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Research Article

Smart City Economic Management Prediction Model Based on Information Analysis System

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In order to establish a central metadatabase that can comprehensively reflect the overall situation of regional economic and social development, this paper proposes a smart city economic management prediction model based on information analysis system. First, this paper introduces the common prediction methods of time series, explains the meaning of smart city, and expounds the problems existing in the economic management of smart city. Second, the functional requirements of the economic database management system for smart city are introduced. According to the application analysis of the basic database and public information platform, most government departments, relevant civil servants, and the public in the urban area have the demand for sharing and utilizing macroeconomic information. This paper adopts B/S architecture: the foreground uses HTML5 and JavaScript technology and the background uses Java language. It adopts SSH (Spring + Struts + Hibernate) framework, and the database uses Oracle11g to realize the overall function of the system. The system is tested, and the test results of data statistics function show that the selected time period of the last five years is correct and the linear graph is correct. It verifies and ensures the integrity, correctness, and operation stability of the system function.

1. Introduction

In recent years, with the deepening of the development concept of "green, coordinated, innovative, open, and shared" in Chinese cities and the continuous promotion of national big data policy and network power policy, urban development has been given new requirements and connotation [1, 2]. In this context, it has promoted the evolution and development of the traditional smart city to a new smart city and provided a good development opportunity for the construction of China's new smart city. The new smart city is a new ecological city with the main objectives of green and open-source economic development, open and inclusive data sharing, orderly and efficient urban governance, and full-time service for the people. Therefore, building a new smart city has become the main goal of urban development in China at this stage [3]. We should vigorously build a new smart city, promote urban operation and development to be smarter, safer, faster, and efficient governance, and promote urban people's lives to be happier [4]. Therefore, cities need to actively explore the construction path of new smart city platform to promote the good development of cities. Figure 1 shows the construction of new smart city platform based on the urban information model. As the basis of the whole smart city data resources, economic data information needs to be placed in an important position in the construction of smart city. Therefore, how to design and implement macroeconomic data management system is of great significance [5, 6].

2. Literature Review

In view of this research problem, Liao and others believe that the focus of smart city construction is gradually shifting from the construction of hardware infrastructure in top-level design to the construction of soft power such as service, education, and culture [7]. Liu and others believe that smart cities should be evaluated from six aspects: people, water, energy, communication, commerce, and transportation. The operation level of these six aspects directly affects the

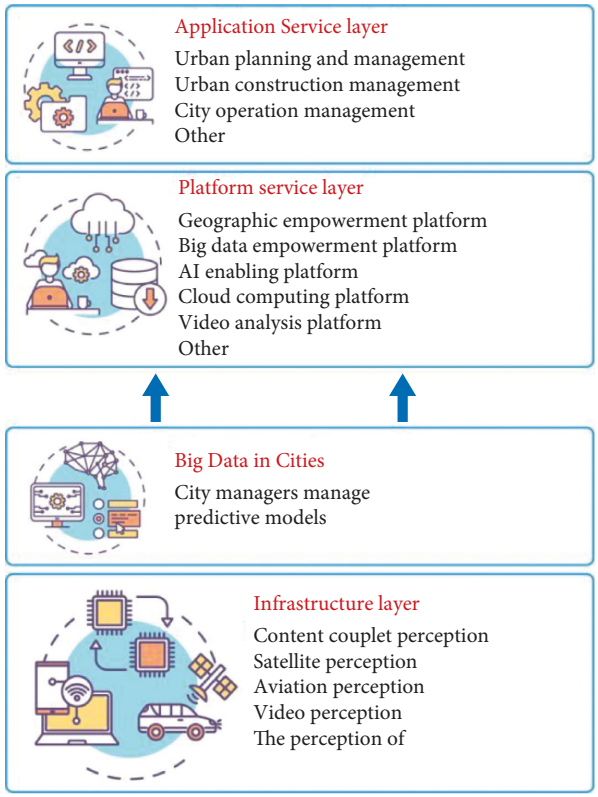

Figure 1: Construction of new smart city platform based on the urban information model.

effectiveness of smart city construction [8]. Yu and others set the world community information development index as the standard to evaluate the intelligent level of communities and organizations when building the smart city evaluation index system [9]. Li and others selected 100 innovative cities from all over the world from the six aspects of architecture, environment, population, economy, government, and mobile to carry out evaluation [10], taking urban sustainable development capacity and innovation capacity as indicators. Joud and others divided energy-related planning technologies into five main areas: generation, storage, infrastructure, facilities, and transportation under the background of smart city construction. On the basis of summarizing their advantages and limitations and according to the existing trends and challenges, they developed an improved energy model to support the construction of smart city [11]. Yinglei and others provided a series of solutions for the construction of smart city in terms of transportation. They proposed a dynamic lane management system to alleviate traffic pressure and a new information and communication technology based on the ICT technology and verified it in simulating the operation of the designer and the condition of drivers [12]. Yuan and others studied the emergency management based on Cloud Architecture and the localization of emergency personnel in the context of smart city. A key challenge of emergency management is the lack of comprehensive decision-making facilities based on the real-time coordination and response ability of the website based on the information obtained by the personnel of the crisis emergency department [13].

Based on the current research, this paper proposes a smart city economic management prediction model based on information analysis system. Using the concept of software engineering, this paper carries out the system design requirements and system design of the smart city macroeconomic information management system, realizes the three functions of front-end data collection, data management, and sharing and exchange, and finally realizes the system. First, this paper expounds the purpose and significance of the system and clearly summarizes the content structure of this paper. This paper introduces the software technology and development tools needed to develop economic information management system. The functional requirements of the system such as target analysis, customer analysis, business analysis, and data resource analysis are described in detail and introduced. Second, the implementation process of a functional system model is described. Test cases are designed to test the design, function, and compatibility of the whole system in detail to ensure the stability of the system.

3. Method

3.1. Concept of Time Series. A time series is a series of data points indexed (listed or drawn) in a timely order. Generally, a time series is a series that is continuous and consists of time points with the same distance. Therefore, it is separate time series of data. For example, the high tide, the number of solar panels, and the daily closing rate of the Dow Jones Industrial Average can be considered as time. In the 1920s, the research community used statistical calculations to identify time and develop models of time. As the main objective of this study shifted from the context of the surface phenomenon to the analysis of the relative importance, it opened the way for the application statistical data: analysis of relationships based on time series models. The time series estimates use the model to predict future results based on the results seen in the past. Although regression analysis is often used to measure the critical current of another time series and independent time series theory, time series analysis is not a so-called "observation" but a comparison of the significance of a time series of different time details according to a time series model [14, 15].

3.2. Common Prediction Methods of Time Series

3.2.1. Simple One-Time Moving Average Prediction Method. The simple one-time moving average prediction method is the arithmetic mean of time series moving observations, which moves with the movement of observations.

Let y_k be the time series, the number of moving average items is n, y_t is the actual value of phase K, and the formula of predicted value of phase $K+1$ is

$$\widehat{y}_{k+1} = M_k^{(1)},$$
$$M_k^{(1)} = \frac{y_t + y_{t-1} + \cdots + y_{t-n+1}}{n}, \quad (1)$$
$$\frac{y_t + y_{t-1} + \cdots + y_{t-n+1}}{n} = \frac{1}{n}\sum_{j=1}^{q} y_{t-n+1},$$

where $M_k^{(1)}$ represents the first moving average of the k-th period, y_{k+1} is the predicted value of the $K+1$st period, and the standard error of the prediction is

$$s = \sqrt{\frac{\sum (y_{k+1} - \widehat{y}_{k+1})^2}{N-n}}, \quad (2)$$

where n is the number of original data in time series y_k. The value of item number n should be determined by the characteristics of time series. If n is too large, it will reduce the sensitivity of M_k and affect the accuracy of prediction. If it is too small, M_k is vulnerable to random changes and difficult to reflect the actual trend [16]. Generally, the size of n is better in the period of seasonal change and periodic change, which can reduce their influence. For time series without seasonal and periodic changes, the value of N depends on the trend type of historical data.

3.2.2. One-Time Exponential Smoothing Prediction Method. This exponential smoothing prediction method has been widely used. It is a special weighted moving average method. The first feature is to obtain the latest observation value in the prediction period and give it the maximum weight, while giving the decreasing weight to the value far from the prediction period. Second, continuously calculate the exponential smoothing value of the unified market phenomenon and give a decreasing weight to the earlier market observation value. The value of a is a variable weight number, and its value range is (0, 1). The one-time exponential smoothing prediction method is a prediction method of weighted average of time series Y_k. It takes $a(1-a)^i$ as the weight, and the formula is

$$\widehat{y}_{k+1} = S_k^{(1)},$$
$$S_k^{(1)} = a y_k + (1-a) S_{k-1}^{(1)}, \quad (3)$$
$$\widehat{y}_{k+1} = a y_k + (1-a) S_{k-1}^{(1)},$$

where y_k represents the real value of phase k, y_k is the predicted value of phase $k+1$, $S_k^{(1)}$ represents the smoothing value of phase $k-1$, $S_{k-1}^{(1)}$ represents the primary exponential smoothing value of phase k, and a is the smoothing coefficient, $a \in (0, 1)$.

The prediction standard error is

$$s = \sqrt{\frac{\sum_{k=1}^{n-1} (y_{k+1} - \widehat{y}_{k+1})^2}{n-1}}, \quad (4)$$

where n is the number of data. The smoothing coefficient a has a great influence on the predicted value. At present, the value can only be selected according to experience. When the time series data show a horizontal development trend, a can take a smaller value, near 03 [17, 18]. If the data type shows an upward or downward development trend, a can take a larger value, 0.6–10. The one-time finger smoothing method is suitable for the prediction of time series data with stable change and no obvious change trend.

3.2.3. Twice Exponential Smoothing Prediction Method. The secondary exponential smoothing prediction method is to perform another exponential smoothing on the primary exponential smoothing value to complete the prediction. The prediction value of phase $k+1$ is not the secondary exponential smoothing value of phase k, and the prediction is made with the following formula:

$$S_t^{(2)} = a S_t^{(1)} + (1-a) S_{k-1}^{(2)}. \quad (5)$$

The standard error of prediction is

$$s = \sqrt{\frac{\sum_{k=1}^{n} (y_k - \widehat{y}_k)^2}{n-2}}. \quad (6)$$

The quadratic exponential smoothing method is suitable for short-term prediction when the time series shows linear growth.

3.3. The Meaning of Smart City. Smart city is an advanced form of urban development supported by the new generation of information technology. Smart city realizes the goals of all perception, ubiquitous interconnection, and intelligent integration through the new generation of information technologies such as big data, cloud computing, and mobile Internet. Therefore, the definition of "smart city" refers to the comprehensive and systematic integration of various fields involved in urban operation by using new generation information technologies such as big data, cloud computing, and mobile Internet, so as to make it an intelligent urban operation management system with central unified management and coordination of all parts. The prominent feature is automation, systematization, and intelligence.

3.4. Problems in Smart City Economic Management

3.4.1. Single Construction Subject. International experience shows that smart city construction is a system project with huge cost and long duration, which requires the participation of social capital, especially the investment and cooperation of enterprises. The experience of integrating multiple subjects to participate in the construction of smart city gives us very useful enlightenment. In order to better build a smart city, actively explore the PPP mode of cooperation between government and enterprises, form the characteristics of diversified operation modes, and ensure the safe, efficient, and sustainable operation of the smart city. According to the different roles of the government and enterprises in the field of investment and construction, the construction of smart city presents the coexistence of various

modes such as "government investment and operation and enterprise participation in construction," "joint venture construction and operation between the government and enterprises," "overall planning of the government and enterprise investment and construction," and "enterprise construction and operation, government and public purchase of services" [19]. For example, in terms of smart city construction in city A, the municipal government is responsible for formulating the smart city planning strategy of city A, determining the six themes of smart city construction, organizing and contacting all parties involved in smart city construction, and establishing an open data platform to open more than 800 databases in city A; the partner organization (the economic promotion agency of city A, which is jointly run by the government and the people) provides one-stop services to implement the planning strategy and operate 10 pilot areas. In order to implement the "digital BONN" strategy, city B government established a smart city construction committee with the participation of more than 70 members of government departments, enterprises, universities, Federation of Industry and Commerce, and social organizations and entrusted the famous software company axxessio to help design software and establish a smart city construction platform. The construction of smart city shows the trend of multiagent participation, which is extremely healthy for the sustainable and long-term construction and operation of smart city. Relatively speaking, the construction subject of smart city in city C is extremely single. For example, the main body of the construction of the smart economic service platform of city C is the Economic, Trade, and Information Technology Commission of city C, which is the main functional department of city C government in charge of economy and service enterprises. In the construction process of the platform, almost all rely on the power of this government department. During the period, only the Third Party C New Industry Investment Consulting Co., Ltd., was entrusted to carry out relevant work in the process of system construction [20]. This fully reflects that the construction of smart economic service platform in city C does not give full play to the role of the government and the market, especially the decisive role of the market in allocating resources, and does not fully mobilize the initiative, enthusiasm, and creativity of enterprises, the public, and other subjects to participate in the construction of smart city. In fact, it is still a model in which the government takes full responsibility and relies too much on government investment. Because of the single main body, the construction of the platform can only rely on financial investment. For example, the smart economic service platform in Pingshan District of city C alone has invested 2.8 million yuan, and the total investment of the 10 districts and municipal platforms of the city is expected to be as high as 50 million yuan. This is only the investment of a public service platform of the smart economic service platform. At the same time, many platforms such as smart medical services, smart education services, and smart public transportation have been created [21]. City C, a smart city with full financial investment, is easy to cause repeated construction and waste of resources to a great extent, and the long-term sustainable operation will bring heavy burden to the finance of city C. The main reasons are as follows.

The openness of the platform is uncertain, which affects the participation of other investors. The smart economic service platform of city C gathers a large amount of economic activity data, including both macroeconomic dynamic monitoring data and microproduction and operation activity data of a single enterprise. Some of them have the attribute of trade secrets. Whether the platform is open to other subjects and the degree of openness are a sensitive issue related to economic ethics. At present, there is no unified understanding in this regard, let alone special legislation. Under the current technical conditions, the information security protection mechanism is not perfect and the supervision of information use is not in place. If the data use of the open platform is not appropriate, the data security of economic activities will not be effectively guaranteed and the privacy of enterprises and individuals will face a great threat. Therefore, the openness of data application has not been clarified, which has affected other investors to participate in the construction of intelligent public service platform to a certain extent [22, 23].

The income problem has not been straightened out and cannot attract investment from other subjects. In addition to solving the problem of permission or not, it also depends on whether it is attractive to investors. According to the prediction of the prospective industry research institute, the market scale of China's smart city has exceeded 6 trillion yuan in 2017 and the average annual compound growth rate in the next five years (2017–2021) is about 32.64%. By 2021, the market scale of China's smart city will reach 187 trillion yuan. By 2020, 40–80 billion devices in the world will be connected to the Internet of Things and more than 7 billion devices will be related to government management, most of which come from the connection demand of smart cities. In the next 10 years, the investment related to smart city construction will exceed 2 trillion yuan, as shown in Figure 2. Such a huge market scale is fully sufficient to attract third-party participation. To attract the participation of third-party forces and market forces, there is an urgent need to find a profitable and sustainable business model, which involves whether the platform allows participants to obtain benefits from the consumption of their products and services. Smart city is the infrastructure of serving people's livelihood for a long time. Its profit depends on the results of in-depth development and application of service products and data in line with the trend of consumer demand. At present, the intelligent economic service platform and other public service platforms in C city have not developed information and data services suitable for public consumption, and lack of products and services that can be sold abroad. On the one hand, information and data services suitable for mass consumption have not been developed and there is a lack of products and services that can be sold externally [24, 25]. On the other hand, its audience and users are relatively small. In practical application, it is difficult to compare the number of downloads and usage between public service platform applications and social platform applications and it cannot form a scale effect. The above two

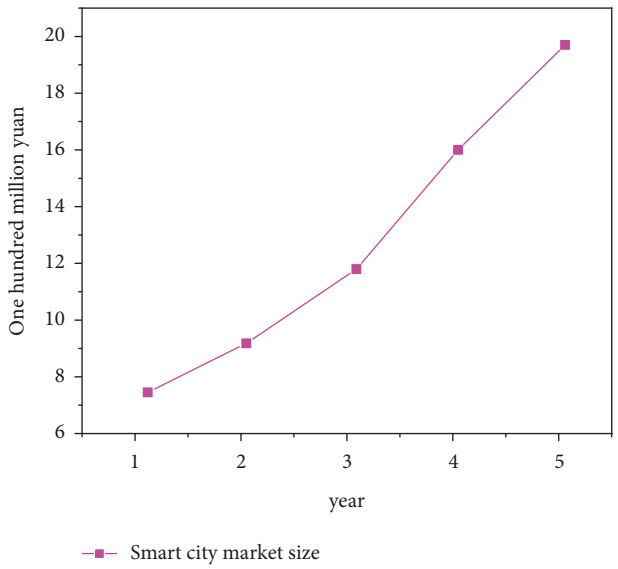

Figure 2: Change trend of smart city market scale in five years.

aspects cause that the platform construction and operation have little attraction to investors. The income problem is not straightened out, which restricts the market-oriented subjects from deeply participating in the construction process of various intelligent public platforms to a certain extent.

The development of some fields is uneven lack of suitable partners: the smart industry includes the new generation of information technology, mobile Internet technology, cloud computing, and big data technology industries, as well as the integrated application industry of smart systems. City C has leading enterprises in China's new generation of information technology, such as Huawei, ZTE, and Tencent. It has technical advantages in the field of new generation information technology and big data. It occupies a very important position in China's intelligent industry, and some fields even lead the world. However, the development of some fields is uneven, mainly in the aspect of system integration and application. There is no enterprise above designated size that can lead the industry standard, and most of them are mainly start-up teams and technical small enterprises. As early as the 2014 smart city forum, the media noticed that not only government departments, but also the three major operators and a large number of well-known enterprises such as ZTE and Huawei showed great enthusiasm for smart city infrastructure construction. At the same time, some small and medium-sized start-ups focus on the integration and application of smart city system. In terms of products and services, the development of relevant fields is uneven, which leads to the lack of appropriate partners in the construction of relevant public service platforms in city C to a certain extent.

3.4.2. Inadequate Infrastructure. City C smart economic service platform is a public service platform with advanced functional design in China, but in actual operation, it often encounters problems such as the system freezes and crashes, data lag, poor timeliness, delayed decision-making key time points, data distortion, low accuracy, and poor guidance. Almost all of these problems appear in hardware. In recent years, city C has repeatedly entrusted a third-party organization to conduct a comprehensive analysis and evaluation of the operation status of enterprises under its jurisdiction. However, because of the difficulty of data collection, data distortion, and long time-consuming data analysis and evaluation, it has not played a good supporting role in economic decision-making. These situations fully reflect that the infrastructure construction of smart city in city C cannot meet the requirements of the big data era. The main reasons are as follows.

Hardware facilities are not updated in time. At present, the economic form has been deeply transformed. The high tech and related industrial economy are changing rapidly. The data produced by production and life are quite large, which are very different from the processing level in the digital age. Moreover, the processing objects are quite complex, with strong timeliness and great differences. They have high requirements for data processing ability. They need to meet the needs of economic data statistical analysis for dynamic supervision and real-time monitoring and realize "all things perception, all things interconnection, and all things intelligence." The current information infrastructure in city C has been laid for a long time, and many of them were laid before the emergence of a new generation of information technologies such as big data, cloud computing, and the Internet of Things. At that time, the technical foundation and laying logic were based on the processing needs of the digital age, which was difficult to meet the needs of real-time perception and real-time processing of massive data in the era of big data. At the same time, 5G technology in city C has just been piloted, the construction of the Internet of Things has not been fully covered, and the higher-level mobile Internet has not been fully launched, so it is difficult to meet the needs of massive data real-time transmission.

Low degree of technology integration: at present, the construction of public service platforms is basically a routine of information collection, information processing, and information services. It just simply loads the popular advanced information technologies, including the Internet of Things, cloud computing, big data, mobile Internet, and SDN (self-defense network), into the smart city. It does not realize the deep integration of information technology and various functional modules of the city. The format, syntax, and operation logic of the platform database vary greatly. There is a lack of massive data processing and analysis framework for different types and operation logic. All kinds of data cannot be seamlessly connected, and it is extremely difficult to capture and analyze data. The construction of simple platform facilities directly faces the problems of data analysis and processing, integrated application, and storage management in management.

3.5. Functional Requirements. The smart city oriented economic database management system includes front-end data access, data conversion, cleaning and other processing, data

management, sharing and exchange of basic data, and public information platform, which are explained as follows.

3.5.1. Data Access/Switching Module. The module performs the function of information collection and exchanges data from the Commission Office to the data processing center. The method adopted is to place the front-end machine in the Commission Office, install the front-end access software client on the front-end machine, and exchange the data to the data center through the data exchange middleware.

3.5.2. Data Processing Module. The function of this module is to process the original data taken from the Commission Office, mainly including data deduplication, data comparison, information joint review, and other processing methods, and import the data from the temporary database/file into the target database used by the program.

3.5.3. Data Query Module. The processed data will be displayed to users and can be queried according to the year.

3.5.4. Statistical Analysis Module. The module performs statistical analysis of the data, according to time, classification, and other methods, mainly including regional GDP statistics, total retail sales of various industries, household consumption, output of grain, vegetables, and fruits, fixed assets, investment, and industrial growth.

3.5.5. User Management Module. The module performs user management of the system, including platform administrator, data administrator, Commission Bureau user, and other users.

3.5.6. Role Management Module. The module performs role management of the system, including system management role, data management role, and role of each Commission Bureau.

3.5.7. Field Authority Management Module. The data in the macroeconomic database come from various government departments, so no matter the users of the Commission Office or the public, they need to control their authority. They cannot see all the data, but they should see the data within their respective authority. This module maps roles and database fields and specifies the data that each role can see.

3.5.8. Menu Authority Management Module. This module controls the user's platform permissions. For example, the system administrator can manage users and roles, the data administrator can manage field permissions, and ordinary users can only query, statisticize, and view.

3.5.9. Data Sharing Module. This module provides external WebService interface and data sharing services.

4. Results and Analysis

4.1. User Analysis. According to the application analysis of basic database and public information platform, most government departments, relevant civil servants, and the public in the urban area have the demand for sharing and utilizing macroeconomic information. According to users' organizational attributes and business division, users of macroeconomic basic databases and platforms can be divided into three types: internal users, institutional users, and the public.

4.1.1. Internal Users. Internal users refer to all government departments and their business staff involved in the construction of macroeconomic infrastructure. These users have the need to use basic information and undertake the main construction and maintenance tasks of macroeconomic basic information database at the same time.

4.1.2. Government Agency Users. Institutional users refer to the government departments in the urban area that have the demand for sharing and utilizing the basic macroeconomic information.

4.1.3. Social Public. The public, including individual users and institutional users, has diverse needs for basic macroeconomic information resources, such as obtaining statistical information in a specific range. Such users can access relevant information through the business portal of the urban macroeconomic basic information database. Social public users have the characteristics of large number, diverse needs, high access frequency, and large access peak and have high requirements for the system.

4.2. Business Analysis

4.2.1. Municipal Bureau of Statistics. Study and put forward the city's statistical work, statistical reform, statistical modernization plan, statistical census, and investigation plan; organize, lead, supervise, and inspect the work of statistics and national economic accounting of all municipal (county), district, and municipal government departments; implement the basic statistical system and index system formulated by the state and the province; establish and improve the city's national economic accounting system and statistical index system; organize and manage the city's statistical investigation projects.

4.2.2. Municipal Development and Reform Commission. Be responsible for monitoring the macroeconomic and social development trend, and assume the responsibilities of prediction, early warning, and information guidance; study the city's macroeconomic operation, aggregate balance, economic security, overall industrial security, and other important issues, and put forward macrocontrol policy suggestions; study major issues related to the city's economic operation; undertake the responsibility of planning major construction projects and productivity distribution in the

city; formulate the regulation and control objectives, policies, and measures for the total scale and investment structure of fixed assets investment in the whole society; the connection and balance requires the municipal government to arrange investment and special planning involving major construction projects; arrange municipal financial construction funds. The newly assigned department responsibilities also include the responsibilities of the former Municipal Price Bureau and the newly added responsibilities of antiprice monopoly law enforcement and price public service. The former Municipal Economic Committee is responsible for the comprehensive coordination of energy conservation and emission reduction, the development of circular economy, and the conservation and comprehensive utilization of energy and resources in the whole society.

4.3. Analysis of Information Resources. The core database business system of urban macrodatabase shall be divided into the following types of data according to different data sources, levels, granularity, business content, and regional characteristics.

4.3.1. By Data Source. It can be divided into data of government statistical departments and data of other government departments, as shown in Table 1.

4.3.2. By Data Hierarchy. According to the data hierarchy, it is divided into original data layer and integrated data layer. Original appearance data are data stored according to the data source, maintaining the original appearance characteristics. The integrated data are the logically unified data formed after the original appearance data are integrated and processed.

4.3.3. By Data Granularity. It is divided into macro- and mesolevel data. The macrolevel indicators are the main socioeconomic aggregate indicators, and their structure, speed, and benefit index data reflect the overall operation of urban socioeconomic development. Mesolevel indicators are summarized data and classified data grouped according to the characteristics of industry and region.

4.3.4. By Business Indicator System. It mainly includes economic operation, urban construction, population employment, social development, and environmental resources. Economic operation can be divided into total amount, finance, taxation, investment, industrial production, real estate development, etc.

4.3.5. By Regional Characteristics. It divides the data according to administrative divisions and regional functions.

4.4. Overall Function Realization of the System. The system adopts B/S architecture: the foreground uses HTML5 and JavaScript technology and the background uses Java language. It adopts SSH (Spring + Struts + Hibernate) framework, and the database uses Oracle11g.

The smart city macroeconomic management system includes data exchange management, data query/statistics, data sharing, and data management. The role of the data exchange control module is to exchange data from the Commission to the data center of special data. In addition, it can set the frequency and regularly execute data exchange tasks, including data node management submodule, data exchange process submodule, and data exchange task management submodule. The role of the data management process is to identify the data or information exchanged by the Board and to determine the information related to filtration and other procedures take care after completing some information (use, load, access, etc.). Exchange data should be filtered according to the purity of the definition set, and the data provided by the Office of Operations shall be stored in the system file, including the change management process and submodule change management process. The role of the data query and statistics module is to display the data to the users. The status of the survey is asked by year. Statistics include industry statistics, Chinese industry, prices, agriculture, forestry, livestock, fishing, fixed investment, and other statistics, including submodule queries and submodule statistics. The role of the data sharing module is to share information with users of each Bureau of the Commission, create a source of information, connect to a database, request information to share, and finally publish it to the WebService service, providing the interface in WebService format, and share information with other Commission Bureau users, such as the DB registration submodule service and the submodule sharing service. System management is a system module for easy operation and maintenance that can be set up by the administrator. It is only used to store simple data and permissions required by the system, such as user management submodule, operation control submodule, documents provide menu control submodule, area distribution management submodule, location management submodule, and submodule authorization as well as a submodule control menu.

4.5. Test Process and Results

4.5.1. Data Exchange Function Test. The purpose of data exchange is to exchange data or files from the Commission Office to the data center, including server registration, adding nodes, connecting links, creating exchange processes, tasks, starting exchange, and other steps. The test cases and results of each step are shown in Table 2.

4.5.2. Data Processing Conversion Function Test. The purpose of data processing and conversion is to process the data from the file through certain verification and deduplication, sort the data into the required format, and store it in the database. The main steps include creation, conversion, task, and execution. The test cases and results of each step are shown in Table 3.

Table 1: Data sources of macroeconomic database construction.

Data classification	Data sources	Channel
Statistical data	Statistical system	Docking
Collect data from government departments in urban areas	Municipal development and reform commission, municipal finance bureau, and municipal local taxation bureau	Exchange filling
Various data outside the system		Import
Statistical annual report and final report	Historical data	Exchange filling
Investigation	Historical data	Exchange filling
Census data	Historical data	Exchange filling
Classified comprehensive summary data	Historical data	Exchange filling

Table 2: Test cases and results of data exchange function.

Serial number	Test item	Test description	Result
1	Server registration	Fill in each attribute of the server and save it	The server was added correctly
2	Add node	Fill in node name, IP address, and other attributes	The node was added correctly, and the connection was successful
3	Connecting link	Establish a connection link between the commission office node and the data center node	The links are added correctly and can interact with each other
4	Create file exchange process	Specify the source directory and target directory and establish the exchange process	The process is properly established and operational
5	Create file exchange task	Specify the exchange frequency and other attributes and establish the exchange task	The task is properly established and can be run
6	Start file exchange	Start exchange process and task	Processes and tasks are performed normally, and documents are exchanged from the commission office to the data center

Table 3: Test cases and results of data processing transformation function.

Serial number	Test item	Test description	Result
1	Create transformation	Create data using various components and connections	The transformation is created and can be executed
2	Create task	Fill in attributes such as processing frequency, specify conversion, and create tasks	The task is created and can be executed
3	Start file processing	Start processing transformations and tasks	The conversion and task are executed normally, the data in the file are processed as required, and the results are stored in the table specified in the database

4.5.3. Data Query Function Test. The purpose of data query is to query the corresponding data according to the year specified by the user. The test cases and results are shown in Table 4.

4.5.4. Data Statistics Function Test. The purpose of data statistics is to query the corresponding statistical information according to the time period selected by the user (the last 5 or 10 years) and display it in the form of linear chart, pie chart, and histogram on the front desk. Because there are many types of statistics, only the economic aggregate classification is used as the test case here. The specific test cases and results are shown in Table 5.

4.5.5. Data Sharing Function Test. The purpose of data sharing is to share the data in the database to users in the form of interface. The main steps include establishing data source, establishing data service, and registering and publishing shared service. The specific test cases and results are shown in Table 6.

4.5.6. Basic Data Management Function Test. Basic data management includes data addition, deletion, modification, and query. The processed data include users, roles, menu items, field classification, and fields. The specific test cases and results are shown in Table 7.

Table 4: Test cases and results of data query function.

Serial number	Test item	Test description	Result
1	Data query	Specify the year and query the data	The data displayed are correct

Table 5: Test cases and results of data statistics function.

Serial number	Test item	Test description	Result
1	The economic aggregate of the last five years is counted by linear chart	Select the time period of the last 5 years for statistics	The statistical data are correct, and the linear chart is displayed correctly
2	The total economic output in the last five years is counted by pie chart	Select the time period of the last 5 years for statistics	The statistical data are correct, and the pie chart is displayed correctly
3	The economic aggregate of the last five years is counted by histogram	Select the time period of the last 5 years for statistics	The statistical data are correct, and the graph is displayed correctly
4	Statistics of economic aggregate in the last 10 years	Select the time period of the last 10 years for statistics	The statistical data are correct, and the linear chart, pie chart, and histogram are displayed correctly

Table 6: Test cases and results of data sharing function.

Serial number	Test item	Test description	Result
1	Establish data source	Specify database, table, input user name, password, and other attributes to establish data source	The data source is created successfully and can connect to the specified database
2	Establish data service	Specify the data source, establish shared SQL statements, and establish data services	The data service is established successfully, and the SQL statement can be tested and executed successfully
3	Registration service	Register data services with shared services	Service registration succeeded
4	Publish shared services	Publish shared services	The shared service is published successfully, the corresponding WebService service is published, and the tool is used to connect the WebService interface successfully

Table 7: Test cases and results of basic data management function.

Serial number	Test item	Test description	Result
1	User management	Data addition, deletion, modification, and query	Data addition, deletion, modification, and query succeeded
2	Role management	Data addition, deletion, modification, and query	Data addition, deletion, modification, and query succeeded
3	Menu item management	Data addition, deletion, modification, and query	Data addition, deletion, modification, and query succeeded
4	Field classification management	Data addition, deletion, modification, and query	Data addition, deletion, modification, and query succeeded
5	Field management	Data addition, deletion, modification, and query	Data addition, deletion, modification, and query succeeded

5. Conclusion

This topic will analyze the technical system and key technologies of economic information management system in smart city, and on this basis, we develop and implement a more efficient economic information management system to make economic data more widely used. This topic uses the concept of software engineering to carry out the system design requirements and system design of the smart city macroeconomic information management system, realize the three functions of front-end data collection, data management, and sharing and exchange, and finally realize the system. First, this paper expounds the purpose and significance of the system and clearly summarizes the content structure of this paper. This paper introduces the software technology and development tools needed to

develop economic information management system. The functional requirements of the system such as target analysis, customer analysis, business analysis, and data resource analysis are described in detail and introduced. Second, the implementation process of a functional system model is described. Test cases are designed to test the design, function, and compatibility of the whole system in detail to ensure the stability of the system. Although this paper discusses the concept and significance of intelligent economic service, it does not provide in-depth analysis of new features. It is difficult to understand the relevant concepts of intelligent city and public service from the depth of public management. By analyzing its characteristics from different angles, we can understand its meaning more deeply.

Data Availability

The data used to support the findings of this study are available from the author upon request.

Conflicts of Interest

The author declares no conflicts of interest.

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