relative experimental validity and generalizability.

Theoretically, this research, by integrating data-driven and structural modeling approaches, enriched the literature on tourism ecosystem management at the provincial level and provided a native framework for analyzing multi-level interactions. From an applied perspective, the final model can be utilized as a tool for assessing the current status and strategic planning in the Cultural Heritage, Tourism, and Handicrafts Organization of Khuzestan Province.

Focusing on data-driven, network participation, and destination branding, three key levers were identified for transitioning from traditional to ecosystem management.

In summary, the results indicate that achieving an advanced tourism ecosystem in Khuzestan Province is not a one-time project but a gradual process requiring institutional commitment, investment in digital infrastructure, human capital empowerment, and collaboration between public and private sectors. The presented model can serve as a basis for intelligent policy-making, efficient resource allocation, and enhancing the province's competitiveness at the national and international levels, paving the way for sustainable development and elevating Khuzestan's tourism position.

The findings of this research are theoretically significant as it, for the first time at the provincial level, elaborates advanced ecosystem tourism management through an integrated data-driven model. Combining data-based methods with structural equation modeling, while deeply identifying the dimensions of the phenomenon, enabled the experimental validation of causal relationships. This integrative approach demonstrated that ecosystem tourism management is not a linear and one-dimensional concept, but rather the result of dynamic interactions between technological infrastructure, human capital, institutional platforms, and strategic mechanisms. From a management perspective, the research results indicate that the Heritage and Tourism Organization of Khuzestan Province, to move towards an advanced ecosystem, should shift its focus from partial and reactive management to network-based and forward-looking management. Implementing a data-driven decision-making system, strengthening cross-sectoral participation, and institutionalizing organizational learning can pave the way for enhancing efficiency and increasing resilience against environmental

fluctuations. In this regard, the role of top management in supporting innovation and creating a culture of adaptability will be decisive.

The presented model shows that a sophisticated tourism ecosystem is not only driven by revenue and profitability, but also seeks regional sustainable development. In Khuzestan province, rich in cultural diversity and environmental sensitivities, any tourism development must be accompanied by social and environmental considerations. The connection between tourism branding, visitor satisfaction, and empowering local communities can create a positive cycle that strengthens local economy while preserving cultural and natural heritage. One of the key findings of this research is the emphasis on data management and information technology as the main drivers of the sophisticated tourism ecosystem. This suggests that the future of tourism management in Khuzestan province depends on the ability of organizations to collect, analyze, and leverage visitor data and market insights. Developing intelligent systems, integrating information bases, and utilizing predictive analytics can significantly enhance decision quality and policy effectiveness.

Despite the achievements of this study, further in-depth analysis of relationships between variables over time and comparing the proposed model with other provinces with tourism potential can open new avenues for theoretical development in this field. Additionally, future research should specifically examine the role of interactive new technologies and digital platforms in fostering co-creation of value between visitors and local stakeholders to further enrich and complete the presented model.

Declaration of Competing Interest

The author declares that he has no competing financial interests or known personal relationships that would influence the report presented in this article.

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