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Design and Implementation of Hainan Russian Language Service Platform Based on Smart Tourism

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SUMMARY: *This article aims to lay the foundation for further potential application work by completing the prototype design of the Hainan Russian language service platform for comprehensive smart tourism in Hainan Province, and explore the factors that affect tourists' continued use of the platform. Firstly, based on the expected confirmation model, a theoretical model is constructed with the characteristics of the Hainan Smart Tourism Network Russian Service Platform and tourist perception as latent variables, and hypotheses are proposed. Secondly, data will be collected through a questionnaire survey, and the hypothesis will be validated using the Analytic Hierarchy Process to test the mediating role of perceived usefulness and satisfaction. Finally, the entropy weight analytic hierarchy process is used to study the antecedent configurations that trigger tourists' intention to continue using, and to analyze the impact of different factors on their intention to continue using. The results of the hierarchical regression analysis show that the information quality, media richness, usability, and perceived interest of the Hainan Russian service platform for smart tourism have a positive impact on expected confirmation and perceived usefulness; Expectation confirmation and perceived usefulness have a positive impact on satisfaction; Perceived usefulness and satisfaction have a positive impact on the willingness to continue using. The results of the entropy weight analytic hierarchy process show that there are three patterns of triggering sustained use intention, with high media richness and high expected confirmation appearing multiple times as core conditions. The study verified the applicability of the expectation confirmation model in the design of the Hainan Russian language service platform for smart tourism, indicating that improving information quality, media richness, usability, and perceived interest can enhance tourists' expectation confirmation and perceived usefulness, thereby improving satisfaction and sustained use intention. The research results provide theoretical basis and practical guidance for the design and implementation of a Hainan Russian language service platform for smart tourism.*

KEYWORDS: *smart tourism; Hainan Province; Russian language service platform; Entropy weight method; Analytic Hierarchy Process; Expected confirmation degree; Perceived usefulness*

1 Introduction

Smart tourism is a key direction of China's tourism informatization construction, and the global smart tourism platform is an important carrier platform for the construction of global tourism informatization. It is an important channel connecting tourists, enterprises, and supervisory

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units. Assisting tourism related enterprises to access the global smart tourism platform is an urgent problem that the cultural and tourism departments need to solve [1, 2]. The Hainan Russian language service platform is of great significance to smart tourism. Russia is the largest overseas customer source country in Hainan, and the Russian language service platform accurately meets its needs, breaks down language barriers, and allows Russian tourists to easily access tourism information and enjoy services. The Russian tourism language service course offered by Sanya University can cultivate talents who can use the platform to guide scenic spots, book hotels, etc. in Russian. At the same time, the platform combines with the smart tourism system to provide real-time navigation, personalized recommendations, and other functions to enhance the tourist experience. In addition, it can also help promote the dissemination of Hainan's tourism culture, allowing Russian speaking tourists to have a deeper understanding of Hainan's characteristics, attracting more tourists, and promoting the international development of Hainan's smart tourism [3].

In December 2021, the State Council issued the "14th Five Year Plan" for the development of the tourism industry, emphasizing the need to strengthen typical demonstrations, innovation guidance, and dynamic management, promote the construction of national comprehensive tourism demonstration zones, improve coordination mechanisms, enhance development quality, and carry out comprehensive tourism as an effective way to further promote supply side structural reform in the tourism industry [4]. The purpose of comprehensive tourism practice is not only to make the tourism industry bigger and stronger, but also to increase the added value of the tourism industry to related industries through the tourism practice of the entire region. Through comprehensive tourism practice, not only can it promote the growth of regional tourism income, but it can also promote the development of regional economy. It can be said that comprehensive tourism is not only an important manifestation of China's tourism process, but also an important development mode for promoting social and economic development in China. Intelligence and intelligentization are the development directions of the tourism industry today. Through technologies such as networks, big data, and the Internet of Things, the level of tourism management, decision-making, and service can be improved. Global tourism is led by the tourism industry, and through the integration of regional resources and deep integration of industries, it achieves a tourism development model that promotes coordinated regional economic development driven by the tourism industry. Intelligent tourism is a systematic and intensive management reform that utilizes new generation information and communication technology to achieve the sharing and effective utilization of tourism and social resources, in order to meet the personalized needs of tourists and provide high-quality and high satisfaction services. At the same time, smart tourism has also received attention from the academic community both domestically and internationally, becoming a cutting-edge issue in theoretical research [5]. With the upgrading of tourism informatization and the rise of smart city construction, smart tourism has become a key focus of China's tourism informatization construction. Unlike the early stages of tourism informatization, the application of intelligent mobile terminals is one of the important features of smart tourism.

The research on the design of a Hainan Russian language service platform for global smart tourism based on entropy weight hierarchy analysis can be used for the construction phase of the Hainan global tourism information platform project. When designers of the Hainan Russian language service platform analyze the main process of the product, they need to conduct requirement management. They can prioritize the requirements based on the Carnot model and Analytic Hierarchy Process, and then develop the minimum feasible product after building the final set of functions. This article lays the foundation for further potential application work by completing the prototype design of the Hainan Russian language service platform for comprehensive smart tourism in Hainan Province.

2 Related research

With the upgrading of tourism informatization and the rise of smart city construction, smart tourism has become a key direction for China's tourism informatization construction. Unlike the early stages of tourism informatization, the application of intelligent mobile terminals is one of the important features of smart tourism [6]. At the same time, smart tourism has also received attention from the academic community both domestically and internationally, becoming a cutting-edge issue in theoretical research. By analyzing domestic and foreign research on the construction of a comprehensive tourism information platform, scholars have proposed relevant ideas in the areas of provincial-level regional smart tourism control systems, tourism service applications, and tourism cloud management systems [7].

Reference [8] points out that intelligent tourism is a systematic and intensive management reform based on new generation information technology, aimed at achieving the sharing and effective utilization of tourism resources and social resources to meet the personalized needs of tourists and provide high-quality and high satisfaction services. In terms of connotation, the essence of intelligent tourism refers to the application of intelligent technologies, including information and communication technology, in the tourism industry, aiming to improve tourism services, enhance tourism experience, innovate tourism management, optimize the utilization of tourism resources, enhance the competitiveness of tourism enterprises, improve the management level of the tourism industry, and expand the scale of the industry as a modernization project.

Reference [9] proposes that the tourism industry has recognized and utilized the advantages of information and communication technology in managing its relationships with customers by strengthening its network presence. At this point, mobile marketing is currently one of the best marketing strategies, surpassing online marketing, and it is recommended to use different tools to integrate them into a practical system with high personal involvement. We increasingly need to attract and engage tourists through readily available smart devices/mobile phone applications to gain economic and commercial benefits.

According to the current development of the "One Mobile Tour in Yunnan" APP, the literature [10] analyzed the problems and causes of its lack of core content, weak traffic aggregation ability, and lack of use scenarios from the perspective of communication science, and put forward suggestions such as identifying the pain points of core users, giving up competing in inferior fields, making full use of social communication, and reversing stereotypes, with a view to exploring the development dilemma and trend of "Internet plus+Global Smart Tourism" in China through the research on the application.

Reference [11] suggests that in the context of smart tourism, tourism service applications can better understand users' internal needs, address pain points, provide users with immersive service experiences through user experience design, make products more personalized, and unleash the value of tourism service applications.

Reference [12] proposed that "one machine tourism" is now a key area for the construction of cultural and tourism destinations, and solving the pain points of different industries through information technology is also a fundamental demand in various regions. The 96301-tourism service hotline on the "One Mobile Travel Yunnan" platform is a convenient one click complaint window, where tourists can seek help for any difficulties they encounter before, during, or after their trip. The practice of "One Mobile Tour in Yunnan" has made the construction of public information services and application platforms in the field of cultural tourism based on mobile Internet technology the consensus of the industry.

Reference [13] believes that the provincial-level regional smart tourism control system has important practical significance for empowering and increasing the efficiency of provincial-level regional tourism economy, especially in the context of normalized epidemic prevention and control. It will help to better build provincial-level regional tourism demonstration zones, achieve safe, orderly, and efficient management of provincial-level regional tourism, promote the organic integration of regional tourism resources, and promote the deep integration and development of industries.

Reference [14] proposed a tourism cloud management system and discussed the infinite possibilities of integrated methods, which integrate different disciplines to consolidate multidisciplinary and interdisciplinary concepts based on limited actions and functions. It includes design, tourism ICT, Several possibilities in the areas of economy and multimedia. The implementation and application of TCMS will make intelligent and smart management of the tourism industry possible, and enhance the experience of tourists.

Reference [15] analyzed the construction of a smart tourism management platform based on the big data environment. It collected tourism information through cloud computing technology, managed scenic area information resources, and used cloud data as a platform for information exchange, improving the information resource library of the management platform and providing effective resources for the development of the tourism industry, thus promoting the long-term development of the smart tourism management platform for tourism.

Reference [16] proposes that through the application of cloud services, smart tourism can improve the dissemination of tourism information, enhance the utilization of tourism resources, better analyze passenger information, and thus achieve the growth of tourism economy.

The core of smart tourism management is to obtain tourists' travel information through cloud service technology, organize travel information, and recommend personalized travel plans for tourists. Apply cloud services to smart tourism management and use weighted average algorithm to regress and predict passenger information. The application of cloud services using weighted average algorithm in smart tourism management can better analyze and predict tourism information, and improve the level of smart tourism. The weighted average algorithm of cloud services in smart tourism management can integrate and predict tourism information to develop corresponding tourism marketing strategies, enhance tourism economic growth, and improve tourists' tourism experience.

3 Structural relationship model of three influencing factors

3.1 Platform Architecture

Figure 1 shows two typical Russian service platform pages. If the Hainan Russian language service platform takes smart tourism as its core architecture [17], it needs to build a systematic solution around four dimensions: technical support, content services, marketing promotion, and user experience, in order to accurately meet the needs of Russian tourists and promote the internationalization of Hainan tourism.

Figure 1: Russian Service Platform Page

The following is the specific analysis architecture of the Hainan Russian language service platform:

(1) Technical support layer: Build a stable and efficient digital foundation. 1) Independent website and multilingual CMS system. Adopting CMS frameworks such as WordPress, Cholla, or WordPress, it supports Russian interface customization and multilingual switching to ensure localized content presentation. Deploy local servers or CDN acceleration in Russia (such as Cloudflare) to optimize page loading speed and improve Yandex search engine ranking (with a market share of over 60% in Russia). Integrate SSL encryption and data compliance tools, in compliance with the Russian Personal Data Protection Law, to enhance user trust. 2) Mobile adaptation and responsive design. The usage rate of mobile devices in Russia has reached 51%, and it is necessary to ensure seamless adaptation of the website on desktop, tablet, and mobile devices, with a focus on optimizing core functions such as scenic spot guidance and online booking.

(2) Content service layer: Creating a localized tourism information hub. 1) Multi language content production and SEO optimization. Professional Russian translation team: To avoid

ambiguity in machine translation and ensure accurate and smooth text such as attraction introductions and service descriptions. Yandex Keyword Research: Using Yandex Wordstat tool to analyze the search habits of Russian tourists (such as "Hainan Duty Free Store" and "Sanya Diving"), optimize content tags and long tail keyword layout. Multimedia content integration: embedding Russian video guides, VR panoramic views, and voice explanations to enhance information immersion. 2) Cultural adaptation and scenario based services. Develop a guide library for Russian language attractions such as Red Square and Winter Palace, and design exclusive tourist routes based on Hainan's unique resources such as tropical rainforests and Li culture. Provide a Russian version of the electronic payment guide, integrating local payment methods such as Yandex. Money, Qiwi, etc., to simplify the transaction process.

(3) Marketing and promotion layer: Accurately reach the Russian customer market. 1) Social media matrix operation. VKontakte (VK): The Russian version of Facebook, with over 97 million active users, can accurately target high consumption groups aged 25-45 through advertising. Telegram channel: Publish limited time discounts and holiday event information, establish user communities to increase repeat purchase rates. YouTube Russian Channel: Collaborate with Russian travel bloggers to produce Hainan vacation experience videos and expand brand influence. 2) Data driven precision marketing. Analyze user behavior and optimize advertising strategies through website traffic analytics tools such as Yandex Metrica. Participate in local industry directories (such as Flagma, Avito) and commercial platforms in Russia to enhance opportunities for B2B cooperation.

(4) User experience layer: Build a closed-loop service throughout the entire process. 1) Intelligent customer service and real-time interaction. Deploy a Russian AI customer service system that supports 24-hour online Q&A, covering high-frequency issues such as visas, transportation, and accommodation. Provide a Russian language telephone customer service hotline to address urgent needs and enhance service temperature. 2) Personalized recommendations and membership system. Based on user browsing history and consumption behavior, push customized travel packages (such as family tours and honey moon tours). Establish a membership points system to redeem discounts for duty-free shops, scenic spot tickets, and other benefits, and enhance user stickiness.

The Hainan Russian language service platform can achieve: breaking through language barriers, eliminating communication barriers with professional Russian language services, and improving tourist satisfaction through technology localization, content scenarization, precise marketing, and closed-loop experience. Enhance brand competitiveness: Seize the opportunity in the Russian customer market through Yandex SEO and social media operations. Drive the upgrade of smart tourism: optimize services through data and user feedback, forming a virtuous cycle of "service feedback improvement". This architecture not only serves Russian tourists, but can also be extended to other Russian speaking markets such as Kazakhstan and Belarus, providing long-term support for the construction of an international tourism consumption center in Hainan.

3.2 Dimensions of Influencing Factors

The value influencing factors of the Hainan Smart Tourism Network Russian Service Platform have been preliminarily determined in various dimensions, including marketing strategy, transaction value, recommendation value, knowledge value, network value, and operational performance of the Russian service platform. The theoretical model of the research has been derived, and corresponding research hypotheses have been established. Before conducting quantitative analysis, it is necessary to provide graphical explanations of the causal hierarchical relationships between each element [18].

Interpretative Structural Modeling Method (ISM) is a research method in systems engineering that involves topological operations on the relationships between factors to create a simplified hierarchical structural relationship topology diagram. It is a relatively simple method for analyzing the relationship structure of Russian service platform design, including classical models, Boben models, fuzzy models, damping models, virtual solution models, function models, adversarial models, etc. [19].

The ISM method is a process of transitioning fuzzy knowledge models into structured systems, which can provide assistance for theoretical research and determine and accept the hierarchy of research theories. Each research model has its own applicable situation. Based on the previous theoretical analysis, this study found that both classical and fuzzy models are suitable, and the results of classical and fuzzy models are the same. Therefore, it was decided to use a simpler and more understandable classical model to establish causal relationships between factors. The specific analysis steps are [20]: 1) Establish an influencing factor relationship table; 2) Establish adjacency matrix; 3) Calculate the matrix and solve for the reachable matrix; 4) Decompose reachable matrix; 5) Establish a hierarchical relationship structure of factors.

3.3 Relationship Table of Influencing Factors

Based on the theoretical model introduced in the previous chapter, draw a directed graph of the elements of "marketing strategy customer lifetime value operational performance" for the Hainan Smart Tourism Network Russian Service Platform, as shown in Figure 2.

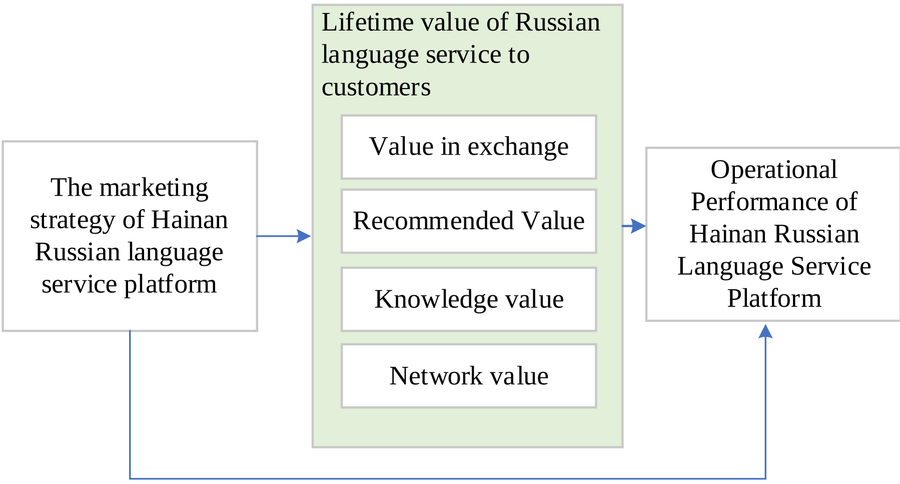

Figure 2: Directed Graph of Russian Service Platform Relationship Model

In Figure 2, the arrows from the marketing strategy of the Hainan Smart Tourism Network Russian Service Platform to the customer lifetime value indicate that the marketing strategy has an impact on the customer lifetime value, the arrows from the customer lifetime value to operational performance indicate that the customer lifetime value has an impact on operational performance, and the arrows from the marketing strategy to operational performance indicate that the marketing strategy has an impact on operational performance, which can be represented by a matrix of $m \times m$, where *m* is the number of influencing factors represented by the matrix corresponding model. Each row and column in the matrix correspond to an influencing factor. When the row factor S_i has an impact on the column factor S_j, the factor relationship value a_{ij} is 1. When the factor S_i has no impact on S_j, the factor a_{ij} is 0, which can be expressed by formula (1):

$$a_{ij} = \begin{cases} 1, \text{When } S_i \text{ has an impact on } S_j \\ 0, \text{When } S_i \text{ has no effect on } S_j \end{cases} \tag{1}$$

Based on this, this study obtained comparative relationship values between factors by distributing survey questionnaires to experts. In the survey questionnaire, the Structural Self Interaction Matrix (SSIM) was used to compare the influencing factors obtained from different conceptual theories pairwise. In terms of expert selection, due to the limited application rules of ISM, the number of experts should not be too large and should be between 5-15. A large number of interview experts or deviated selection criteria can affect the consistency of analysis results and make it difficult to match the actual situation. Therefore, we are looking for 5 scholars who have been engaged in research in smart tourism or related fields for more than 5 years to compare the impact of influencing factors. The following four symbols are used to represent the direction of the relationship between factors *i* and *j*:

(1) Factor *i* will help enhance factor *j*, with a corresponding factor relationship value of 1;

(2) A-factor *j* will help enhance factor *i*, with a corresponding factor relationship value of 1;

(3) The X-factors *i* and *j* will contribute to mutual enhancement, with a corresponding factor relationship value of 1;

(4) There is no correlation between factor *i* and *j*, and the corresponding factor relationship value is 1.

3.4 Establishing adjacency matrix

The adjacency matrix reflects the direct relationship between various influencing factors in the design, operation, and maintenance of the Hainan Smart Tourism Network Russian Service Platform. It belongs to an equivalent structure with a directed graph and is a non-zero or one Boolean matrix [21]. The adjacency matrix uses logical operations and multiplication rules. Let $A=\left[a_{i,j}\right]$ be a $m \times s$ matrix and $B=\left[b_{i,j}\right]$ be a $s \times n$ matrix, forming the $m \times n$ matrix $C=\left[c_{i,j}\right]$, where:

$$C_{i,j} = a_{i1}b_{1j} + a_{i2}b_{2j} + \cdots + a_{is}b_{s,j} = \sum_{k=1}^{j} a_{ik}b_{kj} \tag{2}$$

Therefore, the product of *A* and B is denoted as *C*=*AB*. Matrix multiplication satisfies: 1) The number of rows in matrices *A* and *B* is equal; 2) Matrix *C* has the same number of rows as matrix *A* and the same number of columns as matrix *B*; 3) The product matrix conforms to the row by column rule. Based on this, the adjacency matrix calculation results of this study are as follows:

$$C = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \tag{3}$$

The reachable matrix in this study was calculated using the transitive closure Warshal1 method [22]. Warshal1 proposed an effective algorithm for finding transitive closures of relationships in 1962. The transitive closure Warshall method is based on the binary relationship *R* on the adjacency matrix *C*. The transitive closure of *R* is the smallest transitive relationship on *C* that contains *R*. Generally, *B* is used to represent the $n \times n$ binary matrix defined on the set *C* with n elements, and the matrix *B*+for transitive closure can be calculated as follows: $B+ = B + B_2 + B_3 + \cdots + (B)_n$.

When calculating reachable matrices, all multiplications are replaced with logical 'AND', and all additions are replaced with logical 'OR'. The operation order in the above equation is $B, B(B), B(BB), B(BBB), \cdots$, so calculating the reachable matrix simply requires multiplying the existing result by *B*. The specific process is as follows:

The relationship matrix of relationship *R* on a finite set of n elements is *M*:

(1) Set the new matrix *A*=*M*;

(2) Set *k*=l;

(3) For all *i*, if $A[i,\ k] = 1$, then for $j = 1, \cdots, n$: $A[i, j] \leftarrow A[i, j] \vee A[k, j]$;

(4) *k* increases l;

(5) If k ≤ n, proceed to step (3), otherwise stop. The obtained matrix A is the relationship matrix of the transitive closure *t*(*R*) of the relationship *R*.

If the reachable matrix in this study is R, then

$$R = (A + I)^4 = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} = (A + I)^3 \quad (4)$$

4 Fuzzy Entropy Weight Analytic Hierarchy Process

When constructing the comprehensive evaluation system for the design, operation, and maintenance of the Hainan Smart Tourism Network Russian Service Platform, different evaluation indicators usually have different importance or influence. At present, there are three main methods for weighting indicators [23]: subjective weighting method, objective weighting method, and combination weighting method. The subjective weighting method relies on the professional judgment of evaluators to determine weights, such as Analytic Hierarchy Process (AHP), Delphi method, etc. The objective weighting method determines weights based on actual indicator data, such as entropy weighting method, standard deviation weighting method, principal component analysis (PCA), etc. The combination weighting method combines subjective and objective methods, so that the weights can simultaneously reflect the evaluator's judgment and the actual situation of the indicator data. Therefore, this study uses a combination weighting method to determine the weights of filter performance evaluation indicators, namely the combination weighting of Analytic Hierarchy Process and Entropy Weight Method.

4.1 Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) has the characteristics of simplicity and flexibility, allowing decision-makers to establish a bridge between qualitative and quantitative analysis, breaking down decision-making problems into multiple levels such as objective layer, criterion layer, and scheme layer. The constructed indicator system is calculated as follows [24].

(1) Construct a pairwise comparison matrix. Compare pairwise the indicators belonging to

the same category in each layer of the criterion layer, and construct a pairwise comparison matrix *A*. The elements $a_{i,j}$ in the matrix represent the importance of element *i* relative to element *j*.

$$A=\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} \tag{5}$$

where, X_i is n indicators; $a_{i,j}$ is the importance value of pairwise comparison of indicators, commonly determined using a 9-level scaling method, as shown in Table 1.

Table 1: Scale values and meanings of 9-level scaling method

Scale value	Meaning
1	x_i is equally important as x_j
3	x_i is slightly more important than x_j
5	x_i is significantly more important than x_j
7	x_i is stronger and more important than x_j
9	x_i is extremely more important than x_j
2,4,6,8	The importance ranges from 1, 3, 5, 7, and 9
Reciprocal of 1-9	x_i is more important than x_j, and $a_{ij}=1/a_{ij}$

(2) Calculate the weight of indicators. Calculate the eigenvalues of pairwise comparison matrix *A*, obtain the maximum eigenvalue $\lambda_{\max}$ and its corresponding eigenvector *W*, and normalize the eigenvectors to obtain the relative weights of each element [25].

$$\bar{W}_j=\frac{1}{n}\sum_{j=1}^{n}a_{ij} \tag{6}$$

$$AW=\lambda_{\max}W \tag{7}$$

Normalization processing:

$$W_j=\bar{W}_j\Big/\sum_{k=1}^{n}\bar{W}_k \tag{8}$$

(3) Consistency check. To ensure the rationality of decisions, it is necessary to verify the consistency of pairwise comparisons.

$$CI=\frac{\lambda_{\max}-n}{n-1} \tag{9}$$

$$CR=\frac{CI}{RI} \tag{10}$$

where, *CI* is a consistency indicator; Enter the maximum eigenvalue of the pairwise comparison matrix; *n* is the order of the matrix; *CR* stands for Consistency Ratio.

If *CR*<0.1, it is considered that the consistency of the pairwise comparison matrix is acceptable. Otherwise, a pairwise comparison needs to be performed again to improve consistency; *RI* is the average random consistency index, and its values are shown in Table 2.

Table 2: RI values

n	2	3	4	5	6	7	8
RI	0.576	0.879	1.114	1.237	1.318	1.409	1.442

4.2 Entropy Weight Method

Entropy weighting method is an objective weighting method based on the concept of information, used to determine the weights of various evaluation indicators in comprehensive evaluation. Information is used to quantify the uncertainty of information. In the entropy weight method, information entropy is used to measure the degree of dispersion of indicators, that is, the degree of uniformity of indicator value changes, thus reflecting the amount of information carried by this indicator in the evaluation system [26]. Due to the inconsistent measurement units of various indicators, standardization of data is necessary before calculating comprehensive indicators. The smaller the information entropy of an indicator, the more information it provides, and the greater its role and weight in comprehensive evaluation. On the contrary, the larger the information entropy of the indicator, the less information it provides, and the smaller its role in comprehensive evaluation, resulting in a lower weight.

(1) Positive evaluation indicators. In this article, evaluation indicators are divided into three categories: extremely large indicators (the larger the indicator, the better), extremely small indicators (the smaller the indicator, the better), and intermediate indicators (the closer the indicator is to a certain value, the better). To unify the consistency of evaluation indicators, the indicators of extremely small and intermediate indicators are normalized.

For the conversion from extremely small to extremely large:

$$x_i = \max\{x_1, x_2, \cdots, x_i\} - x_i \tag{11}$$

If all elements are positive, the reciprocal can be taken directly:

$$x_i = \frac{1}{x_i} \tag{12}$$

For the conversion from intermediate to extremely large:

$$M = \max\{|x_i - x_{\text{best}}|\} \tag{13}$$

$$x_{\text{new}} = 1 - \frac{|x_i - x_{\text{best}}|}{M} \tag{14}$$

where, *x* is the indicator data; *M* is the optimal value for the intermediate type; x_{new} is a very large indicator after normalization.

(2) Standardization of data.

Positive indicators:

$$\mu_{ij} = \frac{x_{ij} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})} \tag{15}$$

Negative indicator:

$$\mu_{ij} = \frac{\max\left(x_{ij}\right) - x_{ij}}{\max\left(x_{ij}\right) - \min\left(x_{ij}\right)} \tag{16}$$

where, μ_{ij} is the standardized value of the *i*-th filter and *j*-th indicator; x_{ij} represents the experimental value of the *i*-th filter and *j*-th indicator; $\max\left(x_{ij}\right)$ and $\min\left(x_{ij}\right)$ are the maximum and minimum values of the indicators.

(3) Entropy value. Calculate the entropy value e_j of the *j*-th indicator according to the Stirling formula:

$$e_j = -\frac{1}{\ln(m)} \sum_{i=1}^{m} P_{ij} \ln P_{ij} \tag{17}$$

$$P_{ij} = \mu_{ij} \Big/ \sum_{j=1}^{m} \mu_{ij} \tag{18}$$

where, P_{ij} is the indicator membership matrix.

(4) Deviation degree of indicators. The information utility value of a certain indicator depends on the difference h_j between its extracted value e_j and 1.

$$h_j = 1 - e_j \tag{19}$$

(5) Standardized difference coefficient. The standardized difference coefficient can obtain the corresponding weights of each indicator:

$$W_{oj} = h_j \Big/ \sum_{j=1}^{m} h_j \tag{20}$$

where, W_{oj} is the weight of the *j*-th indicator, and *m* is the total number of indicators.

4.3 Combination weighting method

The combination weighting method is a method that combines subjective weighting and objective weighting. It fully considers the subjective judgment of decision makers and the information content of objective data to obtain a more reasonable and scientific allocation of indicator weights. In this paper, α is selected as 0.5 to determine the combination weight of evaluation indicators.

$$w = \alpha w_s + (1-\alpha) w_o \tag{21}$$

where, α is a coefficient between 0 and 1, used to adjust the relative importance of subjective and objective weights; w_s is subjective weight; w_o is the objective weight, and *w* is the combined weight.

5 Empirical analyses

Use hierarchical regression method for hypothesis verification. Hierarchical regression is the use of one or more independent variables to predict the dependent variable, taking into account logical order when adding the predictor variables, making it easier to compare two or more regression models. This method is commonly used in research related to tourism organizational behavior, tourism marketing, tourism intelligence, and other fields.

1) Hypothesis testing of perceived usefulness

H1a, H2a, H3a, and H4a respectively proposed that the information quality, media richness, usability, and perceived interest of the Hainan Smart Tourism Network Russian Service Platform have a significant positive impact on tourists' perception of the usefulness of the Hainan Smart Tourism Network Russian Service Platform. To verify these four hypotheses, first use perceived usefulness as the dependent variable, then add control variables (gender, age, average annual travel frequency, usage frequency), and finally incorporate the four antecedent variables (information quality, media richness, ease of use, perceived interest) into the regression equation. Table 3 shows the results of hypothesis testing.

According to Table 3, the information quality (M2, β=0.627, P<0.001), media richness (M3, β=0.735, P<0.001), usability (M4, β=0.546, P<0.001), perceived interest (M5, β=0.625, P<0.001) of the Hainan Smart Tourism Network Russian Service Platform have a significant positive impact on perceived usefulness. H1a, H2a, H3a, and H4a have received data support.

Table 3: Hypothesis Test Results

Dependent variable		Perceived usefulness				t-value
	M1	M2	M3	M4	M5	
1. Control variables						
1.1 Gender	0.035	0.028	0.019	0.036	0.524	
1.2 Age	0.126**	0	0	0.127**	0.018	
1.3 Travel times per year	0.182**	0.096*	0.053	0.187**	0.065	
1.4 Usage times	0.164**	0.093*	0.075*	0.163**	0.125**	
2. Independent variables						
2.1 Information quality		0.627***				16.736
2.2 Media richness			0.735**			22.224
2.3 Ease of use				0.546***		13.897
2.4 Perceived interest					0.625***	17.163
R^2	0.114	0.475	0.897	0.396	0.481	
F	14.165***	75.097***	123.798***	55.271**	78.396***	
ΔR^2	0.112	0.354	0.476	0.275	0.365	
ΔF	14.163***	280.121***	494.008****	193.114***	294.657***	

In Table 3, the asterisk after the number represents the level of statistical significance, indicating whether a coefficient or statistic is significantly different from zero at a given level of significance. These asterisks are associated with p-values, which are used to measure the degree of inconsistency between observed data and the null hypothesis. Here is a general explanation:

Single star sign (*): usually indicates a p-value less than 0.05 (e.g. P<0.05). This means that at a significance level of 5%, we can reject the null hypothesis and consider the coefficient or statistic to be significant.

Double Star (**): usually indicates a p-value less than 0.01 (e.g. P<0.01). This means that at a significance level of 1%, we can reject the null hypothesis and consider the coefficient or statistic to be highly significant.

Samsung (***): usually indicates a p-value less than 0.001 (e.g. P<0.001). This means that at a significance level of 0.1%, we can reject the null hypothesis and consider the coefficient or statistic to be extremely significant.

Four asterisks (****): In some studies, four asterisks may be used to indicate lower p-values, such as P<0.0001, but this is not a universal standard. The specific meaning should refer to the instructions or illustrations in the research.

In subsequent experiments, the asterisks after the numbers represent the same meaning and will not be explained again.

2) Hypothesis testing of expected confirmation degree

H1b, H2b, H3b, and H4b respectively proposed that the information quality, media richness, usability, and perceived interest of the Hainan Smart Tourism Network Russian Service Platform have a significant positive impact on the expected confirmation of tourists using the platform. To verify these four hypotheses, we first use expected confirmation as the dependent variable, then add control variables (gender, age, average annual travel frequency, usage frequency), and finally incorporate the four antecedent variables (information quality, media richness, usability, perceived interest) into the regression equation. Table 4 shows the results of hypothesis testing.

According to Table 4, information quality (M7, β=0.596, P<0.001), media richness (M8, β=0.725, P<0.001), usability (M9, β=0.706, P<0.001), and perceived interest (M10, β=0.576, P<0.001) have a significant positive impact on the expected confirmation of tourists using the Hainan Smart Tourism Network Russian Service Platform. H1b, H2b, H3b, H4b have received data support.

Table 4: Hypothesis Test Results

Dependent variable	Expectation confirmation					t-value
	M6	M7	M8	M9	M10	
1. Control variables						
1.1 Gender	0.013	0.015	0.004	-0.008	0.027	
1.2 Age	0.165***	0.042	0.046	0.079*	0.072*	
1.3 Travel times per year	0.128*	0.046	0.001	0.078*	0.015	
1.4 Usage times	0.146**	0.079	0.046	0.065	0.108*	
2. Independent variables						
2.1 Information quality		0.596***				15.001
2.2 Media richness			0.725***			20.857
2.3 Ease of use				0.706***		21.365
2.4 Perceived interest					0.576***	14.578
R^2	0.101	0.418	0.554	0.568	0.406	
F	10.796***	58.353***	104.804***	109.627***	55.618***	
ΔR^2	0.100	0.315	0.464	0.472	0.306	
ΔF	10.796***	224.954***	435.068***	456.828***	212.571***	

3) Mediating effect test of perceived usefulness

To examine the mediating effect of perceived usefulness on the relationship between expected confirmation and satisfaction, hierarchical regression was used as suggested by Baron and Kennyl for validation. Table 5 shows the results of hypothesis and mediation tests.

As shown in Table 5, the expected confirmation degree (M13, β=0.66, P<0.001) of tourists using the Hainan Smart Tourism Network Russian Service Platform has a significant positive impact on satisfaction, which has been verified by H7. If a variable satisfies the following conditions, it is considered to play a mediating role. (1) The changes in independent variables can significantly explain the changes in mediating variables, and the changes in expected confirmation can significantly explain the changes in tourists' perceived usefulness (M11, β=0.647, P<0.001), which has been validated by H5; (2) The changes in mediator variables can significantly explain the changes in dependent variables, that is, the changes in perceived usefulness can significantly explain the changes in tourists' satisfaction with using the Hainan Smart Tourism Network Russian Service Platform (M14, β=0.717, P<0.001), and H6 has been validated; (3) When controlling for the above two pathways, if the significant effect between the independent variable and the dependent variable is reduced or non-existent compared to before, it is considered to have a mediating effect. After adding the mediator variable of perceived usefulness, the regression coefficient of expected confirmation on satisfaction decreased (M15, β=0.336, P<0.001), from 0.66 in M13 to 0.34 in M15. At the same time, after adding the variable of perceived usefulness, the goodness of fit of the model increased. Furthermore, it can be concluded that tourists' perceived usefulness of the Hainan Smart Tourism Network Russian Service Platform partially mediates the relationship between expected confirmation and satisfaction, and H8 has been validated.

Table 5: Hypothesis and Mediating Effect Test Results

Dependent variables	Perceived usefiulness			Satisfaction			t-value
	M1	M11	M12	M13	M14	M15	
1. Control variables							
1.1 Gender	0.035	0.025	0.009	-0.009	-0.018	-0.017	
1.2 Age	0.126**	0.008	0.146**	0.028	0.057	0.026	
1.3 Travel times per year	0.181**	0.098*	0.175**	0.083*	0.048	0.039	
1.4 Usage times	0.162**	0.072	0.136*	0.035	0.018	0.001	
2. Independent variables							
2.1 Information quality		0.647***		0.656***		0.336***	16.46/16.68
2.2 Media richness							
2.3 Ease of use					0.717***	0.486***	19.26/10.28
2.4 Perceived interest	0.115	0.493	0.102	0.490	0.557	0.618	
R^2	14.165***	81.187***	12.054***	80.068***	102.417***	108.836***	
F	0.114	0.375	0.108	0.384	0.446	0.057	
ΔR^2	14.168***	306.954***	12.052***	315.058***	415.028***	63.069***	

6 Conclusion

6.1 Main tasks

Based on the expected confirmation model, this article explores the factors that affect tourists' continued use of the Hainan Smart Tourism Network Russian Service Platform, with the characteristics of the platform itself and tourists' perception as latent variables. It tests the mediating role of perceived usefulness and satisfaction, and then uses the entropy weight analytic hierarchy process to study the antecedent configuration that triggers tourists' willingness to continue using the Hainan Smart Tourism Network Russian Service Platform.

Firstly, the results of the hierarchical regression analysis are as follows. 1) The information quality, media richness, usability, and perceived interest of the Hainan Smart Tourism Network Russian Service Platform have a positive impact on the expected confirmation and perceived usefulness of tourists using the platform. 2) The expected confirmation positively affects perceived usefulness, and perceived usefulness and expected confirmation positively affect tourists' satisfaction with using the Hainan Smart Tourism Network Russian Service Platform. 3) The perceived usefulness and satisfaction of tourists using the Hainan Smart Tourism Network Russian Service Platform have a positive impact on their willingness to continue using it. 4) The perceived usefulness of tourists using the Hainan Smart Tourism Network Russian Service Platform mediates between expected confirmation and satisfaction, while the satisfaction of tourists using the Hainan Smart Tourism Network Russian Service Platform mediates between perceived usefulness and willingness to continue using it.

Secondly, the results of the entropy weight analytic hierarchy process show that there are three patterns that trigger tourists' willingness to continue using. The core conditions of Mode 1 are high media richness and high expected confirmation. The core conditions of Mode 2 are high perceived usefulness, high expected confirmation, and high satisfaction. The core conditions of Mode 3 are high media richness, high perceived usefulness, high expected confirmation, and high satisfaction. Among the three modes, high media richness and high expected confirmation have repeatedly appeared as core conditions, supporting their positive impact on the willingness to continue using. To a certain extent, high satisfaction has repeatedly appeared as core or auxiliary conditions, which confirms its positive impact on the willingness to continue using.

Thirdly, comparing the results of Analytic Hierarchy Process (AHP) and Entropy Weighted AHP, the following findings were made. 1) In hierarchical regression analysis, perceived usefulness and satisfaction have a positive impact on the willingness to continue using. In the configuration of willingness to continue using entropy weight analytic hierarchy process, perceived usefulness and satisfaction are repeatedly used as core or auxiliary conditions in the configuration, further supporting the results of hierarchical regression analysis. 2) In hierarchical regression analysis, information quality, media richness, perceived ease of use, and perceived interest have a positive impact on expected confirmation and perceived usefulness. In the configuration of the entropy weighted analytic hierarchy process for sustained use intention, media richness is repeatedly used as the core condition, and information quality, usability, and perceived interest are repeatedly used as auxiliary conditions, which supports the rationality of selecting expected certainty and perceived usefulness as dependent variables before sustained use intention from the data.

6.2 Research Limitations and Prospects

This article applies the expected confirmation model to the design and research of the Hainan Smart Tourism Network Russian Service Platform. From the perspectives of expected confirmation degree and perceived usefulness, the pre variables that affect tourists' continued use of the Hainan Smart Tourism Network Russian Service Platform are sorted out. Data is collected through questionnaire surveys, and the hierarchical regression and entropy weight analytic hierarchy process are used for model testing and data analysis. The impact of information quality, media richness, usability, and perceived interest of the Hainan Smart Tourism Network Russian Service Platform on expected confirmation degree and perceived usefulness is explored, further verifying the applicability of the expected confirmation model in smart tourism. Although the research results can provide reference for future research on smart tourism, there are still certain limitations.

1) Some scales are from abroad, and although they have undergone strict translation and multiple checks, there are inevitably semantic deviations in the scale adaptation, which can lead

to subjective understanding errors among the respondents. In the future, a scale with a Chinese context can be developed.

2) In addition to the factors mentioned in the article, there are other factors that may affect perceived usefulness and expected confirmation of willingness to continue using, such as technological fear, rental costs, and time pressure. In the future, other factors can be integrated based on relevant theories.

3) The impact of gender, age, or occupation differences on the research results has not been considered in the study. Taking age as an example, young people are more receptive to new things or technologies and may be more willing to use the Hainan Smart Tourism Network Russian service platform. In the future, the impact of factors such as gender, age, and occupation on tourists' continued use of the Hainan Smart Tourism Network Russian Service Platform can be considered.

4) The entropy weight analytic hierarchy process method inevitably has its limitations, such as the selection of data calibration standards, the setting of PRI threshold values, and the selection of residual content terms, all of which may affect the analysis results. In the future, robustness testing can be added.

5) Although the data collected through questionnaire surveys has some rationality, it is difficult to determine the causal relationship between variables. In the future, not only can multiple methods be used to validate the model, but situational experiments can also be used to test its causal effects.

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