

Application Analysis of Smart Tourism Management Model under the Background of Big Data and IOT

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Abstract

The rapid development of information technology has accelerated the application of big data and the Internet of Things in various industries. Big data has a great potential in the development of smart tourism. With the help of innovation in emerging technologies such as big data and Internet of Things, smart tourism has a better possibility to surpass traditional tourism. Therefore, this article provides a theoretical support to this process. It has explored the innovative management model of big data and IoT in smart tourism and evaluate their effects on promoting tourism. It offers a reference for the integration and innovation of the tourism theory system. Before big data technology, the development of Internet boosted online tourism. However, tourism marketing is still inefficient due to a lack of understanding about tourists. After many practical explorations of big data technology, tourism websites begin to adopt big data technology in their daily operations. With the changes in tourists' preferences and needs, further innovation and research are needed to help smart tourism keep up with the changes in the market and create more competitive products and services. Innovation serves as the driving force for enterprises to occupy the market and develop.

Keywords

Big Data, Electronic Components, IoT Technologies, Smart Tourism

1. Introduction

The rise of Internet of Things (IoT) technology is of great significance to the modern society. With the rise of the smart city, smart tourism also develops. However, as there are not enough theoretical supports to smart tourism or its application, the development of smart tourism still faces many challenges [1-3].

1.1 Big Data

Big data does not mean a specific type of data, but rather a large sum of data collected during operations. Big data can be applied to most tourism companies where the use of big data has initially started. To make accurate data analysis and calculations, the key is to fully use the data available at hands for targeted marketing, instead of acquiring as much data as possible [4].

1.2 IoT

The IoT is a network of connected things formed based on the Internet. The users of the IoT are not

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only people in the traditional sense, but the users also include different items. IoT adopts the Internet to connect things, with the relevant technology to track and monitor materials for better management [5].

1.3 Smart Tourism

Smart tourism improves users' tourism experience with the help of technology. Big data technology and IoT are used to help enterprises obtain data and promote tourism business. Smart tourism can better serve users and promote economic development [6], as shown in Fig. 1.

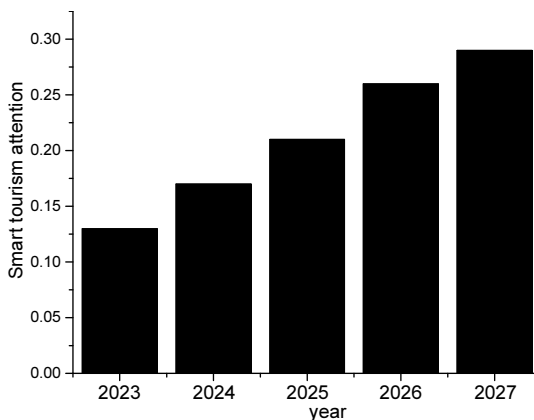


Fig. 1. Smart tourism attention.

2. Questionnaire Survey

To investigate the management mode of smart tourism, this paper distributed questionnaires at the website (<http://www.wjx.cn/>) to 1,000 managers and technical personnel of 50 tourism enterprises. The survey focuses on technical personnel training and tourism marketing status. A total of 3,000 valid questionnaires were collected, with the recovery rate close to 100%. The questionnaires explore the effect of using information technology (IT) resources in tourism enterprises [7]. The results show that the development and use of IT and IoT can effectively promote the formulation of tourism plans, enhance the management of enterprises and increase the value of enterprises related to smart tourism. The statistics of three typical enterprises are shown in Table 1. According to Table 1, China's tourism enterprises have a low rate of utilization and development in IT and IoT resources. There is a problem in repeated use and waste of tourism resources in China. The development mode of network-based tourism enterprises needs to be improved.

Table 1. Construction and use of IT and IoT resources

Typical company	IT completion rate	IoT completion rate
A	0.35	0.11
B	0.33	0.17
C	0.31	0.15

This survey involves tourism enterprises. The statistics of technical personnel training are shown in Table 2. The results show that enterprises pay little attention to the training of tourism technical personnel. Due to a lack of funds and talents, the development of smart tourism slows down with inefficient management of websites and untimely information updating. Many websites struggle with how to update their information quickly and conveniently. Many web pages do not update like they should and many message boards have questions left unanswered. They cannot solve problems for tourists in time, nor can tourists get the expected interactive feedback from the system. This phenomenon greatly affects the development of smart tourism [8].

Table 2. Training of technical talents in tourism enterprises

Typical company	Proportion of IT talents	Proportion of IoT talents
A	0.03	0.01
B	0.04	0.02
C	0.03	0.01

The key to the profitability of a tourism enterprise lies in marketing, and smart tourism marketing is the core of the management model. The tourism marketing data of the questionnaire survey is shown in Table 3, after statistics.

Table 3. Tourism marketing

Typical company	Tourism marketing accuracy	Tourism design rationality
A	0.31	0.16
B	0.25	0.13
C	0.19	0.12

As shown in Table 3, all of the three typical companies being surveyed have a low level of tourism planning, and not-high-enough accuracy in tourism marketing. Company C shows the worst performance. Only 12% content of companies' tourism design suits the tourists' demand with local conditions. Company A has the highest tourism marketing accuracy, but its proportion of reasonable tourism marketing is only 31%. Therefore, these tourism companies still need to improve accuracy in tourism marketing.

To analyze and process the data collected by the questionnaire, the paper adopts the method in literature [9] as a reference. The formulas are as follows.

$$\mu(\{m \in M: |g(m) - t|\} \leq \frac{1}{t} \int_M |h| d\mu, \quad (1)$$

$$Pr(Md \cdot I) \leq \frac{tr(E(M))}{a}. \quad (2)$$

3. Analysis of the Problems of the Smart Tourism Management Model

3.1 IT and IoT Resource Development is Relatively Backward

Tourism companies often neglect IT and IoT development and most of them still rely on traditional

management mode. Although some companies try to establish office automation systems or one-click smart tourism systems, but they are small in numbers. Most tourism companies do not pay attention to IoT technology. When it comes to meeting program development needs, such as system design, they always seek support from external companies. The actual problem is mainly the lack of equipment and experts.

3.2 Inadequate Recruitment and Training of Technical Talents

Smart tourism requires a large amount of data, but tourism enterprises are not able to collect and process the data, due to a lack of talents. As a result, employees in the tourism enterprises generally lack the awareness of developing smart tourism, and few companies can lead such management model. When recruiting IT talents, most companies directly choose those with computer-related degrees. Actually, the ones who promote smart tourism should be from majors of big data or IoT.

3.3 Marketing is not Precise Enough

At present, the advertising of smart tourism projects is mainly released through TV advertisements or short video platforms. The content of advertising is often simple and short, partially about the services of the smart tourism at the scenic spots. Tourism enterprises fail to fully tap tourists' information to provide targeted tourism. As a result, tourists are reluctant to travel to the scenic spot, and the revenue of tourism companies remain flat.

4. Innovative Development of Intelligent Tourism Management Mode

4.1 Continuously Introducing New IT and IoT Resources

To solve the problem of backward IT and IoT resources in tourism enterprises, the enterprise can hire a technology consultant who are specialized in smart tourism. The consultant can work along with the procurement department to buy some new IT and IoT equipment for the enterprise. With updated IT and IoT infrastructure, the enterprise is able to provide tourists with personalized and novel travel experience. Based on the innovation of this smart tourism management model, we might get positive feedback from travelers, thereby improving local reputation of tourism enterprises. According to a follow-up survey of enterprises that have been surveyed before, it is found that the attractiveness of smart tourism projects has improved after the continuous application of IT and IoT resources, as is shown in Fig. 2.

4.2 Incentive Related Talent Development

Smart tourism demands more technical talents than traditional tourism due to its technical nature. Smart tourism practitioners must hone their skills in advanced technologies, such as big data and the IoT. Using new technologies has a positive effect on the development of smart tourism, as shown in Fig. 3.

4.3 Integrating Big Data Technology into Marketing Design

Tourism enterprises should establish a big data platform for targeted marketing and deal with related problems. The analysis of demand and preference can help enterprises better understand their users, which is an important step during the process. Preference factors such as hotel stars, hotel themes, and

destinations are key information captured by the big data system. If more influencing factors can be added, the analysis accuracy will be further improved. The travel needs of users are divided into three categories, and the preferences are divided accordingly.

The business of tourism companies involves various types of smart tourism. The sales results are also different in types. Among the marketing results disclosed by tourism companies in previous years, most sales results were displayed as revenue or volume of transactions, which lacked users' feedbacks. Therefore, when analyzing sales results, data of users' feedbacks should also be introduced, as shown in Table 4.

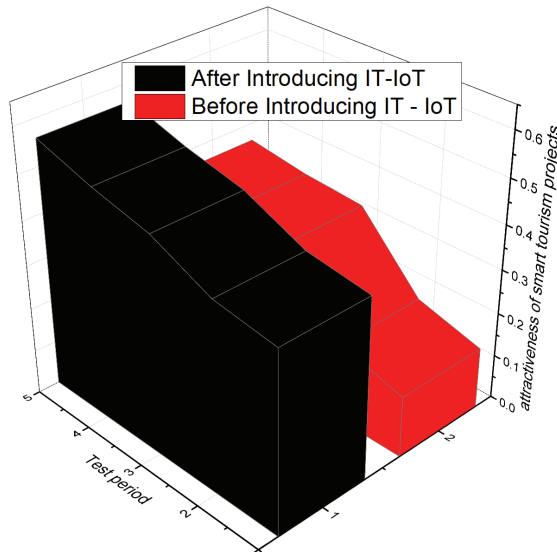


Fig. 2. Changes in the attractiveness of smart tourism projects.

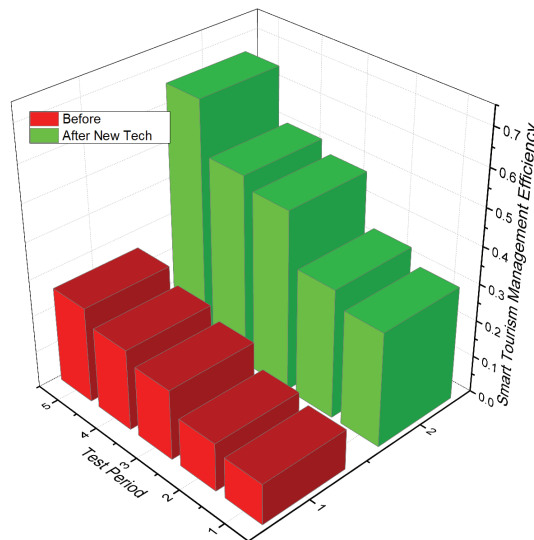


Fig. 3. Changes in smart tourism management efficiency.

Table 4. Analysis and design of sales results

Types of products and services	Analyze reference factors
Hotel	Transaction volume, transaction rate, user evaluation (good rate), return rate, long-term stay rate (more than 2 days)
Transportation	Turnover, user evaluation, repeat rate, market share
Tickets	Turnover, user evaluation, repeat rate, similar competition level
Products and services	Turnover, user evaluation, demand rate

Marketing success rate combined with big data technology is shown in Fig. 4.

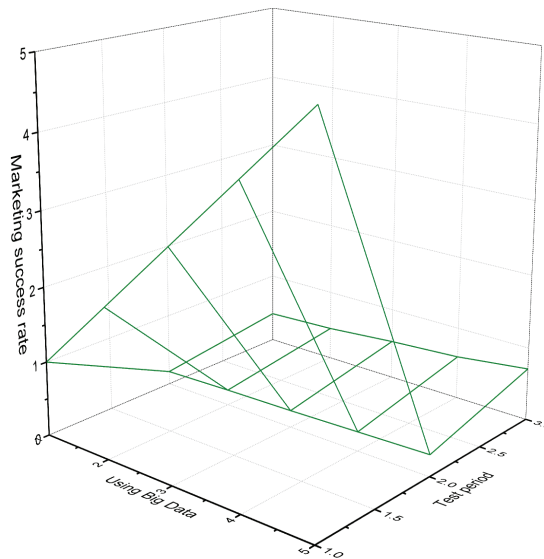


Fig. 4. Marketing success rate combined with big data technology.

4.4 Development of IoT Management Mode

With the advance of IoT technology, a IoT management mode has been developed by the government, enterprises, and organizations. The management mode features accurate, intelligent and personalized through the linkage of the sensor, the transmitter, the cloud and the application end. The design, operation and maintenance of IoT management mode follows a "four-end linkage, three in one" strategy. (1) the "three in one" management innovation mode integrates innovations in technology, management, and system. (2) In this "four-end linkage" management mode, the sensor serves as the foundation of the whole process. Transmission is a guarantee, cloud computing works the control center, and application terminal facilitates the decision making. (3) IoT management mode is economical, transparent, efficient, accurate, and personalized.

4.5 Application of IoT Management Mode in Smart Tourism

Measures for innovating the tourism include setting up a new public service platform for smart tourism. This platform must be based on the IoT management mode.

- (1) Resource platform: The cornerstone of smart tourism is an accurate, dynamic, and shared database.

Through effective information collection, processing, and feedbacks will allow for the business restructuring of tourism organizations, as well as a change in the manner in which the tourism industry is supervised. The collection and analysis of tourists' personal needs will also greatly make tourism services more targeted and timely.

(2) Cloud platform: the professional clouds of various tourism businesses provide support for intelligent processing. The cloud can integrate information from various travel businesses and professional institutions, and provide accurate analysis. Users can get access to all kinds of data obtained from the platform, and data analysis will be more effective, helping tourism managers make wiser decisions.

(3) Application platform: various intelligent terminals guarantee the practical application of smart tourism. It can serve as a business platform for tourism enterprises and scenic spot merchants as well as a platform for government departments to provide tourism public information services.

5. Conclusion

This article investigates the management mode of smart tourism, analyzes the questionnaire data through statistical algorithms. The problems of smart tourism in China include a relatively backward development of IT and IoT infrastructure, insufficient recruitment and training of technical staff, imprecise marketing. Finally, an innovative solution is proposed. It combines big data and IoT technology with current conditions of smart tourism to design a management model. Moreover, the paper conducted a follow-up survey on the tourism enterprises visited in the early stage. This study has found that after using big data and IoT technology to innovate tourism management, the indicators of the enterprise model have improved in all aspects.

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