

Retraction

Retracted: Behavior of Sports Tourism Consumers Based on Cloud Computing and Mobile Big Data

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] H. Wan, "Behavior of Sports Tourism Consumers Based on Cloud Computing and Mobile Big Data," *Journal of Electrical and Computer Engineering*, vol. 2022, Article ID 7009345, 14 pages, 2022.

Research Article

Behavior of Sports Tourism Consumers Based on Cloud Computing and Mobile Big Data

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With the rise of the sports tourism industry, the group of sports tourism consumers is also growing. The study of the behavior of sports tourism consumers has therefore become a popular topic. This paper firstly organizes and analyzes the research results of scholars, finds out the deficiencies, and finds out the methods suitable for this research. On this basis, this research is practiced, and the methods found are successfully improved to add personal innovation points. Then, the definition and characteristics of cloud computing and mobile big data are elaborated. Next, this paper selects some consumers and their consumption behaviors participating in X city's sports tourism town, golf sports tourism, skiing sports tourism, and outdoor sports tourism projects as the research objects and conducts investigation and research by means of questionnaires and interviews. At the same time, the managers and operators of some sports tourism scenic spots are selected as the research objects, and the investigation and research are carried out through the interview method, which provides a realistic basis for the study of consumer behavior. According to the survey, the proportion of sports tourism consumers who choose to travel in summer is as high as 90.10%.

1. Introduction

With the rapid development of the economy, people's ways of leisure and entertainment are becoming more and more abundant. Coupled with the improvement of the vacation system and the increase of free time, the traditional travel content and methods in the past can no longer meet the needs of today's consumers. Therefore, sports tourism, a distinctive and novel way of tourism and leisure, has emerged. Sports tourism has shown great potential for development, but its drawbacks should also be considered. How to enhance the vitality of the sports tourism market is a problem that is worth thinking about. The problem lies in the poor communication between sports tourism consumers and sports tourism suppliers. On the one hand, sports tourism consumers have not been able to get their favorite products, and, on the other hand, sports tourism suppliers have no way of knowing the real needs of consumers. Therefore, in order to solve the contradiction between supply and demand of sports tourism products, it is necessary to deeply understand the tourism needs of consumers,

improve the supply mode of the sports tourism market, and develop sports tourism products that consumers love. While providing consumers with a wealth of sports tourism products, relying on the characteristics of natural resources and cultural resources, it designs sports tourism products with unique local characteristics, forms local brand products, and further enhances the influence of the sports tourism market.

The innovation of this paper is to investigate the consumption behavior of consumers participating in sports tourism. It studies the personal characteristics of consumers, the process of generating sports tourism motivation, the restrictive factors when participating in sports tourism decision-making, the process of consumers' personal experience, and the final evaluation of sports tourism product marketing. This paper investigates, researches, evaluates, and analyzes the consumption behavior of consumers in the process of participating in sports tourism. Through the research on consumers, use theory to guide practice, practice to test truth, put forward development suggestions suitable for sports tourism, and enrich related research on sports

tourism. In order to promote the diversified development of regional sports tourism products, form local brands to avoid the problem of homogeneous competition in sports tourism. This paper further discusses the laws of consumer behavior of sports tourism in a city and makes suggestions for the managers and operators of the sports tourism market in a city while creating sports tourism products that consumers love. In addition, the use of cloud computing and mobile big data as the technical basis gives a favourable source of data for this study. The experiment proves the feasibility of this study on the consumer behavior of sports tourism.

2. Related Work

Many scholars at home and abroad have provided a lot of references for research on cloud computing, mobile big data, and sports tourism consumer behavior.

Wozniak T analyzed the influence of psychological factors on mobile consumer behavior. Drawing on multiple established theories, four psychological factors were identified: smartphone self-efficacy, mobile-specific innovations, information privacy concerns for mobile users, and personal attachment to smartphones. Using structural equation modeling with a large sample of consumers, he analyzes the impact of these factors on two basic types of mobile consumer behavior: behavior in the mobile customer journey and the willingness of consumers to disclose personal data in exchange for a personalized mobile experience. The results confirmed the correlation of the identified factors with mobile consumer behavior [1].

Zhuo et al. recommend the use of cloud computing requester's collective operations. Extensive performance analysis and experiments based on real cloud systems demonstrate the feasibility and efficiency of the scheme proposed by Zhuo et al. [2].

Guo et al. proposed a big data object detection method with compressed measurement domain under mobile distributed computing architecture. Compared with traditional methods, the computational cost and storage cost of this detection process can be significantly reduced, which is suitable for multimedia big data. This can also be used in smart cities to find lost children and other specific events [3].

Pouryazdan et al. proposed a game-theoretic approach to ensure the credibility of user recruitment in mobile crowd-aware systems. The approach that he proposes is a platform-centric framework consisting of three phases: user recruitment, collaborative decision-making for trust scores, and badge rewards. It is found through simulations that his proposed method can achieve about 50% and at least 15% improvement in platform and user utility, respectively, compared to fully distributed and user-centric trusted crowd sensing [4].

Enayet et al. proposed a mobility-aware optimal resource allocation architecture, Mobi-Het, for remote big data task execution in MCC, with higher timeliness and reliability. He presents and evaluates the system architecture and key components of the proposed resource allocation service. The experimental and simulation results demonstrate the

effectiveness and efficiency of the proposed Mobi-Het architecture in mobile big data applications [5].

Fang et al. propose an innovative semantic spatio-temporal representation for each user based on geographic information, called daily living area, which approximates the user's daily movement coverage with less information than the original movement trajectory. He conducts experiments to evaluate the proposed innovative mobile representation and user identification algorithms, which also show that users' mobile privacy is seriously threatened even when spatiotemporal information is significantly reduced [6].

Shahab et al. aim to conduct a comprehensive investigation of intrusion detection systems using computational intelligence (CI) methods in (mobile) cloud environments [7].

Sal et al. leverage the potential benefits of blockchain systems and integrate them with software-defined networking (SDN), while justifying energy and security concerns. A new routing protocol with a cluster structure is proposed for IoT networks using a blockchain-based architecture for SDN controllers [8].

The data of these studies are not comprehensive, and the results of the studies are still open to question, so they cannot be recognized by the public and thus cannot be popularized and applied.

3. Cloud Computing and Mobile Big Data and Sports Tourism Consumer Behavior

3.1. Cloud Computing. Cloud computing is based on a large-scale data center, which can dynamically provide users with the infrastructure capabilities that they need [9]. As a form of distributed computing, it greatly adapts to the needs of massive data processing [10]. Its typical characteristics are as follows:

- (1) The system is dynamically scalable. In a cloud environment, applications can be scaled at will, and the resources occupied by applications can increase or decrease as the load increases or decreases, and good consistency can be maintained under different loads. Users can dynamically adjust from the cloud center according to their required storage space and computing power [11, 12].
- (2) Resource virtualization [13]: virtualization is the logical representation of resources, so that it is not bound by physical limitations. The purpose is to simplify servers, network facilities, storage devices, and applications through virtualization, which can reduce resource users and resources. Its specific purpose is to realize the coupling between technology and resources, so that users no longer only rely on resources [14, 15].
- (3) Economies of scale drive the centralized sharing of resources [16].

The architecture of cloud computing is shown in Figure 1.

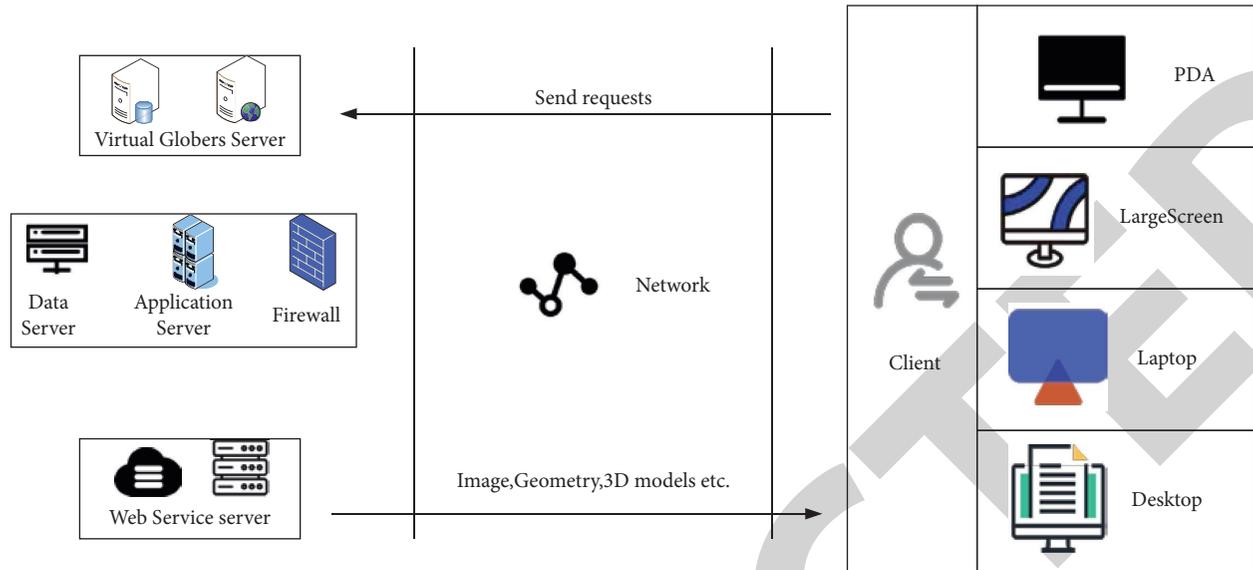


FIGURE 1: Architecture of cloud computing.

Applications in cloud computing divide cloud computing into three service layers (as shown in Figure 2).

As the core technology in cloud computing, virtualization technology can be divided into the following two modes in terms of specific form:

- (1) In order to serve many different users, a server with very powerful processing power can be divided into multiple virtual independent small servers through virtualization technology [17, 18].
- (2) In order to complete some specific services (such as a large amount of data computing), multiple small servers can be combined into a powerful virtual server through virtual technology [19].

These two virtualization modes are relatively common in cloud computing technology, as shown in Figure 3.

In addition to virtualization technology, the main technologies of cloud computing include distributed data storage technology, large-scale data management technology, distributed resource management, information security, and cloud computing platform management [20].

As a typical representative of cloud computing technology development, Hadoop technology has two core components: MapReduce parallel computing mode and distributed file system HDFS. They all adopt a master/slave structure, and they are also distributed basic frameworks with transparent details to users [21, 22]. Through Hadoop, users can use existing computer hardware resources to build cloud platforms [23]. The basic composition of Hadoop is shown in Figure 4.

- (1) Database HBase: it is a distributed open source database, designed on the basis of Google's data table

(Big Table), with powerful functions and good performance. HBase can record unstructured data through a column-based schema, which is different from relational databases. This technology has been successfully applied to a system that records structured data or information through a large number of common servers. The processing of batch data in HBase by Hadoop is realized by MapReduce, and the batch data information is stored by HDFS [24, 25].

- (2) Hive: it is the data warehouse tool in Hadoop. It can not only map it into MapReduce type task execution when querying using SQL language, but also perform statistics on simple MapReduce, with very comprehensive functions. Moreover, it can map structured data files into tables of a single database, which is very convenient for analyzing statistical data warehouses [26].
- (3) Data flow pig: on the one hand, it is a high-level programming language, which is often used in parallel computing and can achieve a high degree of simplification of programming code and reduce the workload of Hadoop. On the other hand, users can also process different types of data through the complete data conversion interface provided by pig [27].
- (4) Data tool Avro: Hadoop transmits and serializes data through the Avro tool. In addition, it can provide a calling scheme for remote processing of dynamic data Script.
- (5) Management tool Ambari: it manages and monitors other components of Hadoop based on the web. It can not only upgrade and configure the cluster, but also monitor services, which greatly assists the management of system administrators.

MapReduce is a programming mode, which is used for parallel computing of massive data and can process and

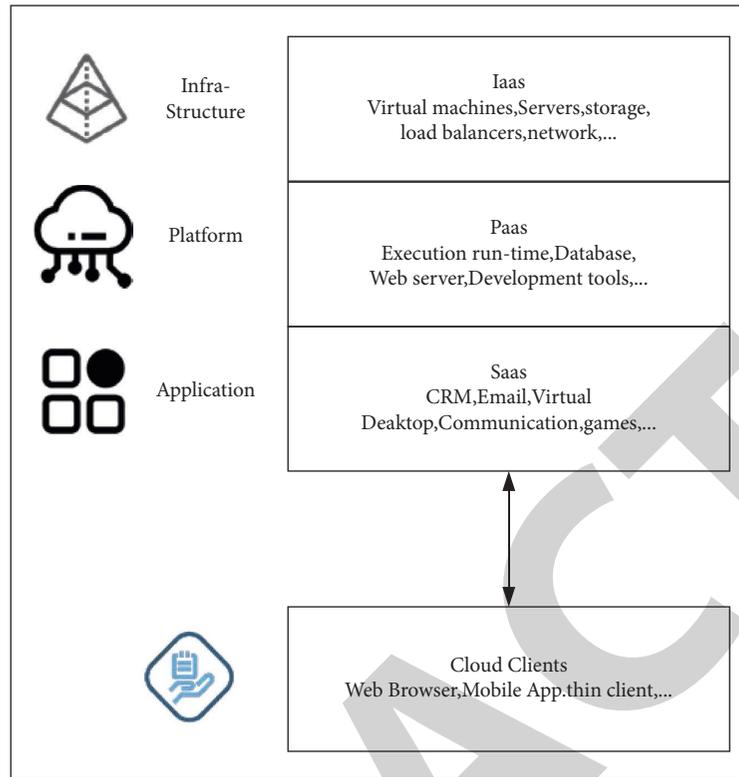


FIGURE 2: Layers of cloud computing.

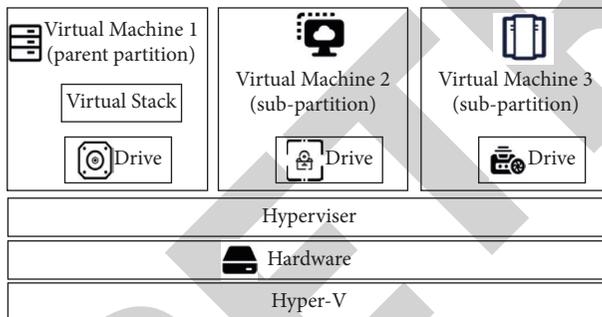


FIGURE 3: Hyper-V server of virtualization architecture.

solve big data through programming. Its core idea is Map and Reduce, so in the solution process of MapReduce it includes two key processes: the Map process and the Reduce process. Data is transmitted in the form of key-value pairs in the intermediate process. The user implements the processing of these key-value pairs through the map function, and the result of the processing is to generate intermediate key-value pairs for output. Then, the intermediate key-value pairs are classified and merged according to whether their key values are the same, and finally the final expected result is output through the processing of the Reduce function. When Google conducted research on MapReduce, it perfected it. When working on programming, staff do not need to consider how to distribute files, how to perform fault tolerance and work scheduling during program execution. They just need to decompose the problem according to the

key value and determine the operations to be performed by the Map process and the Reduce process. The MapReduce model handles other complex tasks, which simplifies the programming model and greatly reduces the workload of programmers. And the files generated by the MapReduce model in the middle process are all temporary, and it is convenient to exchange a large amount of data through a simple mode [28].

In some cases, we can also regard MapReduce as a computing model. When processing massive data, the mapping stage first divides these massive data to form many small data blocks. Then, each small data block will have a corresponding map task to process it, and users can define and write map functions according to their own needs. After the mapping is completed, a large set of key-value pairs will be generated, and MapReduce internally collects key-value pairs with the same key value. The assembled key-value pairs will be sent to the reduction stage for processing. Users also define the Reduce function according to their own needs, complete the aggregation of data and the induction of key-value pairs with the same key value, obtain the required small amount of data, and output the desired key-value pair result.

When the mapping process performs data processing work, the input data will be divided into several blocks (assuming m blocks), and then these small data blocks will be reasonably allocated to the machine to complete the work task. If these machines are regarded as nodes, the data will be processed in parallel by these nodes to complete the tasks of

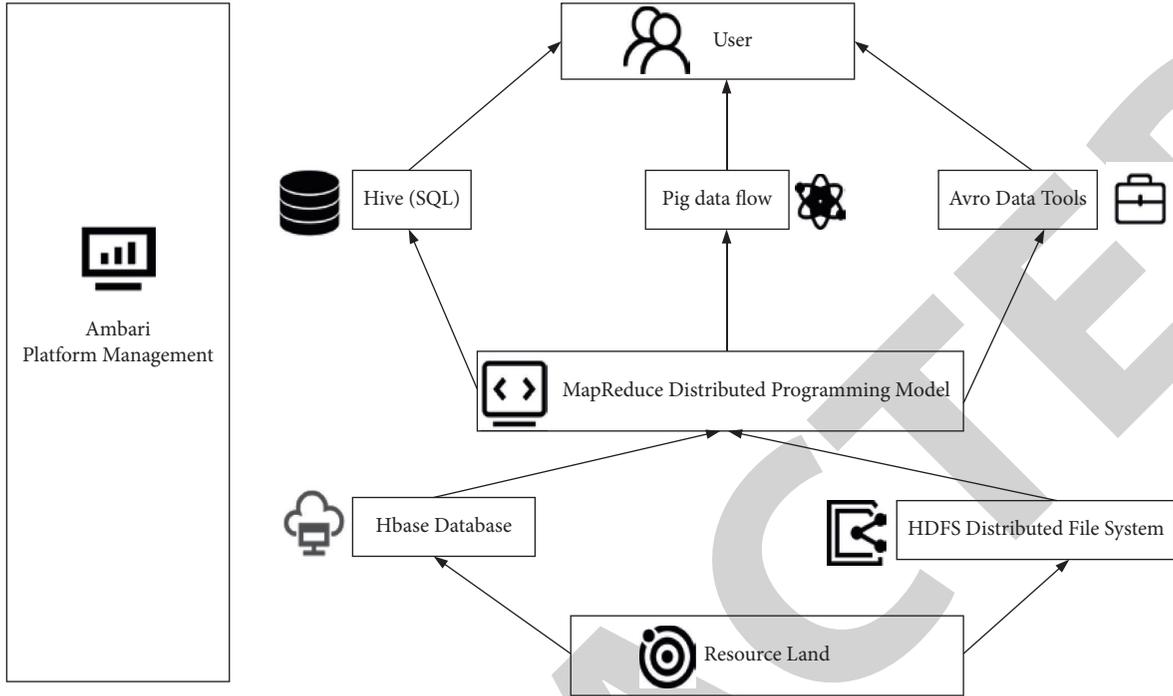


FIGURE 4: Hadoop platform architecture.

the mapping stage. The reduction stage will also reasonably divide the input data into several blocks (assuming r blocks) and also complete the tasks of the reduction stage through the parallel processing of nodes.

3.2. *Mobile Big Data.* Mobile big data refers to data sets whose size exceeds the acquisition, storage, management, and analysis capabilities of typical database software. The big data value chain can be divided into four stages: data generation, data collection, data storage and data analysis. Data analysis is the last and the most important stage of the big data value chain, the realization of big data value, and the basis of big data application. Analysis of data sets in different domains may yield different levels of potential value.

In the era of big data, people’s way of thinking will change. First, people process data from sample data to full data. Second, because it is full data, people have to accept mixed data and give up the pursuit of accuracy. Third, to deal with big data, humans must focus on correlation, not causality. Finally, data is regarded as an important asset, and by mining the value of data the foundation and value chain of value creation can be changed. The change in the way of thinking about big data plays a leading role in the subsequent development and utilization of the entire big data.

Data migration (Figure 5):

$$K(\omega) = K(\omega - 1) + \eta * \epsilon t_{\omega-1, \omega} + \gamma. \quad (1)$$

Thus,

$$\epsilon t_{\omega-1, \omega} = t_{\omega} - t_{\omega-1}. \quad (2)$$

The conclusion:

$$K(\omega) = \begin{cases} 0, & \omega = 0, \\ \min\{B(\omega), K(\omega - 1) + \eta * \epsilon t_{\omega-1, \omega} + \gamma\}, & 1 \leq \omega \leq n. \end{cases} \quad (3)$$

Define

$$\delta(\omega) = \{j | \rho(j) < \rho(\omega) \leq j < \omega\}. \quad (4)$$

There are two situations in which the Caching operation is used to serve

$$\tau = \begin{cases} 0, & \delta(\omega) = 0 \\ \max\{\delta(\omega)\}, & \text{otherwise} \end{cases}. \quad (5)$$

The first case of using the Caching operation to serve

$$B(\omega) = K(\rho(\omega)) + \eta \lambda_{\omega} + C_{\omega-1} - C_{\rho(\omega)}. \quad (6)$$

The second case of using the Caching operation is to serve

$$B(\omega) = B(\tau) + \eta \lambda_{\omega} + C_{\omega-1} - C_j. \quad (7)$$

Its cost:

$$B(\omega) = \begin{cases} \infty & -r \leq \omega \leq 0 \\ \min \left\{ \begin{aligned} & K(\rho(\omega)) + \eta \lambda_{\omega} + C_{\omega-1} - C_{\rho(\omega)} \\ & \min_{\tau \in \delta(\omega)} \{ B(\tau) + \eta \lambda_{\omega} + C_{\omega-1} - C_{(j)} \} \end{aligned} \right\}. \end{cases} \quad (8)$$

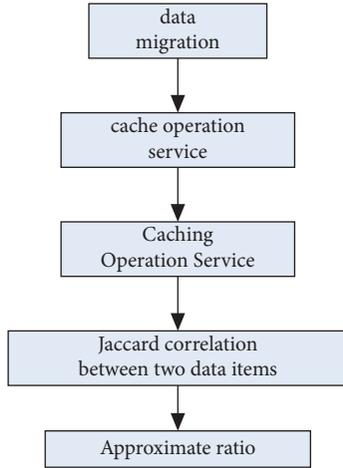


FIGURE 5: Data migration flowchart.

Indicators of whether the system load is balanced:

$$\alpha = \frac{\text{ave}\{1_{\omega}: 0 \leq \omega \leq r\}}{\max\{1_{\omega}: 0 \leq \omega \leq r\}} \quad (9)$$

Cost model:

$$K_{mm}^p = \begin{cases} (t_n - t_m) * \eta + \delta\gamma, & t_n > t_m, \\ +\infty, & \text{otherwise.} \end{cases} \quad (10)$$

The final optimization goal:

$$\phi^*(i) = \arg \min(\cos(\phi(i))), \quad \phi(i) \in \prod(i), \quad (11)$$

$\cos(\phi(i))$ definition:

$$\cos(\phi(i)) = \sum_{n=1}^i \cos t(s_n) = \sum_{n=1}^i \sum_{m=1}^{|K_n|} \cos t(a_m). \quad (12)$$

Correlations between data items:

$$D(m, n) = \begin{cases} d_{mn} \in [0, 1], & m \neq n \\ 1, & m = n \end{cases}. \quad (13)$$

Jaccard correlation between two data items:

$$J(am, an) = \frac{|a_m \cap a_n|}{|a_m \cup a_n|} = \frac{|(a_m, a_n)|}{|a_m| + |a_n| - |(a_m, a_n)|}. \quad (14)$$

Approximate ratio analysis:

$$\begin{aligned} K_{1opt} &\leq K_1^*, \\ K_{2opt} &\leq K_2^*, \\ K^* &= \beta(K_1^* + K_2^*) \geq \beta(K_{1opt} + K_{2opt}). \end{aligned} \quad (15)$$

The conclusion:

$$\frac{K_{1g}}{K_{1opt}} \leq \frac{K'_{1g}}{K'_{1opt}} \leq \frac{2i'\gamma}{i'\gamma} = 2. \quad (16)$$

So,

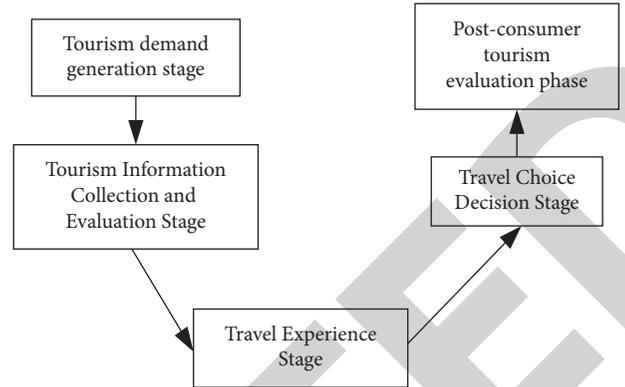


FIGURE 6: Schematic diagram of tourist consumer's consumption behavior.

$$\begin{aligned} K_{1g} &\leq 2K_{1opt}, \\ K_{2g} &\leq 2K_{2opt}. \end{aligned} \quad (17)$$

3.3. Behavior of Sports Tourism Consumers. Sports tourism refers to the travel behavior that consumers leave their place of residence for the main purpose of participating in sports or participating in sports-related activities.

The tourism consumer behavior of sports tourism (as shown in Figure 6) is the personal characteristics of the consumer and the whole process of consumers' acquisition and decision-making of sports tourism information in a city before traveling, all consumption activities in the process of traveling, and reviews and recommendations after the trip. Through the review and integration of literature, tourism consumption can be divided into five categories according to different ways of definition: from the definition of the main consumer, it can be divided into individual consumption combination, family consumption combination, and group consumption combination according to the combination form. Defined from the perspective of the main body of sports tourism participating in consumption, it is mainly to explore the basic characteristics of consumers, such as residence, age, occupation, and education. From the division of sports tourism consumer consumption content, the tourism consumption structure can be divided into six aspects, namely, catering, residence, transportation, sports activities, and shopping. From the classification of sports tourism consumption objects, it can be divided into three consumption structures, which are to satisfy material consumption, labor consumption, and spiritual consumption. Material consumption belongs to tangible consumption, which mainly covers the survival needs of consumers, such as dining consumption, housing consumption, and transportation consumption. The consumption of labor services belongs to intangible consumption, which mainly includes various services in the process of participating in sports tourism, such as coaching services for sports projects, tour guide services, accommodation and catering services, and transportation services. Spiritual consumption also belongs to intangible consumption, mainly including the

appreciation of natural scenery in the process of sports tourism, the experience of folk culture, such as the experience of sports, and the spiritual and physical enjoyment in the experience process. Material consumption, labor consumption, and spiritual consumption will accompany the whole process of sports tourism. According to the internal needs of sports tourism consumers, it can be divided into basic survival consumption, experience enjoyment consumption, and in-depth development of consumption.

The research methods of this paper on the consumption behavior of tourism consumers are as follows:

This paper conducts a survey on the tourist attractions that offer sports tourism products in X city. Through field inspections of the tourist attractions, we can intuitively feel the local unique geographical and humanistic characteristics, gain an in-depth understanding of the local sports tourism resources, and experience the local sports tourism products in person. This paper investigates, interviews, and distributes questionnaires to managers, operators of sports tourism products, and consumers who participate in sports tourism, so as to comprehensively understand the consumption of sports tourism resources, products, and participants.

3.3.1. Documentation Law. In the early stage of the research, this paper collected a large number of domestic and foreign literatures related to sports tourism, sports tourism products, sports tourism resources, and tourism consumer behavior through the Internet. After sorting and analysis, the research purpose, method, process, and conclusion of 21 foreign literature and 36 domestic literature are summarized to provide theoretical support and practical basis for the design research and empirical analysis of this paper.

3.3.2. Questionnaire Survey Method. This questionnaire mainly investigates the consumption behavior of the consumers who participate in the characteristic sports tourism in a city during the process of participating in the sports tourism. By means of questionnaires, we investigate consumer characteristics, consumer decision-making behavior, consumer experience preferences, and consumer evaluations of product marketing and then analyze the influencing factors of consumers in the consumption process.

According to the research content of this paper, a total of 10 experts (5 professors and 5 associate professors) were distributed to conduct a survey on the consumer behavior of sports tourism in a city to test the validity of the questionnaire. According to the table, the results of the expert validity test value indicate that the questionnaire is highly efficient and reasonable and can be distributed, as shown in Table 1.

3.3.3. Interview Method. By interviewing 4 managers, 9 operators, 26 sports tourism consumers, and 11 travel agency practitioners operating sports tourism products in a city's sports tourism market, it comprehensively analyzes consumer characteristics, consumer decision-making behavior, consumer experience preferences, and evaluate the

development of product marketing and sports tourism market, including resource development, product design, and marketing. This paper combines the relevant research theory and practice and analyzes the characteristics and influencing factors of sports tourism consumption behavior in a microscopic view, so as to provide consumers with favorite sports tourism products. It further analyzes the overall situation of a city's sports tourism development from a macroperspective and puts forward targeted opinions.

3.3.4. Mathematical Statistics. The recovered questionnaire data is input and analyzed through EXCEL software and SPSS17.0 software, the proportion of data is counted, the laws in the data are explored, and the data is presented in the form of a table, which provides a basis for the research on consumer behavior of sports tourism in a city.

The characteristics of natural resources of a city's sports tourism products are as follows:

By visiting and investigating tourist attractions in a city and interviewing operators and managers, the geographical landforms and climatic environment of tourist attractions are investigated, and then the characteristics of the content of sports tourism products developed by relying on natural resources are studied.

Coastal sports tourism: seafood products are more abundant, and the characteristics of seafood products are more obvious. The content of sports activities: one is boat fishing and shore fishing sports tourism activities that people can personally participate in; the other is to experience fishing activities, such as picking up shells and pulling nets for fish, for consumers to experience fishery-specific sports activities. The third is beach leisure activities, mainly swimming and beach sports.

Golf sports tourism: the golf course is built by mountains and rivers, with beautiful scenery and beautiful environment. It is a sports tourism product integrating competition, leisure, entertainment, and conference.

Ski sports tourism: the difficulty of the ski trails is relatively simple. There are 1.6 kilometers of ski trails and 1.3 kilometers of ropeways. On the snow-making facilities, there are two large snow-making machines, which can meet the daily snow-making requirements of the ski resort.

Outdoor sports and sports tourism: featured sports tourism products include rock climbing, forest crossing, orienteering, mountaineering, fishing, outdoor camping, rafting, and mountain biking.

In the investigation of the operation of a city's sports tourism consumption market, through the method of on-the-spot investigation, the sports tourism scenic spots were visited and personally experienced. The managers, operators, and consumers of the sports tourism market are interviewed through the interview method. Through the investigation, it was found that the following problems existed in the operation of the sports tourism market in X city:

(1) *Insufficient Integration with Local Characteristics in Product Development.* According to field research and consumer interviews, at present, the development of sports

TABLE 1: Expert inspection of questionnaire validity.

Questionnaire design	Total	Reasonable	More reasonable	General	Unreasonable	Very unreasonable
Questionnaire as a whole	10	6	4	0	0	0
Questionnaire structure	10	5	5	0	0	0
Questionnaire content	10	7	3	0	0	0

tourism products in a city only stays in the two aspects of sports and tourism. The sports tourism products developed relying on the natural resource endowment characteristics can be combined with the unique natural resources of a city. However, the development of the cultural resource endowment of sports tourism products is insufficient, and the integration of regional characteristic culture and sports tourism products is insufficient. It is necessary to further excavate its cultural connotation, highlight local characteristic culture, and form sports tourism products with distinctive regional characteristics.

(2) *The Management Level Needs to be Improved.* According to the interviews with sports tourism consumers, there are certain defects in the operation and management of sports tourism in a city. In terms of the employment system, local residents or family members are mostly selected, and there is a lack of professional service personnel and management personnel with sports knowledge. There is no uniform standard for the price setting of sports tourism products, and operators will adjust the price at will according to the number of tourists. In the process of handling complaints of sports tourism consumption, the methods to solve the problems are relatively random, and there is no systematic and standardized management system as a basis. The consumption experience of sports tourism consumers is not paid enough attention, and the brand image of local sports tourism products is lacking. On the whole, the sports tourism in a city objectively only focuses on short-term benefits and lacks long-term development plans. It is urgent to establish long-term development goals and development strategies for sports tourism in a city.

(3) *The Product Promotion Channel of Sports Tourism Is Single.* According to the interviews with sports tourism managers, the promotion efforts, channels, and methods of sports tourism products in a city have been improved. At the same time, according to consumer interviews, it was learned that some consumers' sources of news were based on word of mouth, or consumers in the circle introduced each other. This leads to the lack of initiative in the promotion of sports tourism information, which affects the popularity of some sports tourism products, such as sea fishing, orienteering, and outdoor crossing, which are very local sports tourism products.

(4) *The Basic Supporting Facilities Are Not Perfect.* According to the interviews with sports tourism managers, in the process of developing sports tourism resources in X city, due to lack of funds, the original sports tourism products have been updated slowly, lacking freshness and attractiveness to

consumers. Traffic carrying capacity is limited, and traffic congestion is more serious during holidays or when a large number of consumers travel together. According to the interviews with sports tourism consumers, there are also certain problems with the basic supporting facilities of sports tourism. The hotel and restaurant facilities are old, and the consumer experience is not ideal. There are few recreational facilities related to scenic spots, insufficient tourism, and entertainment products other than sports activities and single consumption content.

(5) *Weak Awareness of Resource Protection.* According to the interviews with sports tourism managers, with the continuous expansion of the sports tourism market in a city, the development and utilization of sports tourism resources and the process of consumers participating in sports tourism have had a certain impact on the natural environment of a city. For example, in outdoor sports and sports tourist attractions, in order to expand the area of the tourist attractions, forests are indiscriminately cut down. During the operation of coastal sports tourism, the number of consumers continues to increase, and there are phenomena such as overfishing and marine debris.

4. Behavior of Sports Tourism Consumers

For 5 sports tourist attractions in a city, on-site paper questionnaires and on-site electronic questionnaires are distributed and recycled. A total of 950 questionnaires were distributed, and 889 valid questionnaires were recovered, with a recovery rate of 94%.

The statistical analysis diagram of consumer age characteristics is shown in Figure 7(a). Figure 7(b) shows the statistical analysis diagram of consumers' educational level.

Figure 7(a) shows that there are 27 consumers under the age of 14, accounting for 3.04%; there are 191 consumers between the ages of 15 and 24, accounting for 21.48%. There are 291 consumers who aged 25 to 34, accounting for 32.73%. There were 225 consumers who aged 35 to 44, accounting for 25.31%; 119 consumers aged 45 to 64, accounting for 13.39%; and 36 consumers were over 65, accounting for 4.05%. Among them, sports tourism consumers between the ages of 25 and 34 accounted for the highest proportion, while consumers under the age of 14 accounted for the least, and the number of consumers in other age groups was not much different. It can be seen that the consumers of the sports tourism market in a city are mainly young and middle-aged people. Figure 7(b) shows that consumers are mainly concentrated in the groups with undergraduate and junior college degrees.

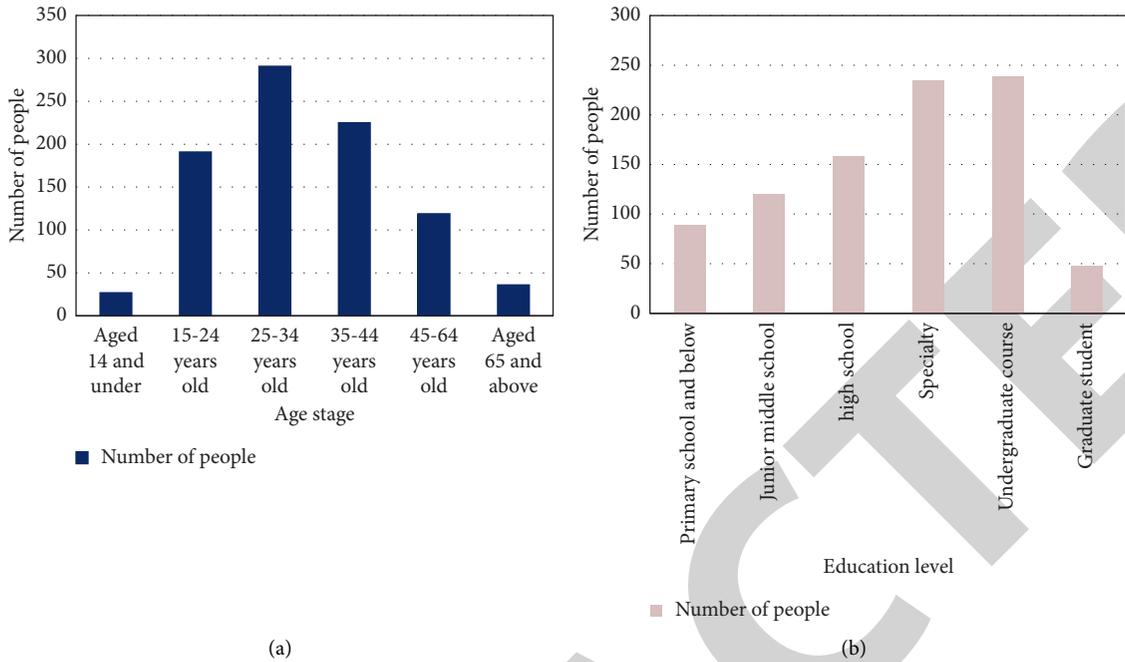


FIGURE 7: Statistical (a) analysis of (b) consumer situation.

The statistical analysis table of factors influencing sports tourism consumer participation time is shown in Table 2.

It can be seen from Table 2 that the sports tourism market of a city should pay full attention to the time period of national statutory holidays.

The statistical analysis diagram of the occupational characteristics of consumers is shown in Figure 8(a). The statistical analysis diagram of consumer income characteristics is shown in Figure 8(b).

Figure 8(a) shows that there are 62 government workers, accounting for 6.97%, 139 teachers/doctors, accounting for 15.65%, and 97 skilled workers, accounting for 10.91%. There are 198 business personnel, accounting for 22.27%, 123 service personnel, accounting for 13.84%, and 96 students, accounting for 10.80%. Figure 8(b) shows that there are 50 consumers with an income below 1,000 yuan, accounting for 5.62%; there are 98 consumers between 1,001 and 3,000 yuan, accounting for 11.02%. There are 164 consumers in the stage of 3001 to 5000 yuan, accounting for 18.45%. There are 318 consumers in the stage of 5,001 to 7,000 yuan, accounting for 35.88%; there are 165 consumers in the stage of 7,001 to 10,000 yuan, accounting for 18.56%. There are 93 consumers with more than 10,001 consumers, accounting for 10.46%. Consumers with income in the 5001–7000 yuan stage accounted for the largest proportion, indicating that sports tourism in a city is more popular among middle- and high-income groups.

The statistical analysis table of the stay time of sports tourism consumers in destinations is shown in Table 3.

It can be seen from Table 3 that most consumers who participate in sports tourism will stay in a city for 3 to 4 days.

The statistical analysis diagram of sports tourism consumer information sources is shown in Figure 9(a).

TABLE 2: Statistical analysis table of influencing factors of consumer participation time in sports tourism.

Participation time	Number of people	Proportion (%)
Leisure time	275 people	30.93
Weekend	418 people	47.02
Personal leave	255 people	28.68
National statutory holidays	508 people	57.14
Winter and summer vacation	275 people	30.93

Figure 9(b) shows the statistical analysis diagram of sports tourism consumers' travel motivation.

Figure 9(a) shows that there are 534 consumers who choose the recommendation of relatives and friends to obtain information, accounting for 60.07%; there are 557 consumers who choose the Internet to obtain information, accounting for 62.65%. There are 424 consumers who choose TV/radio to obtain information, accounting for 47.69%. There are 228 consumers who choose newspapers/magazines to obtain information, accounting for 25.65%; there are 445 consumers who choose travel agencies to obtain information, accounting for 50.06%, and 15 consumers who choose other channels to obtain information, accounting for 1.69%. Among them, consumers who obtained sports tourism information in a city through the Internet accounted for the largest proportion. Figure 9(b) shows that 483 consumers are motivated to experience sports tourism, accounting for 54.33%; 472 consumers are motivated to relax their mind and body/relieve stress, accounting for 53.09%. There are 359 consumers who are motivated by enhancing friendship, accounting for 40.38%; 411 consumers are motivated by exercise, accounting for 46.23%.

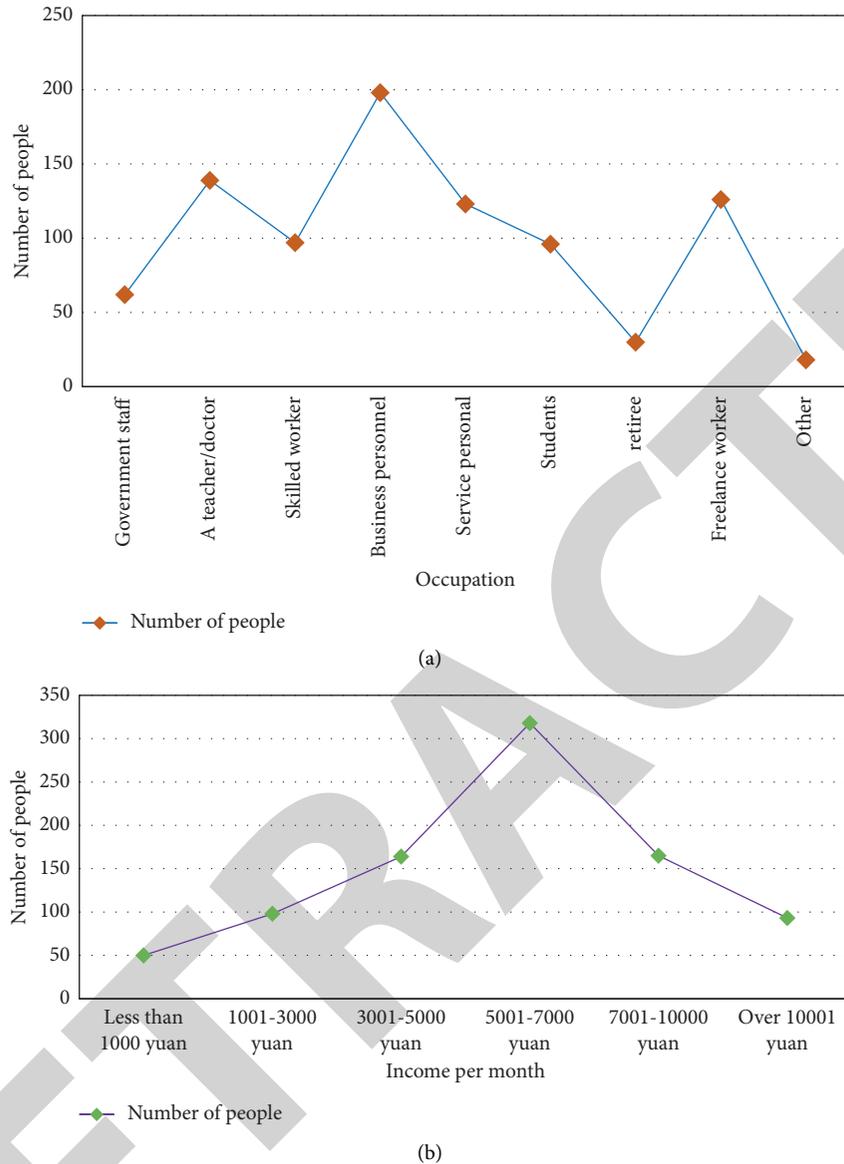


FIGURE 8: Statistical (a) analysis of (b) consumer situation.

TABLE 3: Statistical analysis table of destination stay time of sports tourism consumers.

Stay days	Number of people	Proportion (%)
Less than a day	108 people	12.15
1-2 days	345 people	38.81
3-4 days	389 people	43.76
More than 5 days	57 people	6.41

There are 317 consumers who are motivated by team/company organizing sports tours, accounting for 35.66%; 176 consumers are motivated by visiting relatives and friends, accounting for 19.8%. Sports tourism consumers in a city mostly take the experience of sports tourism as the main travel motive.

The statistical analysis table of travel season preference of sports tourism consumers is shown in Table 4. The statistical

analysis table of the main consumption structure of sports tourism consumers is shown in Table 5.

Figure 10(a) shows the statistical analysis diagram of sports tourism consumers' preference for main travel modes. Figure 10(b) shows the statistical analysis chart of sports tourism consumers' accommodation preferences.

Figure 10(a) shows that the most consumers choose to travel by car. Figure 10(b) shows that 197 consumers choose homestays, accounting for 22.16%; 157 consumers choose chain hotels, accounting for 17.66%. There are 141 consumers who choose hotels, accounting for 15.86%; 135 consumers choose hotels in scenic spots, accounting for 15.19%. There are 112 consumers who choose star-rated hotels, accounting for 12.06%; 71 consumers choose relatives and friends' homes, accounting for 7.99%. There are 54 consumers who choose RVs, accounting for 6.07%; 22 consumers choose tents, accounting for 2.47%. In terms of

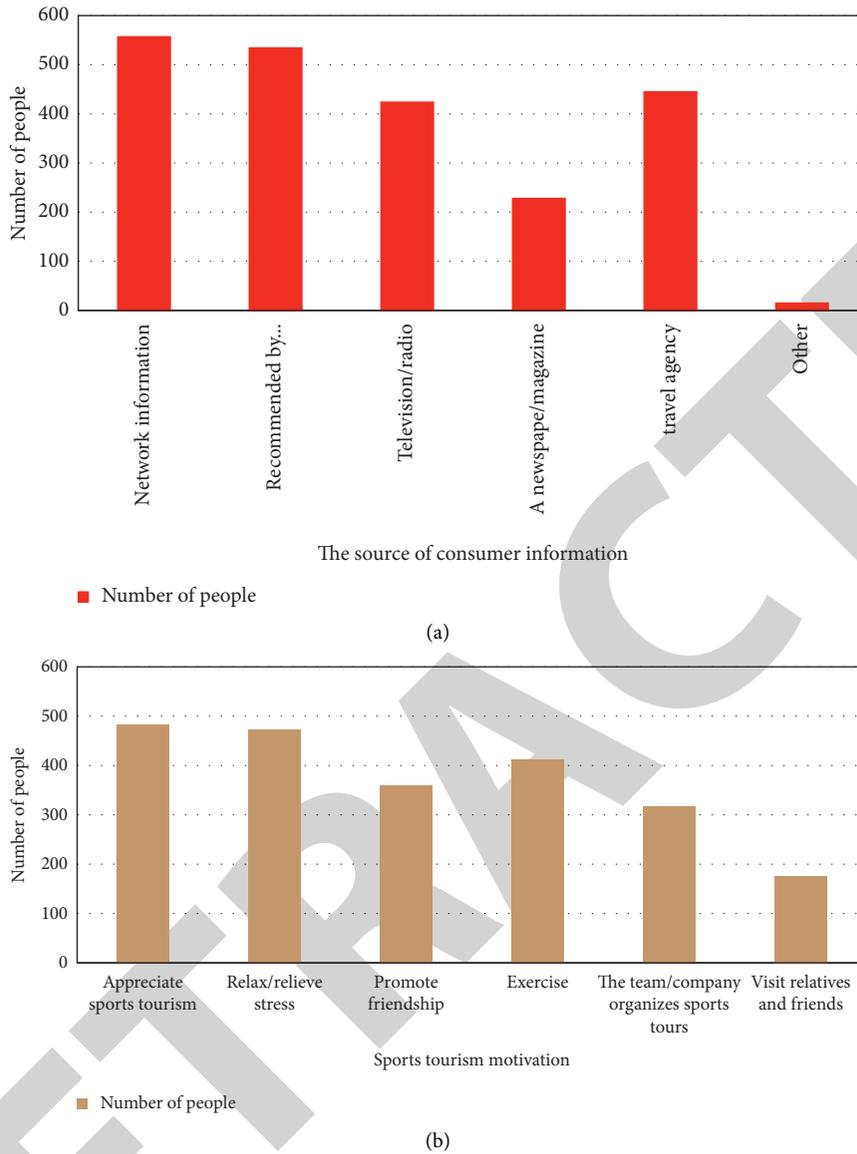


FIGURE 9: Analysis of decision-making, (a) behavior of sports tourism, and (b) consumers in X city.

TABLE 4: Statistical analysis table of sports tourism consumers' travel season preference.

Seasons	Number of people	Proportion (%)
Spring	746 people	83.91
Summer	801 people	90.10
Autumn	458 people	51.52
Winter	342 people	38.47

accommodation, most consumers who participate in sports tourism in a city will choose homestays.

5. Discussion

The government, sports management department, and tourism management department should play a leading role in the development and operation of a city's sports tourism market. While supporting and maintaining the steady development of the sports tourism market, relevant

TABLE 5: Statistical analysis of the main consumption structure of sports tourism consumers.

Main consumption items	Number of people	Proportion (%)
Sports activities	289 people	32.51
Transportation	342 people	38.47
Accommodation	317 people	35.66
Dining	182 people	20.47
Shopping	157 people	17.66
Entertainment	129 people	14.51
Other	75 people	8.44

management regulations should be issued in conjunction with various management departments to enable them to perform functions such as supervision and service and to guide and regulate the comprehensive development of a city's characteristic sports tourism industry. Guiding investment and development direction improve infrastructure

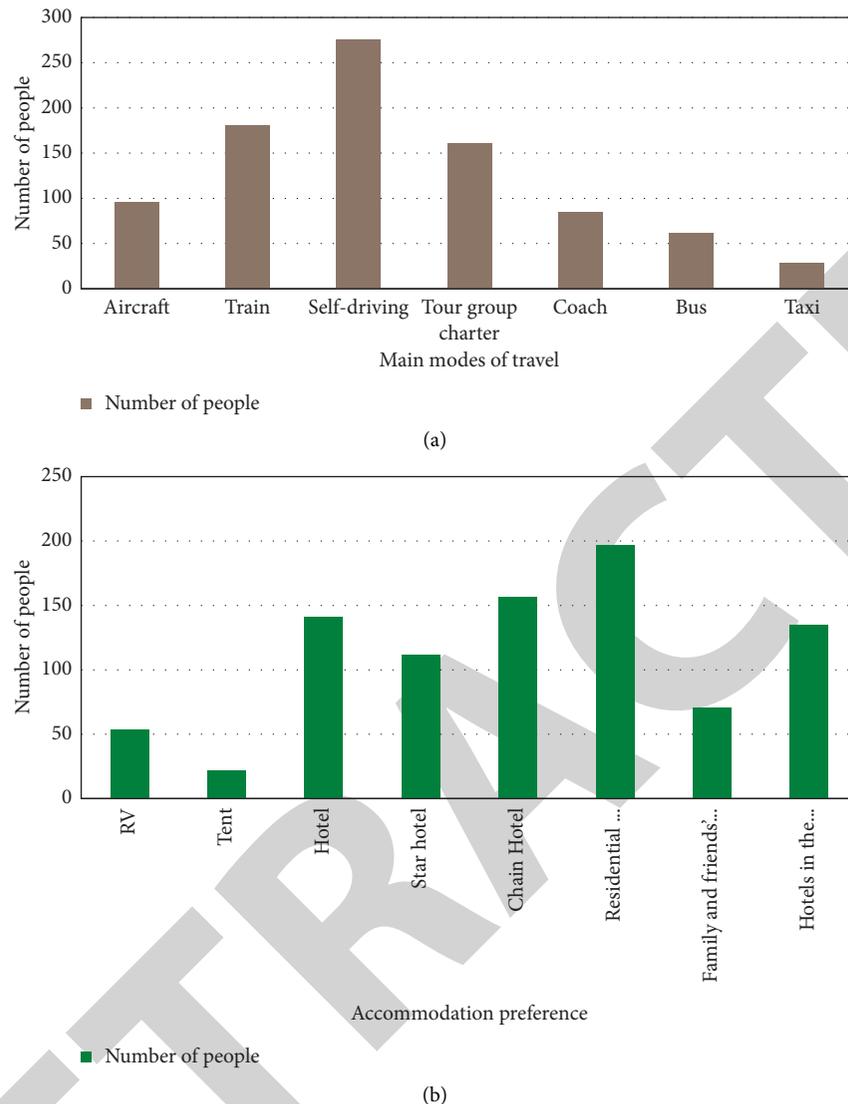


FIGURE 10: Analysis of (a) consumers' experience and (b) preference of sports tourism in a city.

construction, give full play to the important role of travel agencies and related associations, improve the management level of a city's sports tourism market, and maintain and promote the healthy and harmonious development of the sports tourism market. They should further clarify the ecological protection responsibilities of local leaders and managers and formulate a lifelong accountability mechanism, so as to manage the managers and operators of sports tourism and promote the rational development and sound development of sports tourism resources. In the process of developing sports tourism resources, attention should be paid to the degree and scope of development; the number of people in scenic spots should be appropriately controlled during the operation process, and the guidance of consumers' environmental protection concepts should be strengthened to avoid environmental pollution.

Cloud computing essentially increases the speed of data processing and reduces the cost of data processing. Mobile big data has become an important source of big data.

6. Conclusion

Through on-the-spot inspection of X city's sports tourism market and interviews with managers, operators, and consumers, combined with the data analysis of consumer questionnaires, the conclusions are drawn on the basis of focusing on analyzing the consumption situation of sports tourism consumers in a city and the current situation of the sports tourism market in a city. The status quo of a city's sports tourism market is that sports tourism resources are rich in content, numerous products, and prominent regional characteristics. However, the integration of product development and local characteristics is insufficient, failing to highlight local characteristics. The management level of sports tourism products needs to be improved, and there is a lack of professional service personnel and management personnel with sports knowledge; during the development and operation of sports tourism products, the awareness of resource protection is weak. This research is not proficient in

the application of cloud computing and mobile big data. Although the behavior of sports tourism consumers has been successfully analyzed and studied, it can actually save a lot of money in the application of technology less time.

Data Availability

No data were used to support this study.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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