INDERSCIENCE PUBLISHERS
Linking academia, business and industry through research

International Journal of Data Science

ISSN online: 2053-082X - ISSN print: 2053-0811
https://www.inderscience.com/ijds

Design of smart tourism information resource management system based on GIS and big data technology

Xiaoming Gong

DOI: 10.1504/IJDS.2025.10072775

Article History:

Received:	14 April 2025
Last revised:	19 June 2025
Accepted:	03 July 2025
Published online:	16 January 2026

Design of smart tourism information resource management system based on GIS and big data technology

Xiaoming Gong

School of Aviation Services and Tourism Management,
Guilin University of Aerospace Technology,
Guilin, 541000, Guangxi, China
Email: kong_pyc@163.com

Abstract: With the rapid growth of residents' disposable income, demand for tourism has surged, exposing critical challenges in the traditional tourism industry. A major issue is the inability of scenic spots to market tourism projects according to tourists' characteristics and preferences, resulting in resource waste and hindering sustainable development. To address these challenges, this study aimed to design a smart tourism information resource management (IRM) system based on geographical information system (GIS) and big data (BD) technology. The intelligent tourism IRM system was developed by integrating tourism information collection with GIS and BD technologies. To evaluate its effectiveness in solving industry pain points and improving scenic spot revenue, 10 well-known scenic spots with an annual passenger volume exceeding 10 million were selected for comparative analysis. The evaluation focused on three key metrics: annual tourist reception, service satisfaction, and total annual revenue.

Keywords: smart tourism; IRM; information resource management system; GIS; geography information system; big data; visitor satisfaction.

Reference to this paper should be made as follows: Gong, X. (2025) 'Design of smart tourism information resource management system based on GIS and big data technology', *Int. J. Data Science*, Vol. 10, No. 7, pp.154–170.

Biographical notes: Xiaoming Gong is a Lecturer in Guilin University of Aerospace Technology. She received her Bachelor's degree from Xiangtan University, her Master's degree from IPAG Business School in Paris. Her research interest includes study travel and tourism resources development.

1 Introduction

Per capita disposable income continues to rise, and more and more people are spending a portion of their income on out-of-town travel programs. At the same time, tourists put forward more requirements for the service level and service quality of each scenic spot, which is also a great challenge to the management ability of the scenic spot. For tourists, the inability to understand the real-time passenger flow in the scenic spot, the difficulty and time-consuming parking in the scenic spot, and the inconvenient accommodation in the scenic spot not only waste the valuable travel time of tourists but also increase the

travel cost of tourists. Ultimately, these are the reasons for the poor travel experience of tourists. For scenic spots, if they do not understand the preferences and characteristics of tourists, the seller's market based on what tourists have to consume, and the function of tourism products is relatively single, it would result in a great discount in tourists' evaluation of the scenic spots, and would also result in resource waste of the scenic spots. As the per capita disposable income of residents increases, tourism demand surges. The traditional tourism industry lacks an understanding of tourists' characteristics and preferences, resulting in a waste of resources and poor service quality. It is urgent to build a smart tourism information resource management (IRM) system based on geographical information system (GIS) and big data technology to achieve sustainable development. Therefore, to make tourist attractions more diversified and improve the tourist experience, the construction of an intelligent tourism information management system is crucial. In the design of a smart tourism information management system, GIS and BD technology can not only provide one-stop solutions for tourists' outbound travel but also improve the management level and efficiency of tourist attractions. More importantly, it can create more tourism benefits for tourist attractions and help the healthy development of tourism.

With the continuous expansion of the outbound tourism market and residents' tourism demand, the design of an intelligent tourism IRM system has become the focus of many researchers. Almaimoni (2018) designed and implemented an intelligent information platform so that tourists can obtain relevant information about tourist places, such as locations, restaurants, and activities. Research showed that the tourism system would be able to accurately provide relevant services in line with tourists' preferences according to the information provided. By investigating tourists' perception of the attributes of the intelligent tourism information system, Shin et al. (2021) found that these attributes would affect their perception of the tourism destination and enhance their future behavioural intention of the destination, thus reducing the time spent by tourists on information search. Jovicic (2019) conducted a comparative study of the USA and South Korea based on smart tourism and found that the information provided by the smart tourism system has a positive impact on the satisfaction of tourists. Based on the technical attributes of smart tourism and destination services, Um and Chung (2021) used a structural equation model to study how smart tourism satisfaction and service satisfaction affect the overall satisfaction of smart tourism cities. The research results showed that the technical attributes of smart tourism have a positive impact on the satisfaction of smart tourism in all cities. Although most tourist attractions have online tourism information management systems, they are not intelligent or only semi-intelligent. Previous studies have shown that smart tourism systems can enhance tourists' experience and satisfaction and optimise scenic spot management. However, there are still problems such as insufficient intelligence and lack of personalised services. It is necessary to further integrate advanced technologies to achieve comprehensive intelligence.

With the support of computer software and hardware, GIS collects, stores, calculates, analyses, and displays the geographical distribution data related to geographical space, and then establishes a smart tourism information management system through BD analysis and processing and intelligent data mining. Bazazo and Alananzeh (2022) put forward some digital models for managing smart tourism cities by using GIS technology. He found that the establishment of intelligent digital models can provide sustainable management for tourism cities and transform them into competitive smart tourism

destinations, thus giving them the importance of comparative advantage. Cuong and Duy (2021) established a database based on GIS and formed an intelligent tourism ecosystem through the use of information and communication technology. He found that the construction of the smart tourism system can not only provide tourists with high-quality tourism services but also play an important role in the sustainable development of the tourism industry. By demonstrating how BD technology can foster the value-creation process of smart tourism destinations, and applying multiple case studies, Del Vecchio (2018) discussed a series of regional tourism experiences related to southern Europe and destinations. The research showed that BD technology can generate value in smart tourism and create new tourism models and opportunities. Currently, the construction of the tourism industry for the intelligent tourism IRM system is still only in the semi-wisdom degree based on digitalisation. The wisdom tourism IRM system still requires a more detailed design to enhance its wisdom.

To ensure the sustainable and healthy development of the tourism industry, meet the personalised needs of different tourists, and improve the service quality of scenic spots, this paper carried out in-depth research on the design of an intelligent tourism information resources system based on GIS and BD technology. This paper combines GIS and big data technology to design an intelligent tourism IRM system to effectively solve the problems of resource waste and service inefficiency caused by the traditional tourism industry's lack of understanding of tourists' preferences. To verify the effectiveness of the design, in the design practice, this paper took 10 tourist attractions with an annual tourist reception of more than 10 million people as reference objects to design the intelligent tourism information management system. It was evaluated from three aspects: annual tourist reception, service satisfaction, and total annual revenue. The results showed that the smart tourism IRM system based on GIS and BD technology can contribute to the faster and better growth of the tourism industry, and can inject vigorous momentum into the innovation of tourism projects, which has great meaning in solving the pain points of the tourism industry at the present stage.

2 Design and exploration of intelligent tourism IRM system

2.1 Design overview of intelligent tourism IRM system

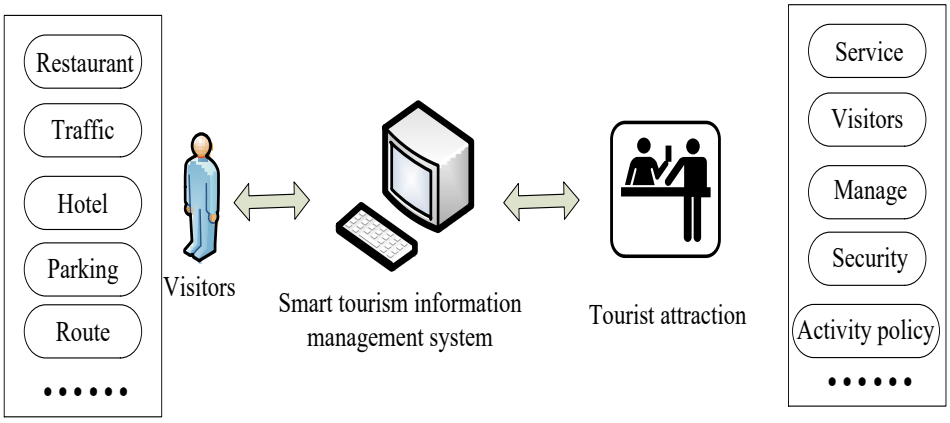
2.1.1 Definition

The establishment of the intelligent tourism IRM system can make tourists stay at home grasp the relevant dynamics of scenic spots, and provide convenience for tourism project activities the first time (Jasrotia and Gangotia, 2018). Moreover, for tourists, access to mobile terminals can not only enable them to experience more high-quality services that are in line with their personal preferences, but also know the traffic conditions near scenic spots, and find places to eat and stay faster (Wang, 2020). For tourist attractions, it effectively integrates the tourist service system and tourist IRM system, which improves the efficiency and quality of tourist management in scenic spots, thus providing better services for tourists. It avoids the blind arrangement of projects that are not in line with tourists' preferences, thus avoiding the waste of scenic resources.

Figure 1 shows the basic composition of the intelligent tourism IRM system and the functions to be realised for tourists and scenic spots. On the left side of Figure 1 are some functions required by the intelligent information resource system from the perspective of

tourists. These functions can be roughly divided into such issues as the route to the scenic spot, the traffic conditions, and the dining, accommodation, parking, and other issues after arriving at the scenic spot. These issues are the primary concerns of tourists to a certain scenic spot and are the primary conditions for tourists to choose to go out. On the right side of Figure 1, the problem is analysed from the perspective of scenic spots. For example, scenic spots need to know the characteristics and preferences of tourists, the age and gender of tourists in advance, and then prepare corresponding tourism services, scenic spot tourism project planning, and scenic spot activity policy preparation according to these characteristics.

Figure 1 Design of intelligent tourism IRM system (see online version for colours)



2.1.2 Characteristics of tourist groups

The most important object to be considered in the design of an intelligent tourism IRM system is the tourist group. It can be said that the tourism industry is a buyer's market, and all tourism projects are developed for tourists. Therefore, in the design of an intelligent tourism IRM system, it needs to completely know the characteristics of tourist groups and cater to various demands of tourists, thus designing an intelligent tourism IRM system that is favoured by tourists and supported by attractions. In this paper, the characteristics of tourist groups are roughly divided into four categories: gender, age, region, and preference of tourists, as shown in Table 1.

From the perspective of tourists' preferences, some tourists may pay more attention to the taste of delicious food, so they may choose those scenic spots famous for delicious food. Some tourists may pay more attention to the aspect of play, so they may choose those scenic spots famous for entertainment. Some tourists may work and live in a noisy environment at ordinary times, so they may choose scenic spots with beautiful and quiet scenery. Some tourists like the places that are bustling, so they may choose the scenic spots that are full of people, singing and laughing. Therefore, care should be taken to segment these different preferences when designing a smart tourism IRM system.

In terms of the gender of tourists, the things that women and men prefer are not the same. In the design of an intelligent tourism IRM system, the difference between men and women should also be noted.

Table 1 Analysis table of tourist group characteristics

Sequence	*Characteristic*	*Item*
1	Sexual distinction	Male
		Female
2	Age	Child
		Juvenile
		Youth
		Middle-aged
		Elderly
3	Area	Eastern Region
		Southern region
		Western Region
		Northern region
		Central Region
4	Interests	Food
		Play
		Quiet
		Boisterous

Table 2 Breakdown of men and women's preferences

Sequence	*Characteristic*	*Points of interest*
1	Male	History
		Culture
		Military
		Sports
2	Female	Romantic
		Shopping
		Delicacies
		Hairdressing

In Table 2, men may be more interested in some hobbies such as history, culture, military, and sports. Therefore, when choosing tourist attractions, male tourists may choose which tourist attractions they should visit according to their interests. If tourists like to study history, they would go to those scenic spots with a sense of history. Similarly, compared with male consumers, women spend significantly more time and money on shopping (Katrodia et al., 2018). Therefore, women are more willing to go to tourist attractions famous for shopping and tourism. For most female tourists, fighting against aging is one of the main reasons that many women spend on beauty every year because appearance is the main way for women to gain and eventually lose their social status (Clarke, 2018). Therefore, they would go to experience the beauty projects set up in tourist attractions, and the attraction of this beauty service project is huge. To sum up, the difference between men and women cannot be ignored in the design of a smart

tourism system. Smart tourism systems and unforgettable tourism experiences for tourists play a very important role in improving tourists' satisfaction and loyalty to tourist attractions. If tourists have unpleasant experiences with smart tourism information systems, they will decide not to use the system and recommend this tourist attraction to other tourists (Azis, 2020).

2.1.3 Demand design of smart tourism system

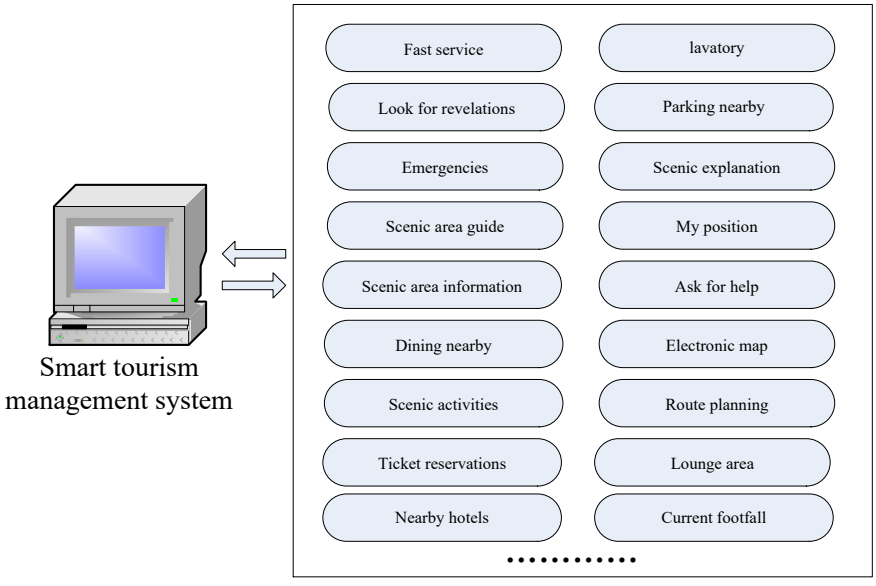
1 *Functionality*

In the design of the intelligent tourism IRM system, the needs of tourists in every aspect should be fully considered, such as their needs for food, accommodation, transportation, travel, shopping, and entertainment, and then these infrastructures should be planned spatially from the perspective of convenience. Therefore, the design from the perspective of function can better meet the actual needs of tourists and improve the experience of tourists. In addition, the smart tourism system can also include ticket reservations, hotel reservations, tourism strategies, and other functions.

2 *Information aggregation capability*

In addition, when designing the smart tourism system, it should also be an information aggregation platform, which means that all supporting information about tourism should be displayed on this smart tourism platform, as shown in Figure 2.

Figure 2 The public service function of smart tourism information system (see online version for colours)



According to Figure 2, this intelligent tourism IRM platform covers various information, such as nearby hotels, ticket booking, nearby parking spaces, nearby meals, route planning, online map, current location, fast services, current traffic information, scenic spot introduction, scenic spot activities, nearby rest areas, and discovery revelation.

Visitors can access the smart tourism system through mobile terminals to realise a one-stop service, which greatly facilitates the various needs of tourists.

3 *Data processing capacity*

The previous discussion is aimed at tourists. As a smart tourism IRM system, it should also be able to help the management and service of scenic spots and feedback on the various data of scenic spots to the scenic spots in real-time, as shown in Table 3.

Table 3 BD content of scenic spots

Sequence	*Data classification*	*Item*
1	Passenger flow monitoring	Passenger flow analysis
		Route analysis
		Tourist behaviour trajectory analysis
		Real-time passenger flow warning
		Daily cumulative passenger flow analysis
		Tourist volume forecast
2	Tourist portrait	The ratio of men to women
		Occupation attribute
		Age structure
		Marital status
		Diet preference
		Income level
		Consumption level
3	Holiday runs	Holiday tourist reception
		Total holiday consumption
		Holiday tourism preference statistics
		Holiday traffic statistics
4	Industrial operation	Tourism assets
		Tourism income
		Industrial value
5	Public opinion information	Hot words of public opinion
		Panoramic comparison of scenic spots
		Analysis of travel motivation
6	Ecology	Water quality
		Air quality
		Temperature data
		Landscape environment
7	External scenic spot sharing	Traffic units
		Weather station
		Communication operator
		Travel-related enterprises

In Table 3, various data of the scenic spot include passenger flow monitoring data, tourist portrait data, holiday operation data, industrial operation data, public opinion information data, ecological environment data, external scenic spot sharing data, etc. In terms of tourist portraits alone, the intelligent tourism IRM system can pass through various scenic spots and tourist sites. For example, public places such as hotels, restaurants, shopping malls, entertainment centers, and parking lots in scenic areas can obtain the ratio of men and women, age structure, marital status, income level, consumption level, hobbies, food preferences, and other tourist portrait data of tourists in the scenic area, and then express them in the form of charts. In this way, it is possible to visualise the situation related to each indicator and provide a reference basis for the development of policies and activities of each scenic spot and local government.

The key point of smart tourism IRM system design is that tourists and scenic spots can benefit from each other. However, due to the non-transparent information of the traditional tourism model, tourists have been criticised for the service of the scenic spots all year round, and tourists have a very unfriendly experience of the scenic spots.

2.2 GIS and BD technology

2.2.1 GIS

GIS provides effective functions for storing, retrieving, analysing, and displaying spatial data. At present, the use of GIS technology has become an essential tool for data management and numerical data analysis and is broadly applied to geomorphological mapping, watershed management, and disaster studies (Asgari, 2021; Lawson-Body et al., 2024). In addition, some scholars have applied this technology to the study of soil erosion assessment in geographical watersheds, thus helping local governments to protect the geographical environment (Mondal and Mandal, 2018; Pham et al., 2018). The application of GIS technology in the intelligent tourism information management system can help the tourism resources management department provide complete data reference and make decision analysis through the system. Tourists can query accurate and real-time tourism information through the database of smart tourism information systems, which provides a relevant reference basis for tourists to formulate tourism strategies. It can help tourist attractions understand the relevant attributes of tourists, to bring more high-quality services to tourists (Fang and Wang, 2024; Wang et al., 2023).

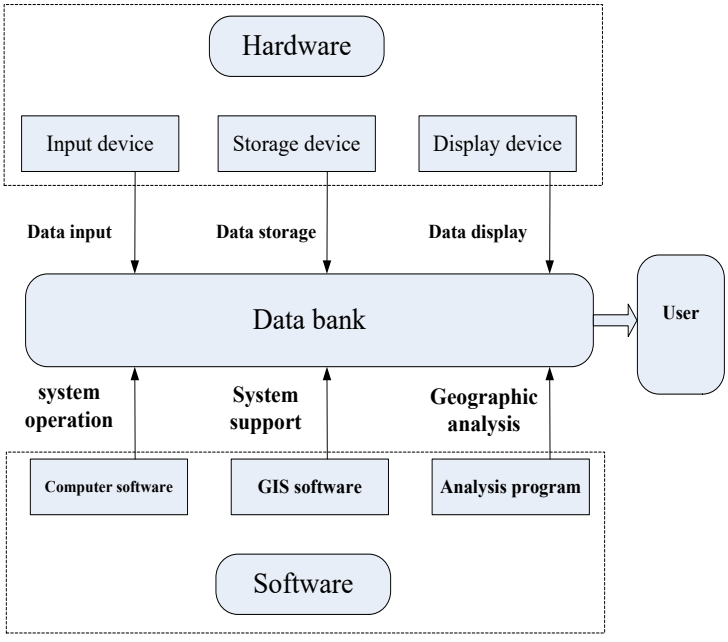
The advantage of GIS technology in this paper is that it can efficiently integrate and analyse spatial geographic data, provide visual management methods for scenic spots, and improve the real-time and accuracy of tourism information. However, its limitation is that it has limited processing capabilities for large-scale dynamic data and is difficult to cope with the needs of high-frequency tourist behaviour data analysis.

Generally speaking, GIS can be roughly divided into four parts, including hardware, software, database, and users, as shown in Figure 3.

In Figure 3, GIS collects various geographic data and information about tourist attractions through hardware, including information data on wireless WiFi, monitoring, access control, network, road, vehicle identification, vehicle dispatching, and other equipment, and then inputs and stores them to establish a database of intelligent scenic spots. After that, with the help of computer system software, GIS software, and application analysis programs, the geographical data of tourist attractions are analysed

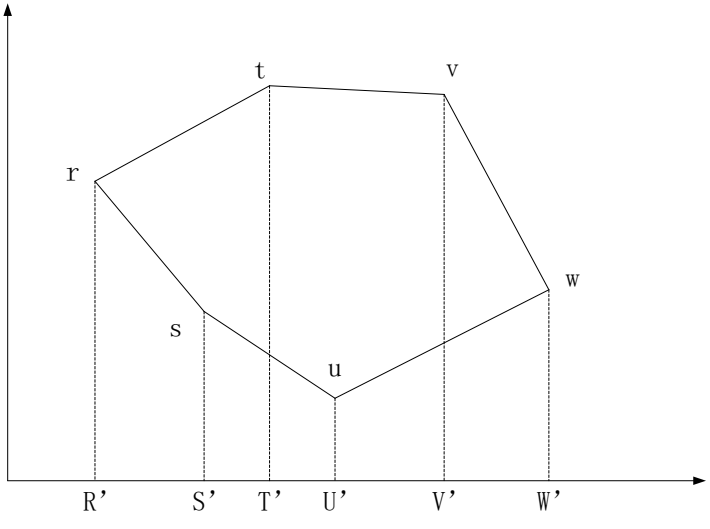
and calculated and finally transmitted to the mobile terminals of tourists and the display screens of tourist attractions through hardware display.

Figure 3 Structure of GIS system (see online version for colours)



In addition, GIS technology can also help with the area calculation, annual rainfall calculation, and tourist density calculation of tourist attractions. Taking the area measurement as an example, the regional map of tourist attractions is shown in Figure 4.

Figure 4 Scenic area



In Figure 4, it is assumed that a scenic area is divided into *m* polygons and the coordinates of each coordinate point are (λ_i, μ_i), then the area calculation process of the scenic area is as follows:

The projection points *R*', *S*', …, *W*' are obtained by projecting each vertex of the polygon to the horizontal axis, thus dividing the scenic spot into *n* irregular trapezoid rsR'S', stS'T',..., vwV'W'. The calculation formula for a trapezoid is:

$$S_{LD} = \frac{\left(A_{tb} + B_{btm}\right) * H}{2} \tag{1}$$

According to Figure 4 and the calculation formula (1) of trapezoid area, the calculation formula of each irregular trapezoid can be listed, and the calculation formula is:

$$S_i = \frac{\left(x_i - x_{i-1}\right) * \left(y_i + y_{i-1}\right)}{2} \tag{2}$$

After adding the area of *n* irregular trapezoidal lands divided by the scenic spots, the total area formula of the scenic spots is:

$$S = \sum_{i=1}^{n} s_i = \sum_{i=1}^{n} \frac{\left(x_i - x_{i-1}\right) * \left(y_i + y_{i-1}\right)}{2} \tag{3}$$

Formula (3) can also be simplified, and the simplified formula is:

$$S = \sum_{i=1}^{n} s_i = \sum_{i=1}^{n} \frac{\left(x_i y_i + x_i y_{i-1}\right) - \left(x_{i-1} y_i + x_{i-1} y_{i-1}\right)}{2} \tag{4}$$

Of course, the area of tourist attractions cannot be negative. Therefore, formula (4) should also take the absolute value, and the result is:

$$A = \left|S\right| = \left|\sum_{i=1}^{n} s_i\right| = \left|\sum_{i=1}^{n} \frac{\left(x_i y_i + x_i y_{i-1}\right) - \left(x_{i-1} y_i + x_{i-1} y_{i-1}\right)}{2}\right| \tag{5}$$

Finally, the total area of tourist attractions is obtained according to formula (5). Through the total area, the tourist density and other data of each scenic spot can also be obtained by counting the number of tourists.

2.2.2 BD technology

The development of BD technology makes it possible to process very massive amounts of data. The application fields of BD technology are very broad, such as e-commerce, finance, transportation, education, and tourism services.

BD technology has powerful data storage and processing capabilities, which can deeply explore tourists' preferences and behaviour patterns and achieve accurate service recommendations. However, this technology relies on high-quality data input. If the basic data is not fully or accurately collected, it may affect the reliability and practicality of the analysis results.

1 *Passenger flow monitoring data*

In the infrastructure construction of smart tourism, many smart devices can record the number of tourists, such as smart ticket gates, smart cameras, scenic spot communication base stations, ticket sales data, and the number of orders from scenic spot merchants. Through the collection of a series of data such as the length of tourist stay and the distribution of tourist flow in the scenic area, it is possible to form a visual data chart for the tourist flow, tourist trend, tourist density, daily reception, tourism project preference and the forecast of tourist reception in the scenic area, and then generate an analysis report of relevant data.

2 *Tourist portrait data*

In addition to the quantitative analysis of the above data, it can also be analysed from the perspective of tourists. For example, specific attributes of tourists can be obtained, such as age, gender, income level, occupation, consumption level, marital status food preference, and some other attributes, to get a portrait of tourists in scenic spots. After that, visual chart data can be generated for the scenic spots to make relevant service adjustments, the introduction of activity policies, the adjustment of traffic dispersion and vehicle delivery by the transportation department, and the commercial project planning of the scenic spots' stores.

3 *Industrial operation data of scenic spots*

It can track and study the operation status of commercial projects in various industries of the scenic spot, the revenue of tourist tickets, the asset evaluation of tourist attractions, the economy of scenic spots, and other data indicators. By taking tourist attractions, restaurants, hotels, and other entertainment places in the scenic area as the data source, and taking the month, quarter, important holidays, and years as the measurement cycle, the relevant chart data and relevant analysis reports are generated, thus building the BD samples of different dimensions such as the scenic area industry health monitoring, tourist density and distribution, and tourism industry statistics.

4 *Ecological environment data*

By installing various intelligent sensors and environmental monitoring equipment inside the scenic area, the monitoring index data of precipitation, air quality, groundwater quality, temperature and humidity, and river water level in the scenic area can be obtained. Through centralised monitoring and management, and relying on BD technology to generate visual charts, the operation of the natural ecological environment of the whole scenic spot can be monitored in a comprehensive and real-time manner, and corresponding protection measures can be taken according to the relevant environmental monitoring indicator data, to truly realise the intelligent management of the scenic spot environment.

5 *Data sharing inside and outside the scenic spot*

The data sharing inside and outside the scenic spot refers not only to the data sharing between the scenic spots but also requires the departments outside the scenic spot to achieve data integration. For example, government departments, transportation

departments, tourism departments, tourism enterprises (catering, hotels, entertainment), and other entities can share data to achieve synergy between the entire tourism industry and supporting industries.

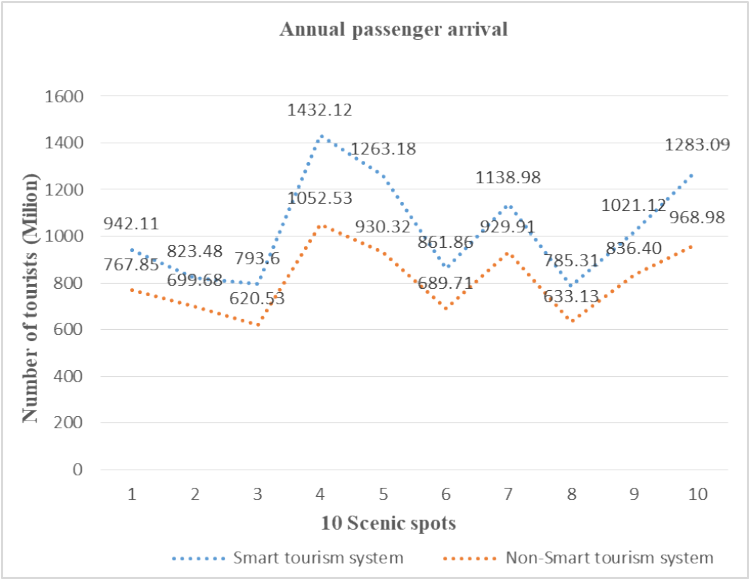
3 Smart tourism information system design experiment

This paper selected 10 tourist attractions of the online intelligent tourism IRM system with an annual passenger volume of 10 million as the experimental data source. The evaluation was made from three aspects: annual tourist reception, tourist satisfaction, and total annual revenue. This paper compared the data before and after the smart tourism IRM system above.

1 *Annual tourist reception*

The annual tourist reception volume of tourist attractions is an evaluation index for evaluating the design effect of an intelligent tourism IRM system. Ten tourist attractions across the country with an annual tourist reception of more than 10 million person-times were compared before and after the launch of the Smart Tourism IRM System. Taking the annual tourist reception as the comparison indicator, the experimental results are shown in Figure 5.

Figure 5 Comparison of annual tourist reception before and after (see online version for colours)



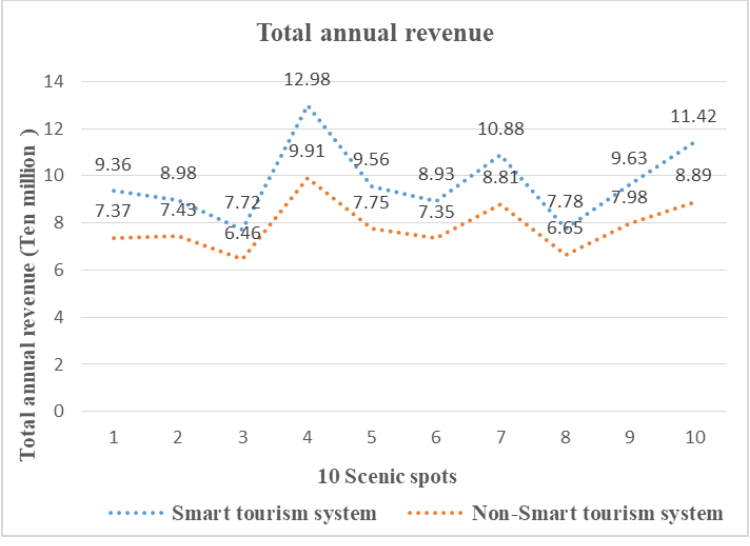
In Figure 5, this paper selected 10 tourist attractions with an annual tourist reception of more than 10 million people and compared the smart tourism IRM system based on online GIS and BD technology with the online smart tourism system. When investigating the annual tourist reception index, it was found that the fourth tourist attraction had the most obvious improvement in improving the tourist reception after the smart tourism information management system was launched, with an annual tourist reception growth

rate of 36.06%. In addition, the fifth and tenth hotels have the highest growth rate of tourists, with 35.78% and 32.42% respectively. The average annual tourist reception growth rate of each scenic spot was 26.61%. From the experimental data, the design of an intelligent tourism information management system based on GIS and BD technology could significantly improve the annual tourist reception of tourist attractions, and the design effect reached the expectation.

2 *Total annual revenue of the scenic spot*

The total annual revenue of the scenic spot reflects the operation status of a scenic spot. This indicator can measure the annual revenue capacity of the scenic spot. The smart tourism system based on GIS and BD technology investigated the total annual revenue of the scenic spot and analysed the effect of the smart tourism system before and after it was launched, so as to examine the effect of the system design. The experimental results are shown in Figure 6.

Figure 6 Comparison of total annual revenue of scenic spots before and after (see online version for colours)



In Figure 6, this paper also examined the annual income of these 10 tourist attractions. After the smart tourism system based on GIS and BD technology was launched, the fourth tourist attraction had the highest total annual revenue, reaching 129.8 million, followed by the seventh and tenth tourist attractions, with total annual revenue of 1.088 billion and 1.142 billion respectively. Among them, the first, fourth, and tenth scenic spots had the highest growth rate of total annual revenue, with 26.95%, 31.01%, and 28.41% respectively. The average growth rate of the total annual revenue of scenic spots was 23.28%. Therefore, the design of a smart tourism system based on GIS and BD technology can significantly improve the total annual revenue of scenic spots.

3 *Tourist satisfaction*

The third evaluation index of smart tourism system design is customer satisfaction. This paper took these 10 scenic spots as the survey object of tourist satisfaction and distributed 1000 questionnaires for each scenic spot from each month of the year. The questionnaire involved various indicators of the scenic spot to survey tourist satisfaction, and each indicator selected would have a corresponding score. The design of the questionnaire is shown in Table 4.

Table 4 Tourist satisfaction questionnaire

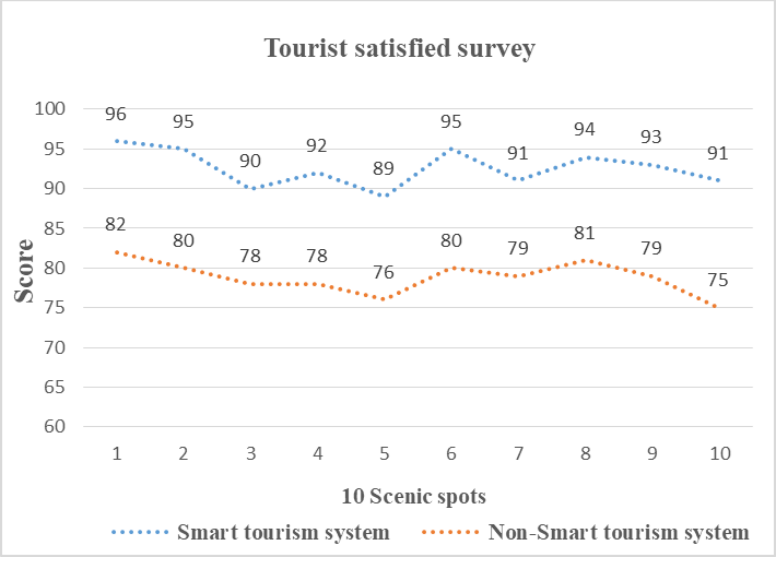
Sequence	*Item*	*Content*	*Score* (100points)
1	Service (50 points)	Visitor Center Services(5points)	
		Ticketing service(5points)	
		Amusement project services(5points)	
		Theme culture display service(5points)	
		Shopping and catering services(5points)	
		Tour transportation service(5points)	
		Deposit parking service(5points)	
		Safety and emergency services(5points)	
		Complaint handling service(5points)	
		Visitor Center Services(5points)	
2	Environment (20 points)	Food Hygiene(5points)	
		Scenic area sanitation(5points)	
		Air quality(5points)	
		Landscape quality(5points)	
3	Convenience (20 points)	Network communication(5points)	
		Convenient parking space(5points)	
		Convenient dining(5points)	
		Convenient accommodation(5points)	
4	Security (10 points)	Public security in the scenic area(5 points)	
		Communication security(5points)	

In Table 4, this paper designed the tourist satisfaction questionnaire from the four aspects of scenic spot service, environmental health, convenience, and safety. The specific indicator score of each aspect was set to a full score of 5 points. Tourists can score each indicator with a value of 0–5 according to their experience. Finally, statistics were made according to 20,000 questionnaires collected before and after the smart tourism system was launched. The specific experimental data is shown in Figure 7.

In Figure 7, this paper obtained the data on tourist satisfaction of each sample through the tourist satisfaction questionnaire. After the smart tourism system based on GIS and BD technology was put online, the first scenic spot had the highest tourist satisfaction, with a tourist satisfaction score of 96, followed by the second, sixth, and eighth scenic spots, with a customer satisfaction score of 95, 95 and 94 respectively. Among them, the 10th scenic spot had the highest growth rate of customer satisfaction, which was 21.33%,

and the average growth rate of customer satisfaction was 17.53%. It can be seen that the design of a smart tourism system based on GIS and BD technology can help improve the service quality of scenic spots.

Figure 7 Comparison of tourist satisfaction before and after the survey (see online version for colours)



4 Conclusions

With the continuous improvement of per capita disposable income, people's spending on tourism is also rising, and people's demand for tourism and requirements for tourist attractions are also rising. The current design of the tourism information management system is not intelligent and lacks an understanding of tourists' characteristics and preferences, so it is unable to provide targeted services for tourists. Based on GIS and BD technology, this paper conducted an extensive study and discussion on the design of an intelligent tourism IRM system. A smart tourism system is not only helpful to improve the tourist reception and increase the business income of the scenic spot, but also to improve the service quality and tourist satisfaction of the scenic spot. However, due to factors such as insufficient consideration and analysis and design in the design of intelligent tourism IRM systems based on GIS and BD technology, the later research would continue to optimise this problem. The application of GIS and big data technology in the design of smart tourism systems in this study still has problems such as insufficient data collection depth and limited dynamic real-time performance, which affects the intelligence level and personalised service capabilities of the system. In the future, we can combine emerging technologies such as 5G and artificial intelligence to improve the real-time response capability of the system, strengthen cross-platform data integration, and promote smart tourism to a higher level of intelligence and personalisation.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this paper.

Conflicts of interest

All authors declare that they have no conflicts of interest.

Data availability statement

No/Not applicable (this manuscript does not report data generation or analysis).

Ethical statement

Not Applicable.

References

Almaimoni, H. (2018) 'Developing and implementing web-based online destination information management system for tourism', *International Journal of Applied Engineering Research*, Vol. 13, No. 10, pp.7541–7550.

Asgari, M. (2021) 'A critical review on scale concept in GIS-based watershed management studies', *Spatial Information Research*, Vol. 29, No. 3, pp.417–425.

Azis, N. (2020) 'How smart tourism technologies affect tourist destination loyalty', *Journal of Hospitality and Tourism Technology*, Vol. 11, No. 4, pp.603–625.

Bazazo, I.K. and Alananzeh, O.A. (2022) 'Applications of digital models in integrated management in smart tourist cities: Aqaba City of Jordan as a case study', *Geo Journal of Tourism and Geosites*, Vol. 40, No. 1, pp.313–318.

Clarke, L.H. (2018) 'Women, aging, and beauty culture: navigating the social perils of looking old', *Generations*, Vol. 41, No. 4, pp.104–108.

Cuong, N.H.H. and Duy, T.C. (2021) 'Information technology infrastructure for smart tourism in Da Nang city', *International Journal of Hyperconnectivity and the Internet of Things (IJHIoT)*, Vol. 5, No. 1, pp.98–108.

Del Vecchio, P. (2018) 'Creating value from social BD: implications for smart tourism destinations', *Information Processing and Management*, Vol. 54, No. 5, pp.847–860.

Fang, Z. and Wang, S. (2024) 'Boosting financial market prediction accuracy with deep learning and big data: introducing the CCL model', *Journal of Organizational and End User Computing*, Vol. 36, No. 1, pp.1–25.

Jasrotia, A. and Gangotia, A. (2018) 'Smart cities to smart tourism destinations: a review paper', *Journal of Tourism Intelligence and Smartness*, Vol. 1, No. 1, pp.47–56.

Jovicic, D.Z. (2019) 'From the traditional understanding of tourism destination to the smart tourism destination', *Current Issues in Tourism*, Vol. 22, No. 3, pp.276–282.

Katrodia, A., Naude, M.J. and Soni, S. (2018) 'Consumer buying behavior at shopping malls: does gender matter?', *Journal of Economics and Behavioral Studies*, Vol. 10, No. 1(J), pp.125–134.

Lawson-Body, A., Illia, A., Lawson-Body, L., Rouibah, K., Akalin, G. and Tamandja, E.M. (2024) 'Big data analytics and culture: newly validated measurement instruments for developing countries' value proposition', *Journal of Organizational and End User Computing*, Vol. 36, No. 1, pp.1–30.

Mondal, S. and Mandal, S. (2018) 'RS and GIS-based landslide susceptibility mapping of the Balason River Basin, Darjeeling Himalaya, using logistic regression (LR) model', *Georisk: Assessment and Management of Risk for Engineered Systems and Geohazards*, Vol. 12, No. 1, pp.29–44.

Pham, T.G., Degener, J. and Kappas, M. (2018) 'Integrated universal soil loss equation (USLE) and geographical information system (GIS) for soil erosion estimation in A sap basin: central Vietnam', *International Soil and Water Conservation Research*, Vol. 6, No. 2, pp.99–110.

Shin, H., Hyejo, M.J. and Cho, M-H. (2021) 'The impact of smart tourism technology and domestic travelers' technology readiness on their satisfaction and behavioral intention: a cross-country comparison', *International Journal of Tourism Research*, Vol. 23, No. 5, pp.726–742.

Um, T. and Chung, N. (2021) 'Does smart tourism technology matter? lessons from three smart tourism cities in South Korea', *Asia Pacific Journal of Tourism Research*, Vol. 26, No. 4, pp.396–414.

Wang, Q., Zong, B., Lin, Y., Li, Z. and Luo, X. (2023) 'The application of big data and artificial intelligence technology in enterprise information security management and risk assessment', *Journal of Organizational and End User Computing*, Vol. 35, No. 1, pp.1–15.

Wang, W. (2020) 'Realizing the potential of the internet of things for smart tourism with 5G and AI', *IEEE Network*, Vol. 34, No. 6, pp.295–301.