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Review of research on smart tourism at home and abroad

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ABSTRACT

Smart tourism not only is highly valued by the academic circles, but also has begun to practice in some areas and obtained good achievements. This article first expounds the origin of smart tourism; then discuss the current research progress and shortcomings of smart tourism from the conceptual connection, theory foundation and research methods, construction framework, technical support, application and evaluation system, etc. according to the content of the literature; at last, summarizes the theory structure of smart tourism research, revalue the position of smart tourism and propose some advice for future development.

Keywords: smart tourism; technical support; theory framework

1. Introduction

In order to accelerate the development of smart tourism services such as online services, online marketing, booking and payment, formulate standards for smart tourism attractions, the former Ministry of Culture and Tourism designated 2014 as the "Year of Smart Tourism" focusing on 5A-level scenic spots to promote the pilot work of smart tourism attractions and continued to promote smart tourism business and smart tourism city construction[1]. Smart tourism is a social phenomenon caused by the integration of information technology and tourism experience[2]. The development of tourism informatization in China has experienced three stages: the professional stage of building websites and databases, the digital stage based on the establishment of digital scenic spot and digital tourism systems and intelligent stage of the market as the demand, tourists as the center and information technology as the means[3]. Smart tourism is an important form of in-

telligent growth mode of tourism economy which is an important embodiment of the transformation of tourism development mode[4]. Smart tourism not only makes tourists more flexible, diverse and casual when collecting information and making arrangements but also greatly enhanced the accuracy and efficiency of tourism organizations in marketing, management and services[5]. Smart tourism is an important fulcrum of global tourism development which is also an important practical way and path of global tourism[6].

Since the concept of smart tourism was put forward, it has been highly expected to provide new ideas for the development of tourism. However, the enforcement and practical effect of smart tourism are not satisfactory, which is specifically reflected in: Heavily depending on technology[7]; stay in the traditional tourism development mode of "collecting tickets around mountains and waters"[8]; insufficient considering on the sustainability of smart tourism

development[9]. Based on this, this article will systematically sort out the relevant literature on the theme of smart tourism at home and abroad aiming to clarify the current research progress and context of smart tourism, re-examine the positioning of smart tourism in tourism industry and look forward to the future.

2. The origin and research trend of smart tourism

2.1. Origin

Smart tourism originates from the concept of "smart earth". In 2009, International Business Machines (IBM) put forward the concept of "smart earth" which aims to make use of the new generation of information technology in a more intelligent way to change the interaction of governments, businesses and people and improve the clarity, efficiency, flexibility and response speed of interaction[10]. In order to implement this concept, IBM then put forward the concept of "smart city", relying on the Internet of Things and the new generation of information technology, etc. to realize the innovation and creation of talents, industries and services, and improve the living standards of residents[11]. *The opinions on accelerating the development of tourism* issued by the State Council clearly states that is necessary to promote the transformation and upgrading of tourism and make it a strategic pillar industry of the national economy. Inspired by the "smart city" and the needs of domestic tourism development, "smart tourism" came into being. In 2011, the former National Tourism Administration proposed in *the Outline of the 12th Five-Year Development Plan for China's Tourism*, that we would take 10 years to basically realize smart tourism and develop the tourism industry into a knowledge-intensive modern service industry with high information content. In 2013, the former National Tourism Administration pushed the National Smart Tourism Pilot Project and the "Year of Smart Tourism" which has brought smart tourism to a new height. In 2015, the General Office of the State Council issued the document "*Several opinions on further promoting tourism investment and consumption*" proposing that 10,000 smart tourism villages will be built in China by 2020. At present, smart tourism is being actively promoted all over the country. For example, Guilin, Guangxi Zhuang Autonomous Region, is building a smart tourism city to improve its international tourism competitiveness[12], Qinhuangdao city, Hebei Province is focusing on building a regional tourism development model for smart tourism[13], etc.

2.2. Research trends at home and abroad

With "smart and tourism/city/destination" and "technology/digital and tourism" as the key words, articles have been searched and selected in SpringerLink, Science Direct and other databases, and it is found that the research on overseas smart tourism mainly focuses on the conceptual connotation[7,14], the application of intelligent technology in tourism [15,16], smart tourism ecosystem[2,17], the relationship between smart tourism and sustainable development[18], etc. It can be seen that foreign scholars paying more attention to smart tourism on technological innovation and destination tourism competitiveness[7], which aims to improve the quality of life of residents, improve the experience and satisfaction of tourists, and optimize the management of tourism agencies, regarding smart tourism as a means and method of tourism development.

Take "smart/digital/technology and tourism/city/scenic spot" as the keyword, papers have been searched and selected in the full-text database of China National Knowledge Internet(CNKI) (popular science literature were excluded). According to the collected literature we find: domestic articles with the theme of smart tourism first appeared in 2011, later, published the article "*The basic concepts and theoretical system of smart tourism*"[5], which opened a new chapter in the research of smart tourism. Scholars believe that in the face of the dilemma of traditional tourism, the concept of smart tourism is exactly the needs of the times, which is not only the necessary choice to satisfy the person-

alized needs of a large number of tourists, but also the main channel to provide tourists with tourism products[19]. Subsequently, research results related to smart tourism continued to spring up, the research topics include concept and theoretical basis, development and management countermeasures, evaluation system, technical support, construction framework, significance and value, etc. After nearly 10 years of research and application of smart tourism, domestic scenic spots and tourist cities enjoy the dividends brought by smart tourism, which improves the efficiency of tourism management and tourist experience, but also exposes some limitations at the same time. Scholars began to pay attention to the difficulties faced by the development of smart tourism, and point out that smart tourism should not rely on technology only to float on the surface, but also achieve knowledge sharing[20], smart tourism is struggling in the construction of rural tourism[9]. Based on this, this article combs and evaluates the relevant research on the theme of smart tourism at home and abroad, expects to find the path for the development of smart tourism in line with China's current conditions, and provide some references.

3. Review of research on smart tourism

By searching in the relevant database, 96 literatures on the theme of smart tourism at home and abroad were collected, the following will sort out and comment on the existing research from six aspects: concept connection, theoretical basis and research methods, framework construction, technical support, application and evaluation system, and put forward the theoretical framework of smart tourism research.

3.1. The concept and connotation of smart tourism

Internationally, the concept of smart tourism can be dated back to 2,000, Phillips, from the Tourism Industry Association of Canada, pointed out in his speech that smart tourism is to "formulate a long-term, comprehensive and sustainable schedule to plan, develop and market the tourism industry"[21], this requires the high efficient use of intelligent management and marketing technology. In 2009, the Assistant Secretary-General of the World Tourism Organization introduced smart tourism into all aspects of the tourism service chain at the Tourism Committee and defined it from four levels: cleanness, green, ethical and quality[22]. The subsequent exploration of the concept of smart tourism pays more attention to the application of intelligent technology in the tourism industry, for example, Molz[23] believes that smart tourism is to use mobile digital technology to create a broader form of deep citizen participation in tourism between smarter and sustainable tourists and cities, Gretzel, Werthner and Koo[17] believe that smart tourism is a form of tourism that the destination party collects data from all aspects (infrastructure, social institutions, government and individuals, etc.) and uses advanced technology to convert the data into local development experience and product value direction.

Through sorting out the relevant literature, it is found that there are five representative views on the concept of smart tourism: firstly, technology application theory, that is the application of high and new technologies has brought changes in tourism services, management and marketing[24,25]. For example, Jin[19] believes that smart tourism is a comprehensive application platform that is supported by high technologies such as Internet of things and cloud computing and through multiple service terminals such as smart phones, computers, touch screens etc. to provide for various tourism public services for the general public, tourism enterprises and tourism management departments. The second is the theory of management change, that is to say, it is believed that the application of intelligent technology has driven changes in tourism management thinking and style[26,27]. For example, smart tourism is a systematic and intensive management reform which relies upon the new generation of information and communication technology to meet the personalized needs of tourists and provide high-quality and high-satisfaction services and to achieve the sharing and effective utilization of tourism resources and

social resources[5]. Thirdly, the theory of tourism form, that is to say, smart tourism has separated from the traditional tourism form and become a new tourism form[28,29]. As Tang[30] considers that, smart tourism is a brand new future-oriented tourism form that applies technology such as Internet of things, intelligent data mining etc. on tourism experience, industrial development, administration and other aspects to promote the highly systematic integration and in-depth development and activation of physical tourism resources and information resources. Fourthly, the tourist-centered theory, that is to say, smart tourism is a tourism form that focuses on serving tourists and deepening their tourism experience[31]. Yao and Zhao[32] believed that smart tourism is as new model of tourism operation that takes tourists as the center, "intelligent technology" as the means, computers, mobile devices, intelligent terminals as tools, intelligent services, smart business, smart management and smart government affairs as the main forms , the basic starting point is to fully satisfy the service needs of tourists such as food, housing, transportation, tourism, shopping and entertainment and the fundamental task is to create greater value for tourists, travel agencies, scenic spots, hotels, government authorities and other tourism participants[32]. The fifth is the information service theory, which holds that smart tourism is an advanced form of information construction[6,33]. For example, some scholars believe that smart tourism is a ubiquitous tourism information service accepted by tourists in the process of tourism activities[22]. Among these views about the concept of smart tourism, the application theory of technology ignores the operation of tourism itself because it relies too much on intelligent technology, tourism form is difficult to implement because of its high positioning, the visitor-centered theory does not take into account the systematic relationship of tourists, tourism agencies, governments and community residents and the information service theory pays too much attention on information construction and ignores that tourist experience is the center of tourism.

The author believes that the foothold of smart

tourism is tourism and the focus is wisdom. the word "wisdom" originated from "Prajna" in Sanskrit, which means transcending secular knowledge and grasping truth. Smart tourism means that in the process of tourism, all interest subjects achieve the point of grasping the truth through coordinated management. The author believes that smart tourism is a management reform triggered by information technology which not only realizes the value co-creation of various interest subjects, but also promotes the sustainable development of tourist destinations.

3.2. Theoretical basis and research method

Scholars generally believe that the theoretical basis of smart tourism is the application of intelligent technology with information and communication technology as the core in tourism, the purpose is to meet the personalized needs of tourists and realize the optimal management of tourism resources and social resources[22,34,35]. Around the application of intelligent technology, smart tourism research can be carried out from macro and micro perspectives. From a macro perspective, scholars rely on disciplines such as management, ecology and geography to explore the development path of smart tourism[34,36–38], construction of tourism system[39–42] and development evaluation system[43–45]. For example, He[46] analyzed the role of information construction in rural tourism and put forward the realization path of using information technology to promote the development of rural smart tourism; Gretzel, Werthner and Koo[17] utilize digital ecosystems and smart business networks to construct a smart tourism ecosystem (STE) with interactive, dynamic and open characteristics which is created, provided and managed by intelligent technology. Deng and Li[47] starts from the perspective of tourism informatization and intellectualization and build the evaluation standard system of smart scenic spots from three dimensions: tourist experience, scenic spot management and tourism products. The research conducted from objective perspective also includes the application of theories of other disci-

plines, such as game theory[48], value chain theory[49], convenience theory[50], etc. From a micro perspective, scholars rely on the knowledge of psychology, behavior and other disciplines to explore the impact of intelligent technology on tourists' travel willingness, tourism behavior and satisfaction[51,52]. For example, Xu and Huang[53] integrated technology acceptance model and task-technology matching model to construct a structure model of the factors affecting the willingness to use the smart tourism system in scenic spots and found that the perceived usefulness and perceived usability have a significant positive impact on the willingness to use the smart tourism system in scenic spots. González-Rodríguez, Díaz-Fernández and Pino-Mejías have confirmed that virtual reality technology has a positive impact on the quality of tourists' experience in heritage tourism; Yoo, Goo and Huang[54] found that the technical characteristics of smart tourism (information quality, information source credibility, interactivity and accessibility) have a positive impact on travel decision support satisfaction.

From the perspective of research methods, smart tourism research is involved in both qualitative and quantitative research. Qualitative research focuses on content analysis and rooting theory, researchers mostly test the construction level of smart tourism from the perspective of tourists[18,29,55]. For example, Liao and He[56] found that tourists have insufficient cognition and low trust in smart tourism and give development suggestions from the perspective of the construction of smart tourism service supply chain, Brandt, Bendler and Neumann[57] analyzed about 600,000 social media messages using content analysis to explore the role of tourism stakeholders in value creation. Some scholars also use the network method in qualitative research, for example, Wu and Huang[58] believe that in the era of smart tourism, network research can help researchers and managers quickly understand emerging and changing tourism markets and respond accordingly. Quantitative research is mainly based on questionnaires, researchers mostly build models from a theoretical perspective, and then empirically test the impact of smart tourism on tourists[51,54,59]. For ex-

ample, Pan, Lin and Fang[52] use structural equation models to test the factors that affect tourists' adoption and continuous use of tourism APP and found that service quality, trust, satisfaction and perceived usefulness all have a significant positive impact on tourists' willingness to continue to use it, Chung, Tyan and Han[60] analyzed the relationship between traveler readiness, geographical tag technology perception and adoption from the perspective of traveler readiness and technical acceptance and found that there is a positive correlation between the readiness of travelers and the usability and enjoyment of geographical tags. Quantitative research on smart tourism also involves artificial neural network method[61], spatial data analysis method, etc. For example, Huang, Li and Dai[62] measure the tourism competitiveness of smart tourism cities according to the human-industrial neural network method, Mu, Guo and Chen[63] used the exploratory spatial data analysis method to explore the spatial differences in the development of smart tourism in various cities and cities in Yunnan Province.

To sum up, the current research on smart tourism has initially formed a theoretical framework from a macro perspective and a micro perspective with the help of other disciplines, but, from a macro perspective, it only stays at the theoretical elaboration level, lack of empirical research focusing on economics; in terms of micro perspective, there is a lack of attention to other interest subjects (community residents and tourism practitioners), in terms of research methods, the qualitative research depth is insufficient, and the quantitative research focuses on the impact of technology on tourists. The research needs to be deepened.

3.3. The construction framework of smart tourism

The framework system of smart tourism is related to whether destination construction and development can reach a virtuous circle. Studies have mainly built a smart tourism framework system from three perspectives: universality, urban and rural[55,64,65]. Firstly, scholars hope to explore the smart

tourism framework system universally applicable in China. Liu and Fan[24] believe that the smart tourism system can be briefly summarized as "one heart, two ends and three networks", among them, "one heart" refers to cloud computing, "two ends" refers to the server and user terminal, and "three networks" refers to the Internet of Things, the Internet and mobile communication network. Zhang, Li and Liu[5] believe that the construction of smart tourism should first clarify the three main bodies: development, operation and application, and then propose a CAA smart tourism framework system composed of capabilities, attributes and applications, among them, ability refers to advanced information technology capabilities, attributes refer to public welfare and profitability, and application refers to the functions provided by various stakeholders. Yao[66] proposed that the smart travel framework includes service system, application system, application support system, information resource system, infrastructure system, institute system, regulations and standard specification system, information security and operation and maintenance support system, each system cooperates together to form a whole. Secondly, cities have inherent advantages such as infrastructure, capital and talents in the construction of smart tourism. Based on the perspective of the coordinated development of regional scenic spots, Weng and Li[67] believe that the urban smart tourism framework should adhere to the combination of top-level design and infrastructure, Wang and Ge[64] pointed out that Hebei Province is rich in tourism resources, superior geographical location and strong policy support, and smart tourism cities can be built from the perspective of target model and implementation model, Sheng[68] based on the inherent development needs of smart cities and the demands of the roles of various groups in the city, proposed that the construction framework of urban smart tourism is "three support platforms, three types of intelligent applications, and five convergence centers". Thirdly, the development of rural smart tourism is subject to factors such as concepts, talents, capital and informatization, and lags behind cities in terms of development speed and scale[9]. Peng, Tan and

Zhou[36] believe that the smart tourism construction framework in rural areas should be built from three aspects: public information service platform, online marketing system and tour guide system; Zheng and Zeng[69] pointed out that there are shortcomings in the development of rural tourism in Fujian Province in supporting facilities, management, marketing and services, it also puts forward a framework system for the construction of rural smart tourism, including basic guarantee system, smart service, smart marketing and intelligent management.

To sum up, due to the differences in resource endowments in different research areas, the smart tourism construction framework proposed by the researchers is quite different, the author believes that the smart tourism construction framework should focus on the three cores of information collection, data processing and application, so as to effectively integrate destination tourism resources and realize coordinated operation among various systems and improve the tourist experience.

3.4. Technical support for smart tourism

Smart tourism is a revolution triggered by the renewal of information technology. Scholars have different views on the technical support of smart tourism, which is roughly divided into three categories: the first is the framework category represented by Zhang and Liu[19,70,71]. According to this view, the core technology of smart tourism should be organically integrated with the reception, processing and transmission of information. For example, Zhang, Li and Liu[5] proposed that the technical core of smart tourism are cloud computing, Internet of Things, mobile terminal communication and artificial intelligence. Liu and Fan[24] believe that the technical layer of smart tourism is the Internet of things, cloud computing, high-speed mobile communication technology and intelligent terminal equipment. The second is the fuzzy category represented by Li and Zeng. This view regards all intelligent technologies related to information technology as the technical support of smart tourism. For example, Li, Hu and Huang[22] believe that smart

tourism technology is an intelligent technology with information and communication technology as the core. Zeng, Zheng and Zhang[29] believe that smart tourism is developed on the basis of a new generation of information technology (intelligent technology). The Third is the detailed category represented by Zhan and Yao Such views list the technical basis for smart tourism needs[72]. As Yao and Zhao[32] proposed that smart tourism is a tourism form with the Internet, cloud computing, the Internet of Things, three-network integration, GIS and other means, and computers, mobile devices, intelligent terminals, etc. as tools. Zhan[35] believes that smart tourism is formed by the integration and synthesis of cloud computing (SaaS, PaaS, IaaS), the Internet of Things (RFID technology, sensors, et al.), the Internet (Web2.0 technology, three-network integration technology, et al.) and personal mobile terminals (3G technology, PDA, et al.), artificial intelligence and other technologies.

Some scholars also have specifically discussed the application of a certain type of technology in smart tourism, which mainly includes three aspects: firstly, the application of the Internet of Things in smart tourism. Liao[73] believes that smart tourism is the integration of tourism and the Internet of Things. With its own advantages, the Internet of Things makes tourism resource information smart, tourism services humanized, tourism process optimized tourism cost-effective substantialized, and seamlessly controlled service itineraries. Wang[74] summarizes the problems existing in the new tourism format, and based on the "four-end linkage and trinity" management model of the Internet of Things to a smart tourism public service platform. Secondly, the application of cloud is computed in smart tourism. Yao and Zhao[32] analyzed the inherent characteristics of cloud computing and believed that cloud computing can bring high-level data processing security, adequate data integration, self-service tourism improvement and intensive efficiency to smart tourism. Thirdly, the application of big data is in smart tourism. In the face of the phenomenon that scenic spots are often overcrowded, Chen and Liu[61] tried to use big data to predict future tourist chang-

es based on the connotation of big data and smart tourism, Zhang, Wang and Liu[75] built a smart tourism prediction and feedback platform and a smart tourism application model based on the big data platform; Vecchio, Mele and Ndou[15] deduced the ways and opportunities for big data to create value in smart tourism. Other scholars have explored the applications of smartphones[76,77], GIS[78], 4G technology[79] and other applications in smart tourism.

To sum up, it can be found that scholars' research on the technical support of smart tourism needs to be further deepened. Firstly, it should be clear that the use of advanced technology is not the basis for distinguishing smart tourism from traditional tourism. Smart tourism aims to combine technical, human and social resources to pursue the sustainable development of tourism in order to improve people's quality of life and enrich customers' tourism experience[80]. Secondly, the fuzzy and detailed views mentioned above confuse different levels of information technology, and compare subclass technologies with main technologies[5], which is easy to cause chaos in the construction of smart tourism. The author believes that smart tourism should be supported by cloud computing, the Internet of Things, mobile communication technology and intelligent terminal devices.

3.5. Application of smart tourism

The application of smart tourism means that in the process of development, smart tourism should meet the needs of smart management, smart services and smart marketing[81]. In intelligent management, scholars mainly discuss how to rely on high-tech to bring about changes in management models. As Zhu and Zhang[10] believe that in order to truly realize intensive, intelligent and unified smart tourism management, with the help of cloud computing, the Internet of Things and other technologies, we need to build a smart tourism management platform that includes three levels: perception layer, cloud platform and application service layer; Kan and Yang[82] believe that relying on core technologies (cloud computing, Internet of Things, mobile com-

munication and artificial intelligence terminals), the tourism industry should build an intelligent management system for scenic spots covering four functional systems: navigation, queuing, fingerprint consumption and early warning; Supported by Internet of Things technology, Wang Qian[74] put forward the "four-end linkage and trinity" Internet of Things management model, Zhang and Wang[34] built a smart tourism management model based on big data. According to the stakeholders, they are divided into four sub-platforms: government tourism departments, tourists, tourism enterprises and community residents and puts forward the requirements of scientific management, intelligent experience, accurate marketing and convenience of facilities for each platform.

In smart services, scholars mainly focus on the innovation and upgrading of smart tourism services, smart tourism public services and information services. Li[72] believes that smart tourism has greatly improved the efficiency of tourism services, deepened the depth of tourism services, and promoted industrial integration; Zhan[35] believes that tourism platforms can rely on data research and combing to provide accurate and differentiated tourism services for tourists; Wei[83] believes that the innovation of smart tourism services should have the characteristics of tourist demand-oriented, technology-led and multi-subject participation. In terms of smart tourism public services, Li, Zhang and Tang[84] believe that the main body of supply and demand for smart tourism is diversified, and the supply nature is public welfare, the supply content is public goods and services and it is also proposed that the smart tourism public service system should be built around five categories: information services, safety and security, convenient transportation services, convenient services benefiting for the people and administrative services[85], Jin[19] proposed that Nanjing's smart tourism public service system should focus on the two main lines of serving tourists and management, and strive to achieve the goal of "one platform and one network" to serve tourists; Huang, Huang and Zhang[86] proposed that Wuhan's smart tourism

public service system should be built from four aspects: personalized customization, information resource integration, and improvement of online tourism information service cluster and information communication mechanism. In terms of smart tourism information services, Zhang, Liang and Xu[87] believe that the fundamental connotation of smart tourism information services is to realize the combination, service management and service marketing of smart tourism services with the help of emerging information technologies, and ultimately provide personalized services for tourists; Jia[88] believes that smart tourism public information services need to achieve the goals of generalization, seamlessness, real-time, precision and interaction; Wang Y, Lu and Li[89] focus on service functions such as scenic spot management, scenic spot search, panoramic image association and three-dimensional landscape guidance and designs the overall framework of service-oriented smart tourism information system to provide a new idea for the application of geographic information in smart city.

In smart marketing, scholars focus on smart tourism marketing strategies. Qu[81] believes that at present, the marketing of destinations in the tourism industry not only lacks effective management tools, but also lacks evaluation means and standards and proposes that smart tourism marketing should start from marketing needs and focus on data analysis; Wu , Wang and Li[90] discussed the intelligent marketing strategy of the traditional village homestay industry and believed that the data of the homestay industry should be integrated into the smart tourism cloud system of Guizhou Province as soon as possible, so as to realize the resource exchange and open sharing of tourism industry data and the data of the Guizhou system platform on the cloud; Li[91] believes that Qinhuangdao tourism marketing strategy needs to actively use cloud computing and Internet of Things technology focusing on four aspects: market analysis, channel construction, price system formulation and reasonable product planning.

In a word, the current research on the applica-

tion of smart tourism mainly focuses on management, service and marketing. From a macro perspective, relevant research focuses more on intelligent management and services, and pays less attention to smart marketing, from a micro perspective, the management reform of smart tourism is still at the practical application level, and lack of theoretical discussion in terms of smart services. In smart service, the present research focuses mostly on smart tourism public services, have insufficient research on for-profit commercial smart tourism services, and lacks in-depth big data analysis and research.

3.6. Evaluation system of smart tourism

Evaluating whether the construction of smart tourism can meet the expected goals is also one of the hot issues in academic research. Because smart tourism involves all elements, processes, aspects, industry and space; Zhang[26] believes that the evaluation system of smart tourism should be based on a four-tier model composed of resource allocation layer, data acquisition layer, business application layer and customer perception layer. Based on the above evaluation model and using the Delphi method, Liu[92] has built a smart tourism evaluation system, including hardware support system, comprehensive application system and application value evaluation, with a total of 17 first-level indicators and a large number of second-level indicators.

Some scholars have evaluated the development of smart tourism from different perspectives, including three aspects: tourism public services, smart scenic spots and smart cities. In terms of tourism public service evaluation, Li, Tang and Liu[43] analyzed the supply mode of tourism public services using the theory of safety key system construction and based on the Analytical Hierarchy Process, established a smart tourism public service evaluation indicators system composed of eight indicators:: information consultation, information release, tourist experience, industry management, security services, convenient transportation services, convenient services for the people, and tourism administrative services. . In terms of smart scenic spot evaluation, Deng and Li[47] are committed to building a standard

evaluation system to improve the construction of smart scenic spots; guided by the people-oriented idea, the standards for measuring the construction of smart scenic spots are put forward from three perspectives including tourist experience, tourism products and scenic spot management. Li, Li and Yang[45] focused on the website service functions of smart scenic spots, and evaluated website services from five aspects: information query function, interactive communication function, scenic spot navigation function, e-commerce function and technical support function. In terms of smart tourism city construction, scholars pay more attention to the relationship between smart tourism and urban development. Wang[44] comprehensively considered infrastructure construction, economic development, hardware support, scientific and technological innovation, environmental support and other aspects, and built a smart tourism city evaluation system; Huang, Li and Dai[62] refer to relevant research on urban tourism competitiveness evaluation and take the five elements: tourism science and technology innovation competitiveness, tourism economic development competitiveness, tourism development guarantee competitiveness, tourism development potential competitiveness, and tourism environment support competitiveness as tourism competitiveness evaluation indicators of smart tourism cities; Mu, Guo and Chen[63] built an index system to measure the development level of smart tourism from the dimensions of tourism economy, tourism innovation, tourism potential, tourism environment, etc., and measured the development level of smart tourism in 16 cities and cities in Yunnan Province.

The current research on the smart tourism evaluation system is not comprehensive. The research on the smart tourism evaluation system is uneven. People pay more attention to the construction of smart scenic spots and smart cities, and ignore the evaluation of the construction of smart villages. There are many views related to the smart tourism evaluation system, but there is a lack of a standard evaluation system that can coordinate the construction of smart tourism.

4. Research prospects of smart tourism

In recent years, academic research and practical construction related to smart tourism have been parallel, and the academic and industry have tried to explore a way of tourism transformation and upgrading. Through reviewing relevant research at home and abroad, smart tourism has gradually formed a theoretical framework with conceptual connotation, theoretical foundation and research methods, construction framework, technical support, application and evaluation system as the core (see **Figure 1**). The smart tourism research framework system also has many shortcomings, such as relying too much on technology and not paying attention to sustainable development. Authors define smart tourism as using advanced technology, carrying out intensive and efficient management, to realize the co-creation of value of various stakeholders, and promoting the sustainable development of tourism destinations. The future research on smart tourism can be carried out from three aspects. Firstly, re-examine the relationship between technology and smart tourism. The application of advanced technology in tourism not only improves the immersive experience of tourists, but also brings a new tourism boom to destinations. With the end of the freshness brought to tourists by some technologies, these technologies will be useless[9]. Secondly, carry out empirical research on smart tourism from a macro perspective. Smart tourism highly relies on information technology[93]. Relevant research can use big data to carry out empirical research on smart tourism from the perspective of regional economic development and spatial correlation. Thirdly, explore the realization path of building the sustainable development of smart tourism. The sustainable development of tourism in a region is to continuously develop the circular economy and improve the quality of life and social value. In the future, it is necessary to deeply explore how smart tourism can use its own advantages such as deepening the tourist experience, improving the quality of life and increasing the competitiveness of tourism destinations, etc. to realize the sustainable development of regional tourism.
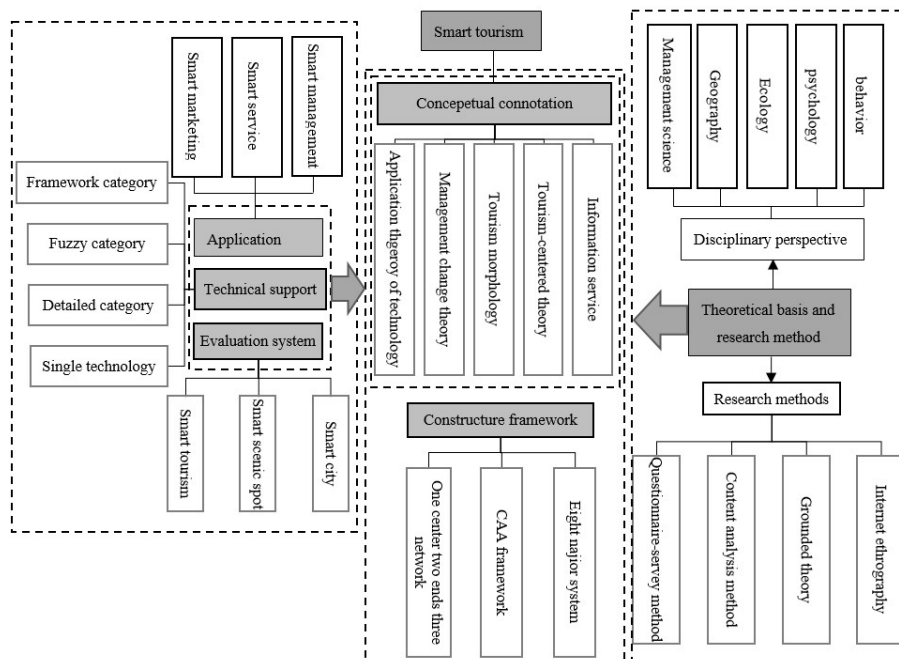

Figure 1. The theoretical framework of smart tourism research.

Conflict of interest

The authors declare no conflict of interest.

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