

# The Main Effectiveness of Digital Transformation of Forest Recreation Industry, Realistic Dilemmas and Countermeasure Suggestions

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## Abstract

**In the context of the rapid development of the digital economy, making full use of digital technology can effectively enhance the transformation efficiency of the forest recreation industry. In recent years, with the aggravation of China's aging population and the promotion of the "Healthy China" strategy, relying on the rich forest resources and humanistic and historical background, the forest recreation industry is booming. But at the same time, it also exposed the digital technology strength that is not hard enough, the digital model is not perfect, and the power of industrial transformation is not enough. With the overall goal of promoting the digital transformation of forest health industry, this paper aims at the problems of digital business model lack of transformation and innovation, digital management model lack of multi-party improvement, digital professional and technical strength need to be strengthened and digital service model lack of integration and improvement. It proposed to coordinate and integrate the development of forest health industry data resources, improve the forest health industry digital support management policy, promote the construction of forest health industry digital demonstration and test base, implement the "two mountains theory" theory, and promote the industry to develop in the direction of standardization, science and diversification.**

## Keywords

**Forest Recreation; Digital Transformation; Social Value Industrial Development.**

## 1. Introduction

In 2019, the State Forestry and Grass Administration, the Civil Affairs Bureau, the Health Commission, and the Administration of Traditional Chinese Medicine jointly issued the Opinions on Promoting the Development of the Forest Health Industry, which clearly put forward the goal of vigorously developing the forest health industry. In recent years, with the continuous construction and implementation of forest recreation and retirement bases, the forest recreation industry has entered a rapid development stage. The forest recreation industry is a comprehensive industry based on forest resources such as natural forests, artificial forests and ecological and natural parks, combining tourism, recreation, rehabilitation, health maintenance and other functional forms of service to carry out sightseeing tourism, health maintenance, experiential teaching, scientific research and industrial economic development.

Thomson (2021) argues that the healing power associated with nature is directly related to an individual's intentional exposure to the "animate and inanimate" aspects of the outdoors, and that natural environments are significant to people's healing [1]. Under the continuous role of digital technology, the internal components of forest health care industry are also updated and iterated, stimulating forest health care as a strong driving force for emerging industries (Ye Junnan, 2023) [1]. Therefore, it is urgent to solve the problem of conforming to the trend of consumption upgrading, promoting the transformation and upgrading of the forest recreation

industry, and reducing the low-end ineffective supply. In view of this, this paper aims to promote the digital transformation of the forest recreation industry as a whole, by identifying the main problems of the development, in order to get appropriate solutions to countermeasures, implement the theory of "two mountains", and promote the industry towards the direction of standardisation, scientification and diversification.

## **2. Major Achievements in Digital Transformation of the Forest Recreation Industry**

### **2.1. Integration of "Space, Earth And Air" Data**

In recent years, with the vigorous development of a series of new digital technologies, such as the Internet of Things, big data and cloud computing, the development of high and new technologies centred on remote sensing and their applications have helped to establish a forest resources monitoring and evaluation system that integrates the sky and the ground, and that is nationally and locally integrated, so as to achieve the monitoring and evaluation of the entire forest resources in its entirety, with its full coverage and its full range of elements. In particular, the application of quantitative remote sensing technologies such as LiDAR and synthetic aperture radar, as well as fine observation technologies such as hyperspectral and unmanned aerial vehicles, will change the traditional data acquisition mode from field survey to intelligent acquisition led by big data, cloud computing and other technologies (Wang Xizhi, 2019) [3]. This shift will achieve a change from regular forest resource surveys to process monitoring. It can efficiently collect data such as forest cover, air conditions, Canopy density, acoustic environment, etc., effectively realising the integration of "sky, air and earth" data and greatly improving the efficiency and reliability of data collection. This greatly facilitates data research in the forest recreation industry and promotes the long-term sustainable development of the industry.

### **2.2. Forest Health Industry Value Multi-level Display**

According to studies conducted in Japan and China, it has been pointed out that activities related to "forest bathing" bring many positive health benefits to the body's physiological and psychological systems (Bowler, 2010) [4]. As civilisation develops and human society advances, the ecological capacity of forests to sustain human health and well-being becomes increasingly important relative to traditional services such as timber supply (Dodev, 2021) [5]. Demand for forest recreation is also predicted to continue to increase over time due to escalating environmental health-related risk factors such as airborne particulate matter, as well as economic development and increased demand for recreation [6] [7] [8].

Through the construction of technical platforms such as big data, cloud computing and intelligent perception, digital technology realises all-round perception and precise quantification of forests, revealing the multiple values of forest recreation. These technological platforms can accurately obtain data on the forest environment, biodiversity, climate change, etc., providing a comprehensive information base for the forest recreation industry. Yong Shian Goh (2022) showed by Meta-analysis that forest bathing significantly reduced depression and anxiety symptoms [9], and both domestic and international scientific studies have greatly enriched the concept of the value of the forest recreation industry. Firstly, digital technology has enhanced the medical basis of forest recreation. Through big data analysis, it is possible to gain a deeper understanding of the health status of different groups of people and the rehabilitation programmes they need, and then screen forest resources suitable for their rehabilitation and quantitatively assess them.

Secondly, digital technology can more effectively publicise and promote the forest recreation industry. According to a report published this year by the China Internet Network Information

Centre, as of December 2022, the number of Internet users in China reached 1.067 billion, and the Internet penetration rate reached 75.6 per cent[10]. Under this, digital technology can help promote the advantages and value of forest recreation, build forest recreation-related websites to convey the concept of forest recreation industry to the public, display forest resources and their related products in various places, and provide consumers with convenient booking and consulting services. Digital technology will play an increasingly important role in all aspects of the forest recreation industry.

### **2.3. Effectively Facilitating Industry Management**

If an industry wants to achieve long-term development, it must be inseparable from reasonable and effective industrial management. Industrial management is a management process that plans, organizes, coordinates, communicates and controls the industry in order to design and maintain a good environment for industrial development and national macro-control. Digital management of the industry can firstly digitise the business processes between various departments to achieve systematic and automated scientific management, thus improving management efficiency and accuracy. Secondly, the change of management style and thinking makes the industrial decision-makers' thinking vision broader and enhances their innovative spirit. At the same time, the transformation of talent training programmes and structures through digital science can optimize the talent structure to meet the development needs of enterprises (Wei Liuji, 2012)[11].

## **3. The Dilemma of Realising Digital Transformation in the Forest Recreation Industry**

### **3.1. Lack of Transformative Innovation in Digital Business Models**

In the process of digital transformation of the forest recreation industry, the business model of the traditional tourism industry has become a good basis on which to develop, and at the same time, it has also shown its drawbacks. The traditional tourism industry needs to design a reasonable tourism product programme, attract customers through a variety of ways, and promote the smooth implementation of the overall tourism programme to complete the consumer transaction activities. Unlike it, the digital transformation of forest recreation mainly relies on a digital business model, in which enterprises establish relevant big data platforms to release relevant information for publicity to attract target user groups, and understand the needs of customers, tailor-made exclusive tourism and recreation programmes, and finally market them to customers through the Internet to improve customer satisfaction.

However, the development of forest recreation enterprises in digital transformation is not yet deep enough, and lacks systematic and innovative, making the development of enterprises lack of vitality. Digital transformation is only reflected in the two aspects of online sales and publicity, and there are two main problems: the failure to make full use of information resources and the failure to establish a complete customer profile, which leads to a lack of uniqueness in forest recreation programmes and thus affects the customer's sense of experience.

### **3.2. Digital Management Model Lacks Multiple Enhancements**

Jerylee Wilkes-Allemann (2015) argues that in an era of multifunctional forests, contested forest uses, and growing interest in decision-making processes and interactions that lead to the sustainable management of forests and their resources and benefits, it has become even more important to look at forests from a governance perspective, and the ways in which forests are managed and utilised[12]. Although digitalisation has facilitated industrial management, there are still some problems and shortcomings in its practical application. In the forest recreation industry, the digital management mode of enterprises is often implemented in a one-way

manner. Even if certain enterprises have gone online with digital management systems, they often simply move traditional management methods to digital platforms without really optimising the development of management methods and processes through digitisation, and without actually improving the management efficiency and accuracy of enterprises.

### **3.3. Digital Expertise Needs to Be Strengthened**

Digitalization determines the new or improved products, processes, technologies and expansions of industrial infrastructure[13],and as an emerging industry, forest health still needs to be strengthened in terms of relevant technical strength. As far as Guizhou Province is concerned, at present, the collaborative R&D capabilities and scientific and technological innovation systems for customers and markets of colleges, research institutions, enterprises and health care bases in Guizhou Province are not perfect.Compared to other industries (e.g. manufacturing, traditional healthcare, transport, etc.), the forest recreation industry has a relatively low level of digitisation (Chen, Lingjun et al., 2023)[14]. In particular, the level of information technology and digitisation of small and micro-enterprises is relatively lagging behind. Although emerging industries have good prospects for development, few skilled personnel are willing to take the risk of joining new industries, and they prefer traditional industries with a long history of development, which has led to a shortage of human resources and logistical services, and the corresponding personnel support and service system has not yet formed a mature structure, which urgently requires a professional talent team and a standard service system[14].

### **3.4. Digital Service Model Lacks Integration and Perfection**

A variety of new service models have emerged in the process of digital development. The traditional enterprise service model is based on customer demand, providing products or services to customers. Under the traditional service model, although customers can constantly compare prices when purchasing, the cost savings that can be achieved are not obvious. At the same time, the rising cost of personnel management makes the disadvantages of the traditional service model even more obvious. Against this backdrop, the introduction of digital technology can effectively address the problems of not going far enough in addressing transformational development and the excessive investment required.Herold, David M. (2021) suggests that digitalisation is a socially formed phenomenon[15],and that consumers now enjoy a wide range of rights of expression and choice, as well as an increasingly high level of personalisation of their needs, which puts forward more requirements on the supply side of the business. However, current forest recreation enterprises mainly develop and make profits through traditional service projects, service industries directly related to forest recreation have not been developed accordingly[16],and the digital service model is still overly dependent on the traditional model. How to take the forest recreation industry as the central axis and vertically unite the medical, tourism, cultural and pension industries to achieve multifaceted development is still one of the problems that need to be solved urgently.

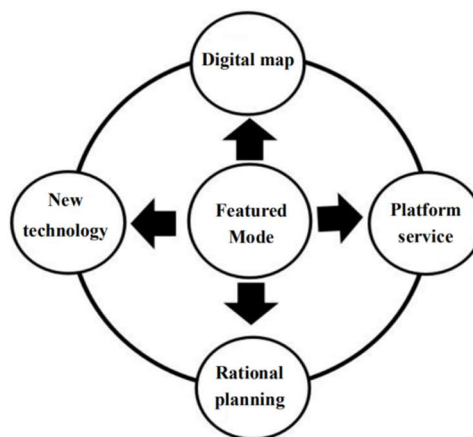
## **4. Suggestions for Promoting Digital Transformation of the Forest Recreation Industry**

### **4.1. Further Coordinate and Integrate the Development of forest Health Industry Data Resources**

#### **4.1.1. Coordinate the Construction of Resources "Map, Network, Library and Platform"**

The distribution of forest resources across the country shows regional imbalance and under-utilisation, which directly affects the gradient difference in the digital level of the forest recreation industry and has an impact on the synergistic development of the industry. In order

to solve this problem, it is possible to integrate digital map resources in different parts of China and enrich the information of regional forest resources, so as to adapt the recreation activities and realise the development strategy of "adapting to local conditions". Visual mapping and three-dimensional (3D) modelling of forest recreation sites, as well as digital and simple assessment of behavioural safety indices, will improve the safety of activities (Sezer, 2021)[17]. In order to promote the digital transformation of the forest recreation industry, we need to promote the construction of a forest network and establish an industrial data resource base so that relevant information can be found in a timely manner. At the same time, it is also necessary to establish a corresponding digital platform, applying big data, the Internet, cloud computing, GPS and other new information technologies to the platform, so as to form a model featuring "digital map + rational planning + platform services + new technologies", and to provide a think-tank service platform for the development of the digital synergistic forest recreation industry chain.

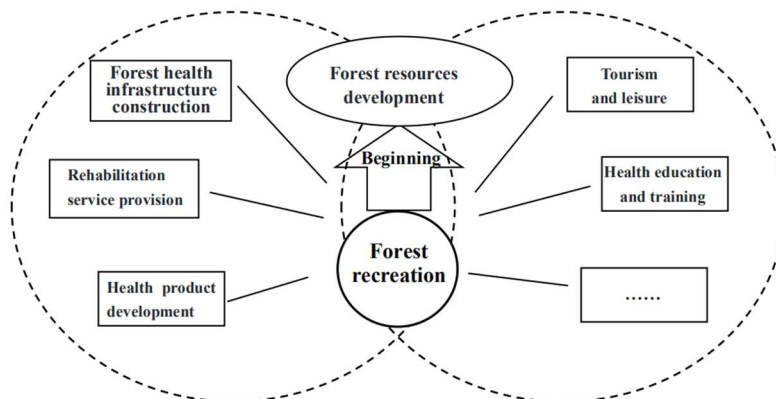


**Figure 1.** Think Tank Service Platform Featured Model Diagram.

#### 4.1.2. Integration of Data Resources from the Whole Industry Chain

Forest health industry breaks through the traditional mode of organizing production, operation, service and management activities in a single industry, and is an industry with "one industry as the main body and multi-industry integration" as the organization and operation mode (Song Weiming, 2020)[19]. However, there is a lack of connection between various industries, and most of them have the trend of "fighting for themselves". In order to enable the forest health care industry to develop vertically, data resources of the whole industry chain should be integrated and every detail of the health care industry from each sub-industry chain should be coordinated. Specifically, we can collect consumer demand preferences and behavior data, and understand the overall consumption habits of customers. In an online survey conducted by the Korea Forest Service from 24 July to 15 August 2015 on residents' perceptions of the current situation, needs, willingness to participate, and expected effects regarding mountain ecotourism, the main results analysed were that for mountain ecotourism, 83% of respondents asked for improved accommodations and amenities, 78% asked for public relations and information provision, 76% asked for the development of local tourism products, and 80 per cent expected to receive natural healing and wellness (Kim, 2018)[19]. It can be combined with relevant survey data at home and abroad to help enterprises develop more accurate marketing strategies and enhance the competitiveness of their products and services. Brown (2017) suggests that a public participatory geographic information system (PPGIS) can be adopted to use geospatial technology to promote the participation of marginalised groups in the decision-making process of ecosystem service management [20]. At the same time, involve stakeholders in the decision-making process of planning and providing forest recreation infrastructure,

improving the management of the use of forest resources and the distribution of benefits, and implementing forest law and related regulations (Paavola, 2007)[22].



**Figure 2.** Forest Recreation Industry Chain Diagram.

## 4.2. Further Improvement of Digital Support Management Policies for the Forest Recreation Industry

### 4.2.1. Increase Financial Support for Digital Transformation of Industries

As an emerging industry, the forest recreation industry has a relatively short history of development, and its digital transformation is more of a public welfare nature, which makes it difficult to obtain direct digital dividends (He Jingbo, 2022)[22]. Due to the limited capital accumulation of enterprises in digital transformation and the increased requirements of digital transformation on the existing technology, manpower, services and management of enterprises, there is an urgent need for enterprises to carry out comprehensive upgrading and transformation. In order to achieve this goal, there are several concrete measures we can take:

#### 1) Increase government funding

The Chinese government encourages and supports the digital development of the health care industry. In 2015, in the Guiding Opinions on Actively promoting the "Internet +" action, the goal and task of "promoting the development of smart and healthy elderly care industry" were clearly put forward. In the digital transformation of forest health industry, the government should make reasonable arrangements in the allocation of funds, and increase the industry fund, innovation fund and other financial support for the digital transformation of forest health industry. At the same time, the government can also reduce the cost of digital transformation of enterprises through tax relief, financing discount and other ways to promote the rapid development of digital transformation of enterprises.

#### 2) Support for channelling social capital investment

Widely publicise the development prospects of the forest recreation industry to the society through various channels such as the Internet, and guide social capital to the field of digital transformation of the forest recreation industry. Encourage entrepreneurs to actively participate in the innovative transformation of enterprises and form industrial development funds and venture capital funds to provide richer financial support and guarantee for the digital transformation of the forest recreation industry. The government can promote the establishment of industrial development funds and venture capital funds by establishing a co-operation platform to facilitate the matchmaking between entrepreneurs and investment institutions. Such financial support will provide a wider and more flexible source of funding for the digital transformation of the forest recreation industry, promote enterprises to accelerate the pace of digital transformation, and improve the competitiveness and sustainability of the industry.

#### **4.2.2. Increase Technology Research and Development, Extension Services and Training**

"Science and technology is the first productive force", the smooth promotion of the digital transformation of the forest recreation industry can not be separated from the hard power of technology, the enterprises should actively support the key research and development projects of scientific research institutes, Yong Shian Goh (2022) research shows that the research of forest recreation function and efficacy evaluation key technology -Subtropical forest recreation factor mining, wisdom monitoring and efficacy evaluation key technology[9], actively cooperate with the trial run experiment. It is committed to establishing a health monitoring system, promoting the knowledge of forest recreation and using the characteristics of forest recreation to raise people's health awareness. Richards (2017) states that social media data can be combined with remote sensing data and machine learning techniques can be applied to obtain fine-grained information about how forest and landscape variables influence the type of recreation that forest tourists engage in[24], which can be analysed to prioritise the development of technological inputs. Bryndin (2018) argues that in an era of rapid technological advancement, training requires rapid updating of knowledge for social use. The creation of new online courses will promote technological retraining[25], and strengthen the cultivation of digital technology-based enterprises.

#### **4.2.3. Regulating the Digital Management of the Forest Recreation Industry**

In the process of digital transformation, forest recreation enterprises should learn and master the general policies of the Party and the State in a timely manner, especially the recreation industry, the digitalisation of enterprises as well as the digital economy, digital empowerment and other relevant institutional policies; at the same time, enterprises should accelerate the construction of corresponding system platforms in a timely manner, in order to solve the problems of incompatibility of data between industrial chains and the value of data resources, so as to regulate the digital management of the forest recreation industry. Here, we can learn from the Swiss IAD framework for forest recreation governance, which is specially developed for analysing common pools of resources, and which provides a multi-level structure linking the operational level with the collective choice and constitutional levels, where stakeholders make decisions on resource management and planning, and where stakeholders decide on rules, norms, or strategies for decision-making at the collective choice and constitutional levels (Ostrom, 2005)[26]. Enterprises should adjust their management policies in a timely manner to keep in line with national development policies. Firstly, enterprises should establish a complete, safe and reliable digital platform according to the characteristics and needs of the forest recreation industry to achieve informationisation and intelligent management. Second, enterprises should formulate standard digital transformation management implementation processes, implementation plans and technical specifications, and guide each enterprise to carry out digital transformation in accordance with the process specifications. Third, enterprises should strengthen team management, especially in the digital transformation process requires professional and high-quality talent support.

#### **4.3. Further Promotion of Digital Demonstration Pilot Base for Forest Recreation Industry**

Since the launch of the "Beautiful China" and "Healthy China" strategies, there have been seven pilot counties, five pilot forestry bureaux and 380 pilot forestry bases in 27 provinces across the country. The China Forestry Industry Federation has also actively promoted the construction of pilot national forest recreation bases. 135 pilot construction units of national forest recreation bases have been approved, covering 26 provinces (Wu Houjian et al., 2018)[25]. At the same time, the supply of health technology has been strengthened, and various innovations continue to emerge: the rapid development of the industrialisation of

health Internet of Things (IoT), artificial intelligence (AI), medical treatment, and other technologies, and the increasingly close cross-border integration of information technology with pension, tourism, and healthcare have provided a new impetus for the development of the health industry[27]. In 2016, the State Forestry Administration issued the "Thirteenth Five-Year Plan for Forestry Development", which clearly proposed that forest recreation should be vigorously developed, and by 2020, China will establish 500 forest recreation (also known as forest bathing or Shinrin-yoku in Japan) bases and 5-10 demonstration bases for international cooperation (Guan Xueling, 2019) [27], thus promoting the forest recreation industry into a rapid development stage. In order to actively promote the spirit of the State Forestry Administration's "13th Five-Year" forestry development plan on vigorously developing the forest recreation industry, the forest recreation industry promotes the promotion, application and demonstration of the intelligent application of equipment, and "forest recreation + science and technology". The forest recreation industry promotes the promotion, application and demonstration of intelligent equipment, the construction of demonstration zones for new types of business that integrate and innovate forest recreation and science and technology, and the pilot project of "Internet+" recreation products.

#### **4.3.1. Promote the Construction of Technology Test Bases for Digital Technology Integration and Model Research**

In order to promote the construction of the technology test base, firstly, the construction of the digital base for the forest recreation industry should be based on the innovative application of digital technology, and the base needs to establish a platform that integrates a variety of digital technologies and high-speed network communications to achieve such functions as information sharing, collaborative office work and business processing. Secondly, the base should carry out research on the integrated application of digital technology and strengthen the ability to apply digital technology. It can conduct in-depth research on digital technology, artificial intelligence, blockchain, big data and other fields to promote the deep integration of digital technology and forest recreation. Finally, integrating the digital forest recreation technology resources of each province, taking municipal colleges and universities and research institutes as the main body, setting up the "5G + intelligent forest recreation" innovation laboratory, constructing the digital technology integration, model research and test bases, intelligent analysis and decision-making control, and "sky-land" digital forest recreation integration, can strengthen the digital technology application capacity. "digital forest recreation integration" and other technologies (Qing, W. U., 2019)[29], and carry out research on technology model assessment and market access standards.

#### **4.3.2. Promoting the Construction of a Demonstration Base for Digitisation of the Whole Production Chain**

The forest recreation industry takes the development of forest resources as its main content and incorporates the new concept of health services such as tourism, leisure, holiday, entertainment, sports, medical treatment, health care and pension (Shao Yan, 2017)[30]. The industry has a relatively complete industrial chain, including accommodation, catering, transport and other links. In order to achieve the information and intelligent management of the forest recreation industry chain, the construction of the base should focus on the full coverage of the digital platform. This can ensure that resource information is updated in a timely manner and quantitative evaluation is conducted to form a comprehensive rating to assess the suitability of the forest recreation base (Li Xi, 2019)[31]. The base can take digital ecotourism and health and wellness products and services as the main carrier to promote the application of digital forest recreation industry in the whole industry chain. Digital forest recreation product supply is enriched by means of digital product promotion, digital service reservation and digital simulation experience. Establish a digital forest recreation industry

alliance, promote digital forest recreation products and services, and create a new mode of digital forest recreation industry.

## 5. Conclusion

As a green industry, and sunrise industry, forest recreation industry has a broad development prospect. Driven by national macro policy and people's demand for recreation, China's forest recreation industry promotes digital transformation, so that the value of the industry has been shown at multiple levels, not only to meet people's health needs, but also to become an important part of ecological protection and tourism economy. In addition, digital transformation also facilitates the management of the industry, making the management process more efficient and convenient, and providing a more scientific basis for corporate decision-making. At present, the foundation of China's forest recreation industry is still relatively fragile, and there are still a lot of weak links, resulting in the forest recreation industry's energy level not being able to match the leap in digital technology. On the road of digital transformation, it is necessary to constantly innovate, actively practice the countermeasure suggestions, pay more attention to the integration of resources, optimize the industrial chain, improve the application of technology, accelerate the pace of digital transformation of the industry, and constantly improve the core competitiveness and profitability of the industry. In order to promote the digital transformation of the forest recreation industry to a new level.

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