

Development Path of New Smart Tourism in Jilin Province from The Perspective of Digital Empowerment

Yan Yang, Jingru Sun, Yuanyuan Ma, Yi Zhu, Yubin Yang, Weiyi Feng *

Changchun University of Science and Technology, Changchun Jilin, China

* Corresponding author: Weiyi Feng

Abstract. Focusing on the new tourism formats in Jilin Province, this study constructs a multi-dimensional framework and model for analyzing influencing factors through literature review and data analysis to explore their current development status, formation mechanisms, and trends. This will provide decision support for tourism management departments and enterprises, promoting the integration of new tourism formats with local economies to enhance Jilin Provinces tourism competitiveness. The research findings are expected to fill an academic gap and offer theoretical and practical guidance for the development of new tourism formats in the region.

Keywords: Jilin Province; New Tourism Forms; Formation Mechanism; Quantitative Analysis; Development Strategy.

1. Introduction

Introduction: Relying on abundant natural resources and a rich cultural heritage, Jilin Province has enormous potential for the development of new tourism formats. However, the current development of these new tourism formats faces numerous challenges. A thorough analysis of the mechanisms behind the formation of new tourism formats in Jilin Province is the focus of this study, aiming to fill an academic gap and provide theoretical and practical support for the transformation and sustainable development of the tourism industry.

2. Analysis of the Current Situation of New Forms of Smart Tourism in Jilin Province

This study compiles the cutting-edge theories and practical achievements of smart tourism development both domestically and internationally, summarizing an analytical framework applicable to Jilin Province. The research not only delves into annual statistical data from the National Bureau of Statistics and the China National Tourism Administration, as well as various publicly available tourism industry reports, but also employs web scraping technology to collect online travel platform data, thereby obtaining detailed information on the new smart tourism business models in Jilin Province in terms of market size, tourist reception volume, and tourism revenue. Insights reveal that the development trend of new smart tourism business models in Jilin Province is positive, with a significant increase in the number of domestic and international tourists received throughout the province in 2023, where smart tourism projects have attracted a large number of young visitors. However, the formation mechanism faces numerous challenges. From a technical perspective, the digitalization process in some scenic areas has been relatively slow, with issues such as outdated intelligent navigation systems and poor information accuracy in some 5A-level scenic areas. From a market perspective, the homogenization of smart tourism products is prominent, failing to provide personalized services for different tourist groups. In terms of policy, the implementation of relevant support policies is less than satisfactory, with complex application procedures for funding subsidies and tax incentives affecting corporate enthusiasm. These issues hinder the further development of new smart tourism business models in Jilin Province [1]

3. Analysis of Influencing Factors of New Forms of Smart Tourism in Jilin Province from the Perspective of Digital Empowerment

By reviewing literature to grasp the current status of new tourism formats in Jilin Province, we first construct a comprehensive "four forces" analytical framework to delve into the mechanisms behind the formation of these new formats. Government guidance is the driving force, economic support is the impetus, social culture is the vitality, and technological innovation is the pull. For government support, an indicator system has been established from three aspects: tax incentives, financial subsidies, and tourism development plans. Policy support plays a crucial role among external influencing factors. Although the government has issued a series of policies to promote smart tourism, there are issues such as inadequate implementation and uneven distribution of support funds, which make it difficult for some small and medium-sized tourism enterprises to benefit. The overall technological innovation environment in Jilin Province also significantly influences the development of smart tourism formats. There is a relatively low level of R&D investment within the region, and cooperation between industry, academia, and research is not close enough, leading to low efficiency in the transformation of smart tourism-related technologies. Additionally, rapid changes in consumer demand continuously increase the requirements for personalization and quality of smart tourism products. If companies fail to timely capture and meet these demands, they will be at a disadvantage in market competition. Economic support involves choosing trends and preferences in tourism consumption, evaluating the costs and returns of investing in new tourism formats, and the GDP growth rate. Four indicators; social culture is analyzed through three indicators: population structure, cultural factors, and social attitudes; information technology, transportation technology, and innovation capabilities are chosen to examine the driving effect of technological innovation on new tourism formats. Internally, the digital transformation capability of tourism enterprises has a decisive impact on the development of smart tourism new formats. Some tourism enterprises lack professional digital talent and technical teams, leading to difficulties in adapting to and applying cutting-edge technologies such as big data and artificial intelligence, and the high application costs constrain the innovation of smart tourism products and services. By integrating internal and external factors and using quantitative data analysis along with qualitative case studies and interviews, a conceptual model of the influence mechanism of Jilin Provinces smart tourism new formats based on the perspective of digital empowerment has been established, laying a solid foundation for further in-depth research [2].

4. Construction of Development Path of New Forms of Smart Tourism in Jilin Province

4.1 Data Processing and Preparation

Regarding the research on new forms of smart tourism in Jilin Province, data processing and preparation form the foundation for constructing effective mathematical models. Data sources are extensive, including statistical data from authoritative departments such as the National Bureau of Statistics and the China National Tourism Administration, as well as industry reports and business operation data. For the collected raw data, professional data cleaning techniques are first used to identify and remove outliers and missing values, ensuring the accuracy and completeness of the data. For example, tourist flow data that clearly deviates from normal ranges or incorrectly entered data is corrected or deleted. Subsequently, standardization is implemented to transform data with different dimensions and scales into a comparable format, allowing various indicators to be analyzed under unified standards. This provides reliable data support for subsequent model construction, ensuring that the model results are both scientific and credible. The comprehensive interpretation of these model results helps to accurately understand the development trends of new forms of smart tourism in Jilin Province, providing a scientific basis for precise insights and laying the groundwork for formulating targeted development strategies [3]

4.2 Logistic Regression Model

The probability of positive results under a set of independent variables is denoted as P and abbreviated as P , and the logistic regression model can be expressed as: $P = P(Y = 1 | X_1, X_2, \dots, X_m)$

$$P = \frac{1}{1 + \exp[-(\alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_m X_m)]}$$

Among them, α is the constant term, and β_j is the regression coefficient. In this study, the dependent variable is the development level of new smart tourism business models, and a set of independent variables includes market size, consumer preference, technological input, and policy environment. After appropriately transforming the above formula and taking the natural logarithm, it is denoted as,

and the formula is: $\logit(P) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_m X_m$

$$\logit(P) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_m X_m$$

The Logistic curve (as shown in Figure 1) shows the relationship between P and Z .

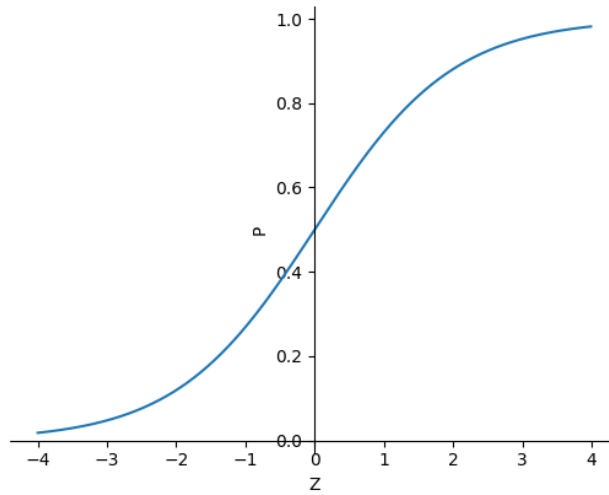


Figure 1. Logistic curve

The regression coefficient represents the change of a factor when it changes by one unit, and has a corresponding relationship with the odds ratio (OR) that measures the effect of a factor. The natural logarithm of OR is: $\beta_j, (j = 1, 2, \dots, m)$

$$\phi_j = \exp[X_{j(1)} - X_{j(0)}]$$

When greater than zero and greater than one, it indicates a positive effect on the positive outcome. Specifically in this study, when greater than zero and greater than one, it suggests that the independent variable promotes the development of new smart tourism models. Based on the above analysis, we can reasonably dissect the relationship between each factor and the development of new smart tourism

models. $\beta_j, \phi_j, X_j, \beta_j, \phi_j$

By ranking the absolute values of logistic regression coefficients, we quantify the marginal contributions of market size, consumer preferences, and technological investment to the development probability of smart tourism. By introducing cross-analysis to examine policy synergy effects, we incorporate visitor profile data into multi-level logistic regression to assist in target audience positioning and targeted recommendations.

4.3 System Dynamics Model

Establish the stock flow model (Stock-Flow Diagram), that is, the dynamic model of market size (MarketSize) with time change, in the specific form:

$$\frac{d(\text{MarketSize})}{dt} = \alpha \cdot \text{PolicySupport} + \beta \cdot \text{TechInvestment} - \gamma \cdot \text{MarketSaturation}$$

$\alpha \cdot \text{PolicySupport}$: The driving effect of policy support (such as subsidies and tax incentives) on market size, α is the sensitivity coefficient of policy impact. $\beta \cdot \text{TechInvestment}$: The promoting effect of technology investment (such as R&D investment and innovation) on market size, β is the efficiency coefficient of technology investment. Negative inhibitory term $\gamma \cdot \text{MarketSaturation}$: The limiting effect of market saturation (such as demand saturation and increased competition) on growth, γ is the damping coefficient of the saturation effect.

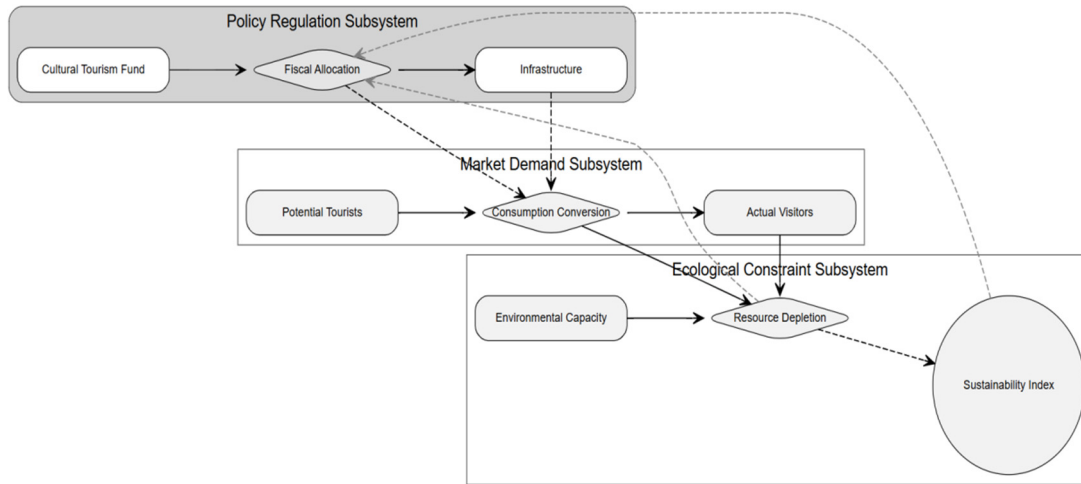


Figure 2. Stock flow chart

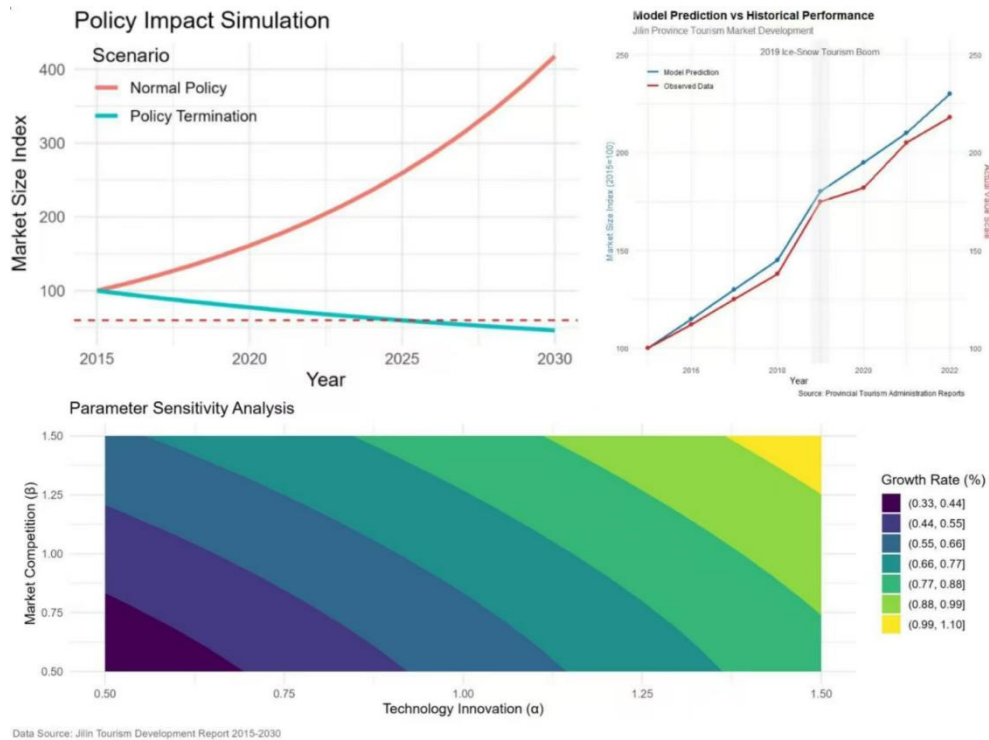


Figure 3. Model validity test

The stock flow chart (as shown in Figure 2) clearly illustrates the dynamic transmission mechanism of "policy input → facility construction → service provision → market demand → technical feedback" in the development of new tourism formats in Jilin Province. By simulating the

system collapse threshold when policy support returns to zero, it compares the model output with actual data from the peak period of winter sports tourism in 2019, examining the elasticity of the impact of changes in the coefficient of technological innovation $\pm 20\%$ on format growth (as shown in Figure 3).

Table 1. Design multi-scenario simulation scheme

Scenario type	Policy variable setting	Technical parameter adjustment
Base scenario	Maintain current policies	Technology penetration is increasing by 5% a year
innovation-driven	Research and development subsidies increased by 30%	The application of digital technology accelerated by 20%
Risk scenarios	Environmental regulations will be tightened by 50%	Infrastructure investment fell by 15%

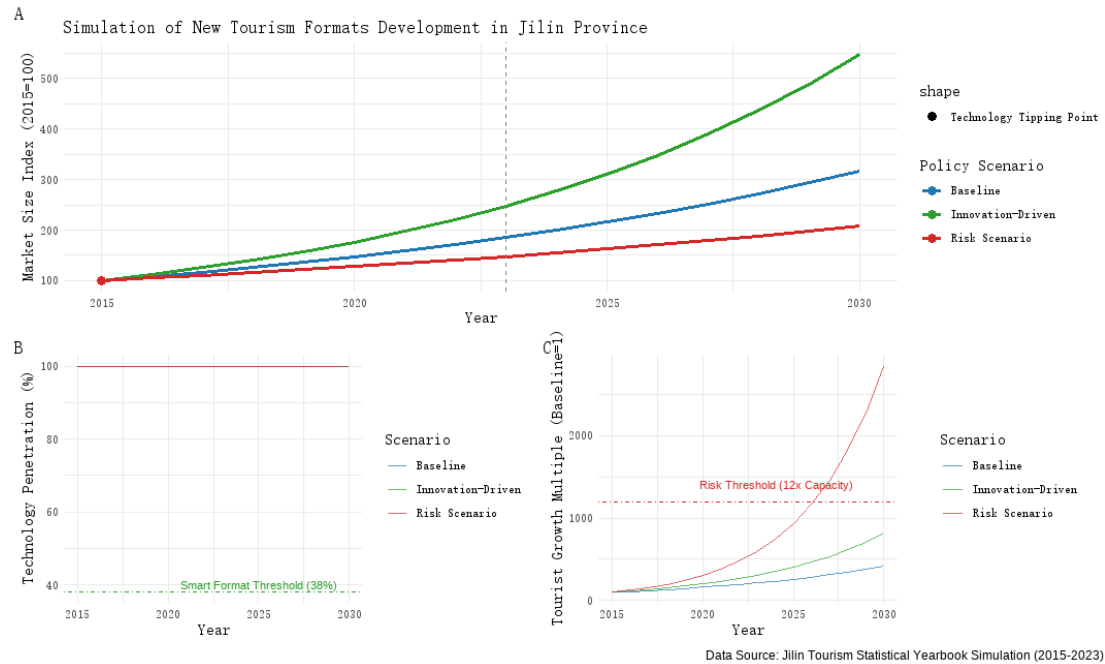


Figure 4. Comparison of tourism development trajectory under multiple policy scenarios

When the penetration rate of digital technology exceeds 38%, the new form of smart tourism will enter an exponential growth phase (as shown in Figure 4), validating the multiplier effect of improved business environment on the cultivation of emerging industries (1 unit of policy investment generates a market response of 2.3 times). When the tourist growth rate exceeds 12% per year, the environmental carrying capacity system will experience a nonlinear mutation. This method, by constructing an analytical loop of "factor correlation-dynamic feedback-policy response," not only explains the growth logic of new forms such as ice and snow economy and rural tourism in Jilin Province but also provides a universal analytical framework for industrial transformation and upgrading in the old industrial bases of Northeast China.

4.4 Econometric Models

Selecting the data from the Jilin Province Tourism Statistical Bulletin for 2015-2024, based on the econometric model test results, we analyze the factors influencing Y (Jilin Provinces tourism revenue). The F-statistic is 72.454 ($P=0.000042$), indicating that the model is highly significant overall, with explanatory variables jointly having a significant impact on tourism revenue. $R^2 = 0.973$, suggesting that the model explains approximately 97.3% of the variance in the dependent variable, indicating a good fit. The slope $t=$, which is greater than the critical value of 8 at the 5% significance level, and

the urbin-Watson statistic = 1.958, close to 2, indicates no significant autocorrelation in the residuals. The formula derived is:

$$\ln y = 1.12 \ln x_1 + 1.86 \ln x_2 + 0.73 \ln x_3 - 19.82$$

In X1 (cultural and tourism expenditure) increased by 1%, tourism revenue increased by 1.116%; In X2 (the number of cultural centers) increased by 1%, tourism revenue increased by 1.860%; In for every 1% increase in x3 (per capita disposable income), tourism revenue increased by 0.734%.

Table 2. Econometric model table

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-19.82167	20.14235	-0.984079	0.3631
LNx1	1.116265	0.902388	1.237013	0.2623
LNx2	1.859930	2.158254	0.861775	0.4219
LNx3	0.734109	1.489957	0.492705	0.6397
R-squared	0.973138	Mean dependent var		10.33844
Adjusted R-squared	0.959707	S.D. dependent var		0.472459
S.E. of regression	0.094838	Akaike info criterion		-1.584124
Sum squared resid	0.053965	Schwarz criterion		-1.463090
Log likelihood	11.92062	Hannan-Quinn criter.		-1.716899
F-statistic	72.45396	Durbin-Watson stat		1.958466
Prob(F-statistic)	0.000042			

5. Countermeasures for the Development of New Forms of Smart Tourism in Jilin Province from the Perspective of Digital Empowerment

5.1 Strengthen Policy Support and Guidance

In the development process of new smart tourism models in Jilin Province, the role of the government is crucial, and it is imperative to strengthen policy support and guidance. First, targeted special policies should be formulated to clarify the direction and key areas of development, such as encouraging the integration of digital technology into characteristic projects like winter sports tourism and folk cultural tourism; establishing a special development fund to provide financial subsidies for enterprises actively promoting the construction of smart tourism, supporting projects like intelligent upgrades of scenic spots and optimization of online travel platforms; secondly, tax preferential policies should be improved and the application process simplified to genuinely reduce the burden on enterprises, enabling more tourism companies to have both the funds and motivation to invest in smart tourism construction; furthermore, supervision and evaluation during the implementation of policies must be strengthened to ensure that all policies are effectively implemented and produce practical results, creating an excellent policy environment for the rapid and healthy development of new smart tourism models[4]

5.2 Strengthening Technological Innovation and Application

Focusing on technological innovation as the core driving force to promote the development of new intelligent tourism models in Jilin Province, firstly, it advocates for increased investment by tourism enterprises in technology research and development, establishing a mechanism for industry-university-research collaboration with universities and research institutions. Together, they aim to develop new technologies that fit the tourism scenarios in Jilin, such as using virtual reality (VR) and augmented reality (AR) technologies to create immersive ice and snow tourism experiences, and developing intelligent tour guide systems that integrate local historical and cultural knowledge to provide rich tour explanations for visitors; secondly, it actively introduces advanced intelligent tourism technologies and equipment from home and abroad, adapting them to local conditions in Jilin, such as introducing intelligent visitor flow monitoring systems to monitor real-time visitor numbers in scenic areas, thereby reasonably planning tour routes to prevent overcrowding and enhance the

safety and comfort of visitors, continuously promoting the deep integration of technology into various aspects of tourism services, management, and marketing to comprehensively improve the level of intelligent tourism [5]

5.3 Promote Coordinated Regional Development

Jilin Province is vast and each region has distinct tourism resources, making regional coordinated development in promoting new forms of smart tourism a crucial strategy. This means that cities at the regional level need to break down administrative barriers and enhance communication and cooperation, working together to integrate tourism resources and create cross-regional smart tourism routes. For example, combining the snow and ice resources of Changbaishan with the folk culture of Yanbian, designing tourism products that feature both snow and ice experiences and folk customs, and promoting them through a unified smart tourism platform; establishing a mechanism for sharing regional tourism information to achieve real-time exchange of visitor numbers and traffic conditions, allowing for rational allocation of tourism service resources across regions and thus improving overall service efficiency; conducting collaborative planning for the construction of smart tourism infrastructure to prevent duplication and improve resource utilization; leveraging regional coordinated development to fully leverage the advantages of each region, achieving complementary resources and mutual guest flow, driving the prosperity of Jilin Provinces new forms of smart tourism.

6. Conclusion

This study provides an in-depth analysis of the current development status, influencing factors, and formation mechanisms of new tourism formats in Jilin Province. By building a model to predict their future trends, targeted strategies are proposed. It is hoped that the findings of this study will serve as a reference for decision-making by tourism management departments and enterprises in Jilin Province, promoting the integration of new tourism formats with the local economy, thereby helping Jilins tourism industry achieve high-quality and sustainable development goals.

References

- [1] Chen Ye, Jia Junqi. New Pathways for the Development of Tourism Destinations under Digital Economy [J]. *Journal of Tourism*, 2022,37(04):6-8. DOI:10.19765/j.cnki.1002-5006.2022. 04.004.
- [2] Ren Xinyu, Li Yanjun. Research on the Path of High-quality Development of Rural Tourism in Jilin Province from the Perspective of Flow Economy [J]. *Shanxi Agricultural Economics*, 2024,(18):72-74.DOI:10.16675/j.cnki.cn14-1065/f.2024.18.022.
- [3] Zhao Zhenan. Research on the Activation of New Cultural Tourism Forms under the Empowerment of Digital [J]. *China Collective Economy*, 2024, (18):109-112.
- [4] Peng Runhua, Shi Shuangshuang. Analysis of the Development Path of Rural Revitalization from the Perspective of Smart Tourism [J]. *Modern Horticulture*, 2023,46(11):137-139.
- [5] Li Pengxiang and Li Yan. Research on the Development Path of Smart Tourism in Rural Areas of Jilin Province under the Context of Experience Economy [J]. *China Market*, 2021, (36):49-50+71.DOI: 10.13939/j.cnki.zgsc.2021.36.049.