[1]Jing Hu

[2]Kangkang Zhang

Marketing Strategy of Rural Home Stay Industry Based on Intelligent IOT

JES

Journal of Electrical Systems

Abstract: - The concept of modern tourism intelligent application in China is to fully meet the information needs of tourists and customer experience, and the development of intelligent tourism relying on Internet of Things (IoT) is its most basic guarantee condition. With the rise of ethnic village tourism and the change of new consumer lifestyle, B&B shows an explosive development. Tourism consumers are also shifting from hotels to home stays in the process of tourism. Therefore, based on IOT application as the starting point, this paper firstly, gives a more detailed description of the development process and marketing status of home stays, and discusses its various problems. Then, based on the TP theory of ethnic villages, Porter's five forces analysis model and the SWOT analysis method of ethnic villages, the marketing environment of homestays is studied in depth to discover their advantages.The HTOE model develops a marketing mix strategy for B&Bs that meets the actual situation of ethnic village development.

Keywords: Internet of Things; B&B industry; marketing strategy; HTOE model optimization

I. INTRODUCTION

Nowadays, China's socialist modernization has developed to a certain level, and the basic needs of the people have been guaranteed, but this has gradually led to an increasingly strong demand for spiritual and cultural life, which has promoted the rapid development of a series of cultural industries and service industries [1]. Tourism is one of the most popular industries in recent years, and a good tourism industry can not only drive the development of the local economy and boost consumption growth, but also ensure that the spiritual and cultural needs of the people are met. However, as more and more enterprises see the momentum of the tourism market, they have developed corresponding tourism projects, which also intensifies the competition in the tourism market, thus service quality has become an important basis for tourists to choose tourism projects, which means that tourism enterprises with higher service quality occupy more market advantages [2]. In this context, IoT technology has been formally promoted and applied to the tourism industry, making tourism develop in the direction of intelligence, which also injects new momentum into the progress of tourism [3]. In this context, the rural B&B industry urgently needs to inject new vitality into rural revitalization with the help of digital transformation, leading the countryside gradually towards digital economic development. Based on the background of rural revitalization, the rural B&B industry should also grasp the opportunities of the times, focus on the digital power to promote the high-quality development of the rural B&B industry, and create high-quality digital rural B&B tourism products [4]. Riding on

---

[1] School of Art Design, Anhui Wenda University of Information Engineering , Anhui Hefei, 230022

2School of Art, ANHUI JIANZHU UNIVERSITY，Anhui Hefei，230601

e-mail: 098010@anjzu.edu.cn

the "digital economy", with the support of high technology, we will help the rural B&B industry to burst out with new vitality.

Especially in ethnic villages, home stay can activate the sleeping assets of ethnic villages, incubate the industry of ethnic villages, attract villagers to return to their hometown to start businesses, stimulate cultural and creative industries in ethnic villages [5-7]. How to solve the marketing problems in the business process of home stay is a big problem in front of the home stay industry.

With the development of the Internet, more and more emerging industries and business opportunities have emerged[8]. The IoT and communication technology have become important supporting forces to ensure the sustainable development of tourism. Under the general trend of personalized tourism, tourists are increasingly dependent on information services [9]. When making travel decisions before traveling, travelers need to use various media to understand the travel information around the country, and make decisions through the text, pictures, videos, and other comprehensive information provided by the media. Under the premise that smart tourism is in full swing and has officially become an industry trend and standard configuration, it is particularly important to improve the marketing strategy of the scenic spot by using the power of science and technology [10].

Rural B&B is a new form of rural tourism industry based on rural culture. As rural tourism continues to heat up, the demand for rural B&B is gradually increasing, and tourists' requirements for B&B stay experience are getting higher and higher [11]. This paper takes the national rural B&B as the research object, refers to relevant research literature, combines field research visits, conducts a comprehensive analysis of the marketing situation of the national rural B&B, deeply analyzes the problems, researches and formulates marketing optimization strategies, carries out development path planning, puts forward relevant management solutions, combines the use of big data, Internet and cloud computing, and builds a richer and more perfect rural B&B in the deep integration with digitalization. industry system.

II. RELATED WORKS

China's mainland B&B originated in the 1980s and has probably gone through three stages of development [12]. Currently, the top five provincial-level administrative regions in China in terms of the number of B&Bs are Zhejiang, Guangdong, Sichuan, Yunnan and Beijing. From the distribution of key cities, the top ten cities in terms of the scale of the number of guest house B&Bs are Beijing, Jinzhong, Chengdu, Lijiang, Hangzhou, Chongqing, Dongguan, Guilin, Jiaxing, and Qinhuangdao, forming the main characteristics of the eastern, southern, and southwestern bias, the concentration of ancient cities and towns tourist areas, and the spatial layout also with more distribution around large tourist cities represented by Beijing [13].

China has the largest online travel transaction group in the world, and the development of IoT technology and artificial intelligence in the field of tourism are dependent on the strong support brought by online and mobile occupant consumption [14-16].

In July 2020, the Ministry of Agriculture and Rural Development released the National Rural Industry Development Plan (2020-2025), which predicts that the number of tourists received by short-haul tourism in China will exceed 4 billion per year and the operating income will exceed 1.2 trillion yuan. This shows that the

demand for B&B industry will increase greatly in the future [17-18]. At present, the geographical characteristics of B&B are clearly distributed, with first-tier and new first-tier cities in economically developed provinces preferring B&B, but it is noteworthy that B&B bookings are strongly penetrating to second-tier cities and steadily increasing in third- and fourth-tier cities [19-20]. The sinking market has huge space, with 300 prefecture-level cities, 2,800 counties, 40,000 towns, 660,000 villages, and about 1 billion people [21-23]. In addition, the national top-level policy supports the promotion of rural revitalization and encourages the development of farm stays and leisure farm tourism, further benefiting the B&B industry [24-27]. Vigorously promote the construction of digital countryside, focus on solving practical problems, and expand the application scenarios of agricultural and rural big data [28]. Accelerate the standardization of digital countryside, research and development of development evaluation index system, and continue to carry out digital countryside pilot. Strengthen the construction of rural information infrastructure. This brings favorable policy conditions for the digital development of the rural B&B industry and lays the foundation for the digital development of the rural B&B industry.

Based on this, this study proposes a HTOE model that includes four dimensions of technology, people, environment and organizational factors. The HTOE model formulates a marketing mix strategy for ethnic villagers' B&B that meets the actual situation of B&B development and shows the way out for the development of B&B in the new era.

III. HTOE MODEL OPTIMIZATION

Based on TOE and HOT models, this study proposes an HTOE model that includes four dimensions: technology, people, environment, and organizational factors. Based on the literature research method, according to previous research, literature review, local and national home stay industry standards, and experts' opinions, 12 key success factors were extracted through comparison, analysis, and induction, and divided into four different categories.

Then the mathematical model of the multi traveling salesman problem is shown in Eq. (1) --- (5):

$$\min Z = \sum_{i=1}^{m} \sum_{j=o}^{n-1} d_{ij} x_{ij} \quad (1)$$

$$\text{s.t.} \sum_{k=0}^{n-1} x_{kj} = \begin{cases} 1 & j \in \{1, 2, \ldots n-1\} \\ m & j = 0 \end{cases} \quad (2)$$
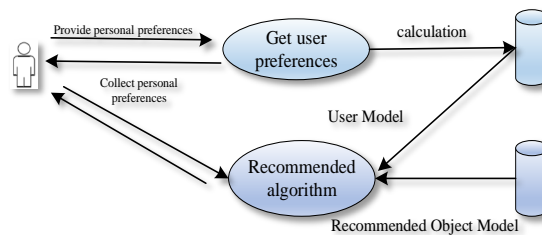
$$\sum_{k=0}^{n-1} x_{ik} = \begin{cases} 1 & i \in \{1, 2, \ldots, n-1\} \\ m & i = 0 \end{cases} \quad (3)$$

$$\sum_{i \in S}^{i=1} \sum_{j \in S} x_{ij} \leq n-1+m \quad (4)$$

$$x_{ij} \in \{0, 1\} \quad (5)$$

Recommendation algorithm module: select a more efficient recommendation algorithm according to the different

needs of users in actual problems. The general recommendation system model is depicted in Figure 1:

**Figure 1 Basic Model of Recommendation System**

IV. METHODS

Porter's five forces model is one of the most commonly used tools in the analysis of industry structure. The five forces refer to purchasing bargaining power, consumer bargaining power, potential competition, competitiveness of horizontal competition and substitution of alternatives. In order to better analyze the current state of competition in the industry of Chinese B&Bs, this paper analyzes the five forces of Chinese B&Bs with the help of Porter's five forces model, compares its competition with neighboring B&Bs, and analyzes the competitive advantages and challenges faced by Chinese B&Bs. Only in this way can we ensure that the marketing strategies developed are highly effective and provide a guarantee for the improvement of the competitiveness of the company. In order to avoid repetition and better understanding, we grouped some factors or topics. The research model is shown in Figure 2.
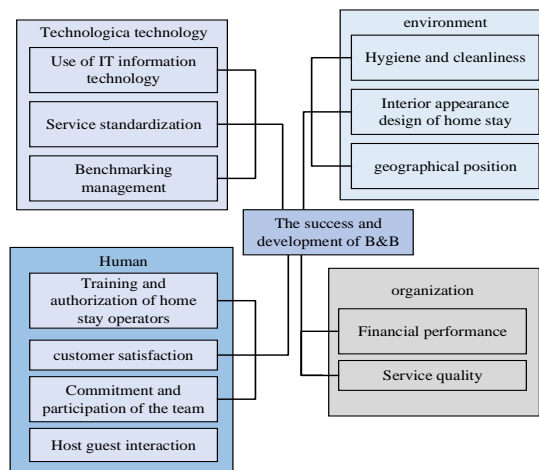
**Figure 2 Optimization of marketing strategy research model**

Through the analysis of home stay consumers in ethnic villages, we can divide consumers into three types, namely group customers, member customers and ordinary individual customers. Based on the bargaining power, the three are ranked from high to low, namely corporate group customers, member customers and ordinary individual customers. Now, before consumers choose products, Metropolis will first search and compare prices on the IoT platform, check the products and evaluation, and select the store with the highest cost performance through

horizontal comprehensive comparison. For example, in home stay recommendation, first analyze the type, location and other attributes of the scenic spots that the user likes and has visited, and then match some other home stay recommendations that are highly similar to the user's favorite home stay. The recommended route planning model of home stay industry in ethnic villages is shown in Figure 3:
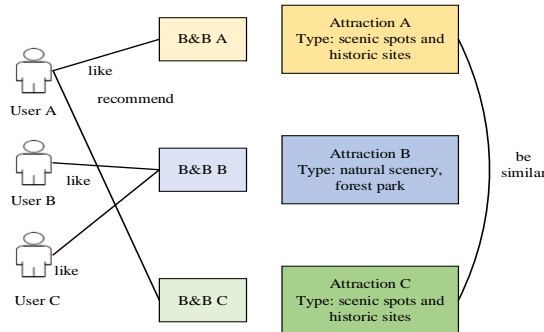

Figure 3 Optimization of route planning model of home stay industry in ethnic villages

With the rise of "private domain traffic" of B&B, the B&B industry is developing in a "community mode" and "industrial agglomeration". B&B is no longer a simple place to provide accommodation, and it is difficult for B&B to make a difference in today's market. As for the B&Bs involved in tourism, agriculture, processing industry and trade and other fields, gathering in space and between upstream and downstream to form a "group" advantage will often bring unexpected results. The models of combined recommendation are also divided into three types: string type, combination type and overall type. The string type inputs and outputs the selected recommendation technologies in sequence, and the combination type inputs and outputs the selected recommendation technologies at the same time, and finally integrates the results to output the optimal results of combined recommendation. The integral type realizes the output by combining the string type and the parallel type. The specific design of the model is shown in Figure 4:
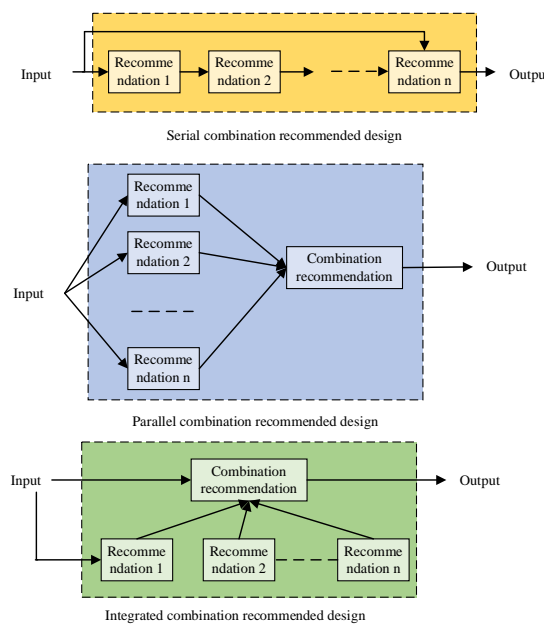
Figure 4 Optimization design of three types of combined recommendation models

This concept is also a good reference for tourism service innovation. We attempt to deepen and extend the application of Web2.0 by describing the innovative tourism service concept, corresponding to the Web3.0 concept, and combine it with the fixed IoT by combining modern mobile communication technology, to complement each other, truly realize real-time, on-site, and timely tourism information and information transmission, and achieve humanization, personalization Prospective tourism services. Smart recommendation is proposed for the stability of tourists' long-term interest. To find the homestay that they have been paying attention to, we can use the association rule algorithm to mine the system structure constructed in Figure 5.
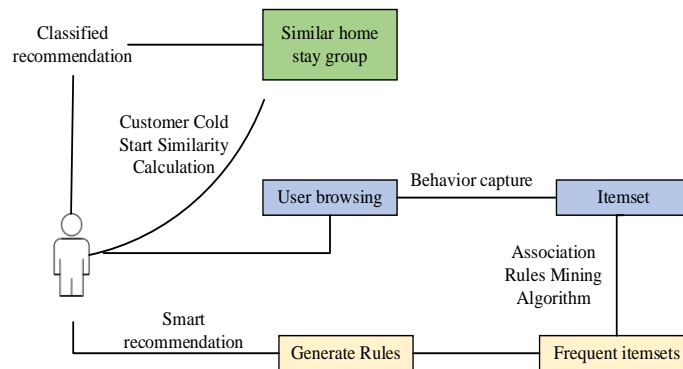
Figure 5 Optimization of the algorithm for personalized recommendation model of smart tourism

The cost of B&B mainly includes the cost that needs to be invested before opening in the early stage and the operating cost that needs to be invested after entering operation in the later stage. According to Table 1, the difference of suppliers' bargaining power is mainly reflected in the cost of material procurement, daily consumption and water and electricity energy consumption in the later period. As the home stay in ethnic villages is a home stay invested, reconstructed, and commissioned by the government, it will have certain advantages over other home stays in terms of supplier bargaining, and some of the operating costs will be lower.

Table 1 Cost Comparison of Home stay in Ethnic Villages and Other Home stay Around

|	project	B&B	Other B&Bs around
Upfront cost	rent	nothing	No or partial rent
	Design and transformation cost	Government input	Owner's investment
	Infrastructure construction cost	Government input	Owner's investment
Operating costs	Staff salaries	Operator payment	Paid by owner or operator
	Energy expenditure	No bargaining space for hydropower	No bargaining space for hydropower
	Purchase cost	Have bargaining space with suppliers	High bargaining power of suppliers
	Cost of sales	-	-

Substitutes pose a great threat to home stay and peers in ethnic villages. Home stay in ethnic villages is not

only used for home stay, but also one of the local tourist attractions. It will be open to tourists in certain periods. This not only makes it unique, but also makes it face the threat of many alternatives. The grow ethnic village algorithm is studied as the prototype algorithm of this paper, to understand FP more intuitively. The idea of the grow ethnic village algorithm, its algorithm optimization flow chart and pseudo code are shown in Figure 6:
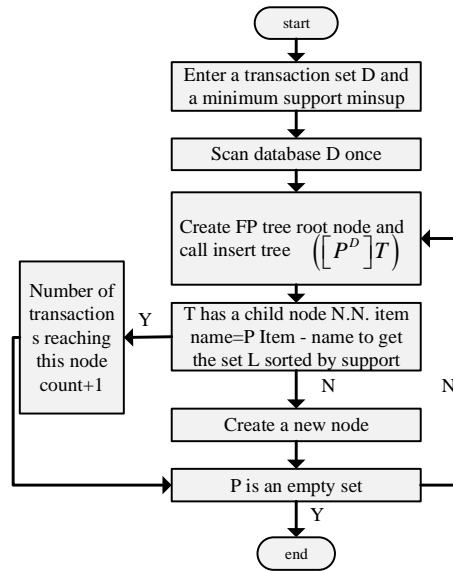
Figure 6 FP. Algorithm optimization of grow ethnic village

A comprehensive analysis of the market environment faced by ethnic village B&Bs and other B&Bs in the surrounding areas shows that the competitive advantage of ethnic village B&Bs is more obvious than that of other B&Bs. Under the existing business model, if the marketing strategy of the ethnic village home stay is not optimized, if the potential competitors and substitutes form a certain scale in the future. The structure of the tree is shown in Figure 7. The table on the left is composed of three parts: item, support count and header pointer, and is called the item header table.
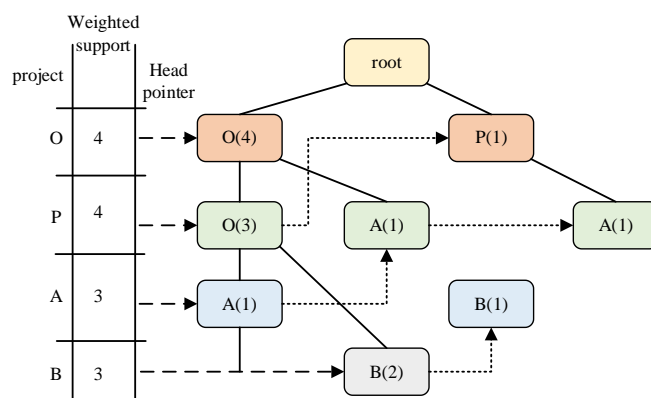
Figure 7 FP. Tree model optimization

In the current B&Bs in ancient towns, apart from hotels, there is no place and time for guests to have tea and cakes, and even the places provided by large hotels for tea and chat are mostly prepared for business people. The

time for tea and chat provided by the Ethnic Village B&B allows guests to stay more comfortable, more relaxed and feel more at home.

To sum up, the marketing strategy and development route of the Ethnic Village B&B needs to have exquisite features in accommodation so as to retain the visitors and make them have a "home" experience. In terms of catering, insist on the concept of "fixed food" so that guests can eat food with local characteristics and nutrition and health. In terms of features and functions, we adhere to the monthly art theme and invite various art practitioners to give lectures, sharing, exchanges and talks. Through these ways, more consumers are attracted to experience and feel.

V. CASE STUDY

The guest house in ethnic villages adopts reservation reception, and the guest has accepted the price marked by the guest house in ethnic villages when making an appointment. Many tourists come from Shanghai, Hangzhou, and other places to experience the customs of Song Kou Ancient Town from a long distance. They have high requirements on the quality of accommodation, so they are more likely to accept the price of home stay in ethnic villages. While most of the surrounding B&Bs receive individual and temporary guests, which is highly sensitive to price. Therefore, the price of other B&Bs is generally set at 200-300 yuan (according to online booking platform data), as shown in Table 2.

Table 2 Pricing table of some home stay in ethnic villages

B&B	Pricing range (days)	Business category	Distance from S home stay
S B&B	488-588 yuan	Accommodation study tour, etc.	-
Jinshui Shanju	158-458 yuan	Accommodation catering	1.3 km
No.1 Plum Garden	358-588 yuan	get accommodation	363m
Ancient mountain dwelling	150-308 yuan	get accommodation	501m
Children's yard	388-488 yuan	Accommodation research	11 km
Chessboard garden	188-588 yuan	get accommodation	297
Straight street small building	188-238 yuan	get accommodation	401
Open Song Kou	288-388 yuan	Accommodation cultural innovation	114m

Three special rooms will be available every week in the home stay in ethnic villages, and five special rooms will be available every week in the off-season in ancient towns. The online and offline purchase prices, the customers brought by the partners in the off-season enjoy a discount of 80%. At the same time, in the off-season, the frequency of launching special price houses every week increases, 3-5 days a week. In addition, there will be an

activity of one night stay and one night free. The time limit is one year. There is no discount for catering throughout the year. However, according to the actual situation of the guests, there will be a free surprise or a special meal. Especially the wedding anniversary, birthday, baby's full moon and other days with special significance[29].

The target customer group that the ethnic village homestay pays attention to accommodation products. Therefore, home stay in ethnic villages focuses on personalized building of accommodation space, improvement of service ability of service personnel, optimization of processes, etc., which reflects the differences between other home stay and different customer groups' product experience, as shown in Table 3.

Table 3 Business Content of Home stay in Ethnic Villages

Leisure Bar	Micro shop (online shop)
Coffee	Green plum wine
tea with milk	Li Mei Cake
fruit juice	Japanese plum cake

According to the marketing positioning made by the SO strategy, the ethnic village B&B has analyzed, identified the target market and positioning of the B&B, expanded its business objectives, and established a good brand image while weakening its disadvantages. At the same time, according to the target market and positioning of B&B, we explored the marketing strategy that can highlight the characteristic functions and quickly open the market to win reputation.

VI. CONCLUSION

The combination of the Internet and the future development of tourism in the IoT and other high-tech strategy use, for the travel industry in the past five years, especially the introduction of high-tech for the tourism industry and the tourism industry to provide a huge space for development and imagination. This paper optimizes the differentiated marketing strategy of ethnic village B&Bs from six aspects, including target positioning, brand, product, price, channel, and promotion. Due to the increasingly fierce competition in the B&B industry, the development of small single-unit, single-business B&Bs has encountered a bottleneck.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declared that they have no conflicts of interest regarding this work.

REFERENCES

[1] Gomez-Oliva, A., Alvarado-Uribe, J., Parra-Meroño, M. C., & Jara, A. J. (2019). Transforming communication channels to the co-creation and diffusion of intangible heritage in smart tourism destination: Creation and testing in ceutí (spain). *Sustainability*, *11*(14), 3848.

[2] Zhang, J., Li, Y., & Cheng, R. (2020). Review of research on smart tourism at home and abroad. *Smart Tourism*, *1*(2), 13.

[3] Naramski, M. (2020). The Application of ICT and Smart Technologies in Polish Museums—Towards Smart Tourism. *Sustainability*, *12*(21), 9287.

[4] Wong, J. W. C., Lai, I. K. W., & Tao, Z. (2020). Sharing memorable tourism experiences on mobile social media and how it influences further travel decisions. *Current Issues in Tourism*, *23*(14), 1773-1787.

[5] Wong, J. W. C., Lai, I. K. W., & Tao, Z. (2020). Sharing memorable tourism experiences on mobile social media and how it influences further travel decisions. *Current Issues in Tourism*, *23*(14), 1773-1787.

[6] Li, X., Xie, C., Morrison, A. M., & Nguyen, T. H. H. (2021). Experiences, motivations, perceptions, and attitudes regarding ethnic minority village tourism. *Sustainability*, *13*(4), 2364.

[7] Barakat, B., Taha, A., Samson, R., Steponenaite, A., Ansari, S., Langdon, P. M., ... & Keates, S. (2021). 6G opportunities arising from internet of things use cases: A review paper. *Future Internet*, *13*(6), 159.

[8] Navío-Marco, J., Ruiz-Gómez, L. M., & Sevilla-Sevilla, C. (2018). Progress in information technology and tourism management: 30 years on and 20 years after the internet-Revisiting Buhalis & Law's landmark study about eTourism. *Tourism management*, *69*, 460-470.

[9] L. Sathish Kumar, M. Ramanan, Jafar A. Alzubi, P. Jayarajan, S.Thenmozhi, " Smart Metering Using IoT and ICT for Sustainable Seller Consumer in Smart City" Challenges and Solutions for Sustainable Smart City Development, Springer, Cham, 2021, pp. 75-89, https://doi.org/10.1007/978-3-030-70183-3

[10] Hasmat Malik, Nuzhat Fatema, Jafar Alzubi, "AI and Machine Learning Paradigms for Health Monitoring System" Springer, 2021 Edition, ISBN: 978-981-334-411-2

[11] M. Alryalat, R. Nripendra, S. Hiren, J. Alzubi, " An Empirical Study of Facebook Adoption Among Toung Adults in a Northeastern State of India: Validation of Extended technology Acceptance Model (TAM)" Lecture Notes in Computer Science – Springer, Vol. 9844, pp. 206-218, 2016.

[12] Kalvet, T., Olesk, M., Tiits, M., & Raun, J. (2020). Innovative tools for tourism and cultural tourism impact assessment. *Sustainability*, *12*(18), 7470.

[13] Battino, S., & Lampreu, S. (2019). The role of the sharing economy for a sustainable and innovative development of rural areas: A case study in Sardinia (Italy). *Sustainability*, *11*(11), 3004.

[14] Wu, J., Ju, L. H., Lin, P. H., & Lyu, Y. (2022). The Relationship between Form and Ritual in Cultural Sustainability. *Sustainability*, *14*(15), 9157.

[15] Arsenijević, O. M., & Cvijić, L. R. (2021). Knowledge management: Development potential of tourism in

Vojvodina. *Baština*, (53), 175-203.

[16] Kiatkawsin, K., Sutherland, I., & Lee, S. K. (2020). Determinants of smart tourist environmentally responsible behavior using an extended norm-activation model. *Sustainability*, *12*(12), 4934.

[17] Cooke, P. (2021). After the Contagion. Ghost City Centres: Closed "Smart" or Open Greener?. *Sustainability*, *13*(6), 3071.

[18] Shevchenko, V., Malysh, N., & Tkachuk-Miroshnychenko, O. (2022). Ukrainian Travel Media: Analysis of Thematic Categories. *Media Studies*, *13*(25), 125-146.

[19] Šťastná, M., Vaishar, A., Brychta, J., Tuzová, K., Zloch, J., & Stodolová, V. (2020). Cultural tourism as a driver of rural development. Case study: Southern Moravia. *Sustainability*, *12*(21), 9064.

[20] Ning, W., Yiyi, J., Haibin, X., Yan, F., Yue, Z., & Zhe, W. (2022). A pre-game evaluation of the tourism legacy of the Beijing 2022 Winter Olympic Games. *Journal of Resources and Ecology*, *13*(4), 578-591.

[21] Xie, Y., Meng, X., Cenci, J., & Zhang, J. (2022). Spatial Pattern and Formation Mechanism of Rural Tourism Resources in China: Evidence from 1470 National Leisure Villages. *ISPRS International Journal of Geo-Information*, *11*(8), 455.

[22] Wijesinghe, S. N. (2022). Neoliberalism, Covid-19 and hope for transformation in tourism: the case of Malaysia. *Current Issues in Tourism*, *25*(7), 1106-1120.

[23] Ageeva, E., & Foroudi, P. (2019). Tourists' destination image through regional tourism: From supply and demand sides perspectives. *Journal of Business Research*, *101*, 334-348.

[24] Gallagher, J. C., & DeVine, M. E. (2019). Fifth-generation (5G) telecommunications technologies: Issues for congress. *Congressional Research Service*, *1*(30), 1-39.

[25] Xu, H., Pittock, J., & Daniell, K. A. (2021). China: a new trajectory prioritizing rural rather than urban development?. *Land*, *10*(5), 514.

[26] Zhou, Huaping, Tao Wu, Kelei Sun, and Chunjiong Zhang. 2022. "Towards High Accuracy Pedestrian Detection on Edge GPUs" Sensors 22, no. 16: 5980.

[27] S. A. Busari et al., "Generalized Hybrid Beamforming for Vehicular Connectivity Using THz Massive MIMO," in IEEE Transactions on Vehicular Technology, vol. 68, no. 9, pp. 8372-8383, Sept. 2019

[28] de Melo CARTAXO, T., Castilla, J. M., Dymet, M., & Hossain, K. (2021). Digitalization and smartening sustainable city development: an investigation from the high north European cities. *Smart Cities and Regional Development (SCRD) Journal*, *5*(1), 83-101.

[29] Jingchun Zhou, Dehuan Zhang, Wenqi Ren, Zhang Weishi. Auto Color Correction of Underwater Images Utilizing Depth Information, vol. 19, pp. 1-5, 2022, IEEE Geoscience and Remote Sensing Letters. doi: 10.1109/LGRS.2022.3170702.