Tourism Marketing Innovation Management Model Based on Big Data

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Abstract: The competition among the tourism industry in my country is very fierce. The emergence of big data provides new opportunities for the development of the tourism industry. The tourism industry uses data mining and cloud computing technology to filter out valuable data from massive amounts of information. This function provides the possibility to develop an innovative management model of tourism marketing based on big data. This paper conducts research on big data technology, combines big data with tourism marketing management mode, and proposes an innovative management mode of tourism marketing based on big data. This innovative management mode can effectively mine and intelligently analyze the data of tourism users, so as to develop a personalized marketing plan. The research results show that the tourism marketing innovation management model based on big data improves the accuracy of customer demand judgment by 25.7%, improves the core competitiveness of tourism enterprises, and promotes the development of the tourism industry.

Key words: Big Data; Tourism Industry; Marketing Strategy; Innovative Management Model

1. Introduction
With the advent of the new era, the further development of network information technology has made the application of big data technology more and more widespread [1]. The changes in the era of social and economic development and the transformation of people's daily lives have become a new information network environment. The era of big data is the main trend of social development. Abstraction will transmit information in the form of data. People use big data technology to classify, analyze, process, and refine real useful information about themselves [2]. China's modern tourism companies are an industry based on information development services. In the era of big data, they are facing huge market opportunities and challenges [3]. The popularization of information network enables people to obtain convenient and quick solutions to their travel needs, which directly affects people's consumption habits [4]. On the basis of big data, tourism companies should change traditional
marketing methods, keep pace with the times, combine with modern information technology, innovate marketing methods in an all-round way, ensure scientific management and efficient operation, and continuously improve the competitiveness of tourism companies[5].

In the era of data informatization, the marketing strategies of tourism companies have undergone tremendous changes. Traditional marketing has been gradually eliminated. At historic moments, new marketing such as marketing and online marketing have appeared. Tourism companies are using big data to guide marketing activities [6]. The reality of many challenges faced by the tourism industry is a comprehensive service industry, and the impact of broader tourism-related data is complex, and it will bring huge challenges to tourism companies to provide processing technology data [7]. Although many online and offline travel companies have established their own data centers and data processing platforms, the advantages of big data analysis technology and applications are still in the preliminary exploration stage, and the development cost is high, so it is not obvious for marketing[8].

In this era of big data development, the interactive behaviors of tourists such as online searching, booking, sharing and commenting have fully revealed their different activities coverage and different hobbies [9]. Therefore, travel agency personnel should quickly and accurately capture long-term travel data left by foreign tourists, and tailor exclusive travel products and travel services according to tourists' personal preferences [10]. In addition, while fully satisfying the needs of tourists for their own differentiated consumption needs, tourism marketing companies start from the combination of strategic theory.

2. Tourism Marketing Theory and Big Data Mining Process

2.1 Related Theories
Tourism marketing management is a specific application of tourism industry marketing. This is to meet the needs of tourists and the goals of tourism enterprises, from the planning and implementation process of conception, price setting, promotion and distribution of tourism products. The tourism marketing management model guided by tourism demand implements various tourism activities and the dynamic process of tourism marketing. Therefore, tourism marketing has a wide range of objects. The marketing subjects are only government departments, local tourism management departments, administrative organizations and other types of tourism enterprises. Similarly, the tourist market is a place where tourist commodities are traded. Due to various problems, research on tourism marketing focuses on resource protection, tourist safety, laws and regulations, and environmental management. At present, various specialized studies on the tourism market are underway at home and abroad.

2.2 Big Data Mining Method
At present, the business application modeling of big data mining system mainly focuses on data. Acrisp-Dm and big data analysis system mining business modeling and standard data business process application understanding learning.

Business understanding: The purpose of data mining is to apply, so data miners should start from the perspective of data application.

Data understanding: Data understanding refers to filtering required data, verifying data quality, and understanding the meaning and characteristics of data.

Data processing preparation: usually refers to the preparation and conversion of the original processing data into the final data processing. This process can usually be executed multiple times at the same time.

Modeling: Data modeling processing refers to how to use massive data mining and model analysis techniques to perform data modeling.

Evaluation: Evaluation refers to the comprehensive inspection of the effects of the established model, that is, to determine whether the model has achieved the established business objectives and whether there is room for improvement.
Application: The model is built to make data mining more accurate. This is not the ultimate goal of data mining, nor does it mean the end of the mining process. Generally speaking, data mining is a cyclic process, that is, through continuous optimization, trying to get the best application. The formulas involved in the data mining process are shown in 1 and 2.

\[ F^x = \sum_{k=0}^{n} \frac{X^k}{k!} + R_s(X) \]  
\[ F^N = \sum_{j=0}^{X} \frac{C_j (u^j - u^i)^2}{\sum_{j=0}^{X} C_j (d^j)^2} \]

Among them, \( F \) is the amount of data mining, \( x \) represents the calculation rate, \( k \) function class, and \( c \) represents the calculation constant.

3. Research on Big Data Mining Algorithms

In data mining, the basic principle of the classification algorithm is to give a database with unknown data characteristics \( D = \{t_1, t_2, \ldots, t_n\} \) and a set of classes with known characteristics \( C = \{c_1, c_2, \ldots, c_m\} \). And then to determine a mapping \( f: D \rightarrow C \). The classification algorithm calculation formula is shown in 3.

\[ C = \frac{1}{t} \sum_{j=0}^{t} \sum_{i=0}^{t} (T_{i,j} - u)^2 \]

Where \( C \) is the classification mapping set, and \( t \) is the feature value of the set element.

The basic principle of K-means clustering method is to use an iterative method to split data objects into different clusters, and then select each object and the first-type center for similarity comparison according to the similarity of size. The calculation formula of the objective function is shown in 4.

\[ K_{i,j} = p\left(X_{m+1} = j | X_m = i\right) \]

Where \( K \) is the value of the objective function, and \( k \) is the number of cluster centers.

In this experiment, the clustering algorithm was used for related research, and the specific data is shown in Table 1.

| Cluster center         | Convergence value | Eigenvalues | Objective function value |
|------------------------|-------------------|-------------|--------------------------|
| Evans Blue             | 247               | 634         | 1257                     |
| Initial class center   | 136               | 588         | 2446                     |
| Central value          | 95                | 719         | 1695                     |

Table 1 data information includes eigenvalues, objective function values and cluster convergence values.

4. Experimental Results and Correlation Analysis

Compared with traditional data analysis, data analysis in the era of large-scale data samples is not random sampling in the past, but all sample data changes according to the analysis of most, complex, and all samples. Although the results are no longer accurate, in the context of big data, enough data and variables can be collected through the development of data storage and data processing technology, and data mining analysis, so it again contains a certain amount of mixing. There is no need for the big data background of data analysis for hypothesis testing. This article compares big data analysis with traditional data analysis to better understand the differences between the two. The specific information is shown in Table 2.
Table 2. Big data and traditional data comparison

| Feature                        | Big data analysis method       | Traditional data analysis methods |
|--------------------------------|--------------------------------|----------------------------------|
| Type of data                   | Unstructured                   | Structured                       |
| Data Sources                   | All data                       | Random sampling                  |
| Data characteristics           | Large capacity and dynamic changes | Small capacity, static           |
| Number of variables            | Very large                     | Very small                       |

It can be seen from Table 2 that the characteristics of big data analysis are unstructured data types, comprehensive data sources, large capacity and dynamic changes, and many variables. Big data mining will maximize the use of new information processing methods, large-scale data of multiple separate online data, detailed analysis and extensive use, and conduct in-depth analysis. At the same time, it will focus on target visitor information to meet the needs of tourists and the accurate judgment of actions, and build tourism marketing innovation management model accordingly. The impact of the tourism marketing innovation management model based on big data on the accuracy of customer demand judgment is shown in Figure 1.

Figure 1. The improvement of tourism marketing innovation management model to the accuracy of customer demand judgment

From the data in Figure 1, it can be seen that the tourism marketing innovation management model based on big data improves the accuracy of customer demand judgment by 25.7%. Using modern big data analysis technology, in-depth and detailed analysis of the various personal consumption preferences and interactive consumption behavior changes characteristics of local tourists. The usual changes in preferences of tourists are implicit because of the specific physical needs and specific psychological material needs of external consumer products. This is mainly to perceive the impulse of specific consumption. Therefore, by analyzing the interactive consumption needs of local tourists, age, occupation, ability, hobbies and other related consumption data, we can accurately grasp the changes in the specific needs and psychological needs of tourists' interactive consumption. Timing is conducive to the targeted planning and development of tourist interactive consumption projects, and encourage local tourists to actively transform specific consumer desires into more specific consumption behaviors, thereby effectively realizing good marketing activities. The study found that the tourism marketing innovation management model based on big data can increase the revenue of tourism enterprises. The relevant data is shown in Figure 2.
Figure 2. The impact of tourism marketing innovation management model based on big data on the profits of tourism enterprises

From the data in Figure 2, it can be seen that the tourism marketing innovation management model based on big data can increase corporate revenue by 18.5%, and corporate core competitiveness will increase accordingly. The innovative tourism marketing management model has had a wide range of influences on consumers, and also has an important influence on their purchasing decisions. Nowadays, travel marketers use big data technology to analyze the travel of tourists before querying records, travel reviews, customize targeted travel products and advertisements after travel needs and travel arrangements.

5. Conclusions

The innovative management model of tourism marketing based on big data proposed in this paper is still in an ideal state, and its economic foundation has not yet been fully formed. This is also an aspect that needs to be considered in tourism construction. The era of big data has not only brought great convenience to tourists, but also revolutionized the tourism industry. In this era of data and information revolution, China needs to take the lead, actively promote the marketing reform of tourist attractions, maximize the use of relevant data and information, and combine it with intelligent technology to promote marketing. The tourism marketing innovation management model based on big data improves the accuracy of customer demand judgment by 25.7%, improves the core competitiveness of tourism enterprises, and promotes the development of the tourism industry.

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