Construction of Economic Operation System HeilongjiangProvince Hi-tech Zone Based on Big Data

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Abstract: With the rapid development of Internet, Internet of things, cloud computing and other technologies, the amount of data is shown with explosive increase, indicating that the era of big data is coming. Big data is another subversive information technology revolution in IT industry after cloud computing and Internet of things, which provides a guidance for economic development in new normal, while the E-government construction in the era of big data will be more rapid and intelligent. At present, in the Harbin Hi-tech Zone of Heilongjiang Province, the information construction level is relatively low and the information control of economic operation is relatively weak, lacking the support system of daily office work and business development, thus the construction of economic operation system based on big data is particularly necessary. On the basis of studying the model of economic operation system defined by big data, the economic operation system based on big data is established in this paper, thus realizing the data sharing and collaboration of relevant economic management departments in the process of business management in the Harbin Hi-tech Zone of Heilongjiang Province, and conducting the multidimensional display on the real-time monitoring and early warning of economic operation indicators, the economic operation of the Hi-tech Zone, the basic situation of key enterprises and the progress of major projects.

1. Introduction

According to a study by IBM, the IT giant, it shows that for the data generated in the past two years, by 2020, the scale of global production data will be 44 times larger than today’s. According to the statistics, Facebook users update more than 10 million photos a day, and the number of compliments or comments is about 3 billion times a day, while YouTube reaches an astonishing 800 million users a month, uploading one hour of video per second. In 2018, Twitter first appeared in June with more than 200 million microblog posts per day. Soon after that, Twitter's daily microblog posts soared to nearly 250 million, and this figure is expected to double annually. The whole world has entered a major era of transformation, namely, "the era of big data ".

1.1 Concept of Big Data

In this paper, it is believed that big data is a kind of technology applied to acquire, store, mine, analyze and forecast massive data on the basis of existing data mining and data analysis technologies. For government statistics, big data will prompt us to change our past working methods and data ideas, and have different requirements for the original statistical data collection, data processing, data mining and utilization technology. It requires a new processing model with better abilities of decision making, insight and process optimization, so as to meet the heavy personnel demand, and the rapid growth and diversification of information assets.

1.2 Informationization Construction of Harbin Hi-Tech Zone in Heilongjiang

In addition to the personal business application system used in vertical management departments, the Management Committee of Harbin Hi-tech Zone in Heilongjiang basically has no corresponding information system to support daily office work and business development. However, in the

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construction of large data, despite the lack of support from business application system, the business data accumulated in Excel spreadsheet form still provides a basis for the construction of economic operation system.

Table 1 Construction of haerbin hi-tech zone in Heilongjiang Province

Serial number	System name	Construction unit	Main function
1	Statistical Internet Intelligence Station	National Bureau of Statistics	Information statistics of various industries in national economy and social development
2	Heilongjiang Province Key Construction Network	Provincial Leading Group Office for Key Projects Construction	Provincial Key Projects Declaration and Information Inquiry
3	Comprehensive Management System of Harbin Grouping New Area and Industrial Agglomeration Area	Municipal Development and Reform Commission	Information Inquiry of Enterprises and Industries in Grouping New Area and Industrial Agglomeration Area
4	National Statistical Basic Units Database	National Bureau of Statistics	Information statistics of various industries in national economy and social development

2. Research methods and model construction

2.1 Design of Big Data System

The main purpose of big data system construction is to meet the requirements of three core business in Harbin Hi-tech Zone of Heilongjiang, including economic operation management (monitoring of economic operation, improvement of economic operation efficiency, and optimization and adjustment of industrial structure), investment attraction management and enterprise service, and the core idea of system construction is the application of big data definition technology to realize data fusion. The overall construction idea of the system is shown in the figure:

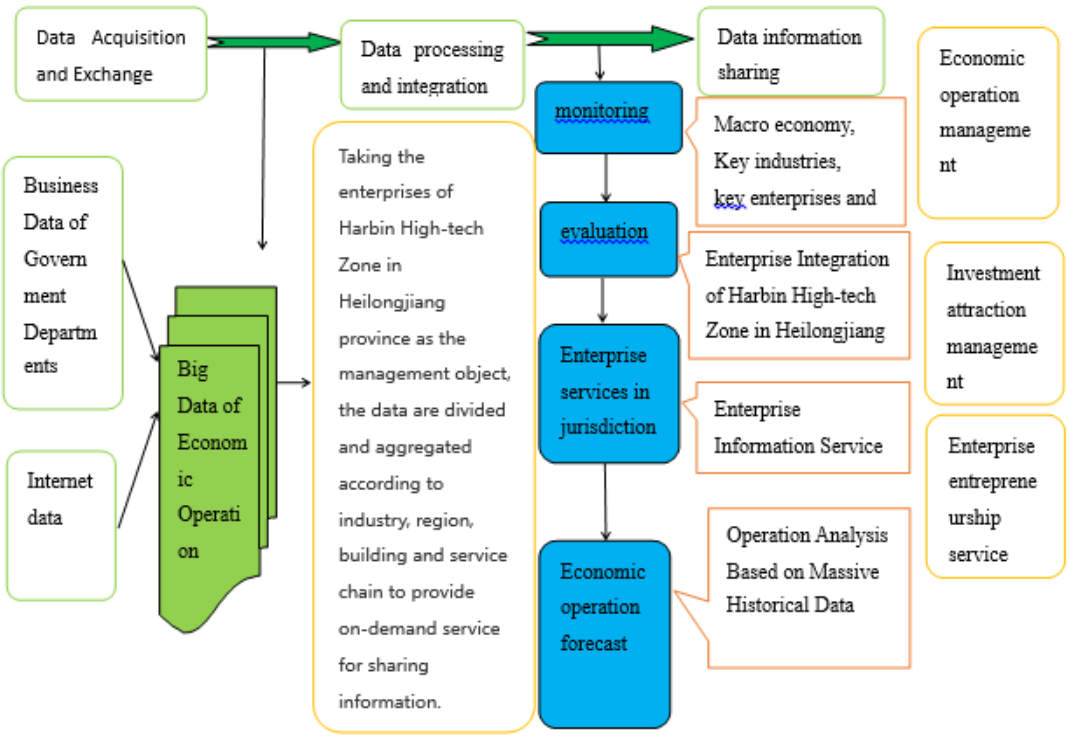

Figure 1 The overall construction idea of the system is shown

2.2 Design of big data model

The data model of big data economic operation system contains the data models of economic operation monitoring, enterprise performance comprehensive evaluation and economic operation decision analysis.

2.2.1 Design of economic operation monitoring model

The overall framework of economic operation monitoring index system: From macro, meso and micro levels, a multi-dimensional economic operation monitoring system integrating macro-economic operation monitoring, key industry operation monitoring, key enterprise operation monitoring and major project progress monitoring is established, with the combination of "point, line and surface".

Macro-economic operation monitoring index system: The index values have the comparison of longitudinal time series and horizontal comparison with similar development zones such as Henan Province. Monitoring indicators (first grade) include gross industrial output value that is higher than scale, industrial value added that is higher than scale, investment in fixed assets, total import and export value, total retail sales of social consumer goods, public budget revenue, RMB deposit and loan balance, registered foreign capital, electricity consumption, total consumer price index. Monitoring indicator values include monthly quantity, cumulative amount, monthly growth, cumulative growth and its warning threshold. Operational monitoring index system of key industries: Classification of key industries is as follows: Automobile, textile, electronic information, new materials, new energy, biomedicine. Monitoring indicator values include current monthly amount, cumulative amount, current monthly growth and cumulative growth. Operational monitoring index system of key enterprises: Distribution of key enterprises according to industrial and administrative regions is as follows: The number of enterprises, the number of loss-making enterprises, the total output value of employees, the total income of enterprises, the total amount of profits and taxes, the investment in fixed assets and the delivery value of export products. Monitoring indicator values include the same-period ratio, year-over-year ratio, link relative ratio, and early warning threshold.

2.2.2 Design of enterprise performance comprehensive evaluation model

The design of enterprise performance comprehensive evaluation model includes three aspects, respectively as evaluation object, evaluation index system and construction of evaluation model, in which, evaluation object includes two types of enterprises: Industrial enterprises with annual electricity consumption of more than 100,000 degrees (including) in Harbin Hi-tech Zone of Heilongjiang Province; enterprises with industrial land area of more than 3 mu (including the lessee enterprises with leased land and factory area of more than 3 mu) in Harbin Hi-tech Zone of Heilongjiang Province. Those who do not meet the standards may apply for inclusion in the evaluation.

The main contents of evaluation index system are as follows: One is the evaluation index of industrial enterprises above scale, which includes average tax per mu, per capita industrial added value, energy consumption per unit of industrial added value and COD emission per unit of industrial added value.

①H= average tax per mu (10,000 yuan per mu)=per mu=tax revenue/ utilization area

h (average value of tax revenue per mu of evaluated enterprise)

②P=average industrial value added per mu (unit: 10,000 yuan per mu)=industrial value added/ usable area

p (average value of industrial value added per mu of the enterprises above scale)

③Q= energy consumption per unit of industrial value added (unit: 1 ton standard coal/10,000 yuan) per unit of industrial value added=total energy consumption of energy utilization/industrial value added

q (average value of energy consumption per unit of industrial value added of the enterprises above scale)

④W=per unit of industrial value added (unit: ton /10,000 yuan) COD emission= COD emission/industrial value added

W (average value of COD emission per unit of industrial value added of the enterprises above scale)

The other one is the evaluation index of industrial enterprises below scale, which includes tax revenue per mu and sales income per unit of electricity consumption.

⑤Sales income per unit of electricity consumption (unit: 10,000yuan/10,000 degrees)

T= sales income per unit of electricity consumption= sales income/total electricity consumption

t (average value of sales income per unit of electricity consumption of evaluated enterprises)

Industrial value added=labor remuneration + net taxes on production + depreciation of fixed assets + operating surplus. (approved by the Statistical Bureau)

Construction of evaluation model:

The first is the weight setting: the basic score of evaluation indicator weight is 100 points, and enterprises are scored according to reality, without upper and lower limits. For industrial enterprise above scale: Average tax per mu is scored 30 points; industrial value added per mu is scored 30 points; energy consumption per unit of industrial value added is scored 30 points; COD emissions per unit of industrial value added is scored 10 points. For industrial enterprises below scale: Average tax per mu is scored 60 points; sales income per unit of electricity consumption is scored 40 points.

The second is the algorithm of evaluation model:

M (comprehensive performance evaluation score of industrial enterprises above scale)

m (comprehensive performance evaluation score of industrial enterprises below scale)

$$M=H\div h\times 30+P\div p\times 30+Q\div q\times 30+W\div w\times 10+E$$

$$m=H\div h\times 60+T\div t\times 40+E$$

Finally, there are some bonus-point items E: The first is brand building. Those who have obtained famous brand products, well-known trademarks, famous trademarks and China's Time-Honored Brand shall receive two points at the national level and one point at the provincial level. The second is technical progress. Those who have obtained patent authorization in the same year shall receive 1 point for each item; those who have acquired the title of Technology Center and Design Center shall receive two points at the national level and one point at the provincial level.

2.2.3 Design of economic operation decision analysis model

There are three kinds of designs for economic operation decision analysis model: The first is the analysis on economic growth structure, such as the analysis on GDP and its growth rate; the analysis on investment in fixed assets and its growth rate; the analysis on consumption and its growth rate; the analysis on export and its growth rate; the analysis on the proportion of investment, consumption and export in GDP. The second is the analysis on harmonious development of economy, such as the comparative analysis on GDP and electricity consumption; the comparative analysis on GDP and water consumption; and the comparative analysis on GDP and sewage discharge. The third is the comparative analysis on economic development and people's living standards: per capita GDP; per capita income; public revenue and expenditure; comparative analysis on per capita GDP and per capita income; comparative analysis on per capita GDP and public expenditure.

2.3 Key technical route of big data system

With JavaEE (including EJB) as core technology, this system, which is characterized by expansibility, flexibility and maintainability, integrates the system technology framework based on SOA architecture with the application system of Web Service.

2.3.1 Constructing the Core Technology based on Java EE

The economic operation system defined by big data will be connected with relevant economic

management departments, so this system should have good portability, expansibility and compatibility. In order to consider the above characteristics, Java is chosen as the system development technology. In addition, the general component standard is also a necessary guarantee, EJB standard is undoubtedly the best component standard accepted by developers. Therefore, Java EE (including EJB) is one of the best standards for big data to define the economic operating system.

As a set of enterprise application criterion developed by Sun Company, Java EE is used by many developers to use multi-tier enterprise application model, such as the classical Java EE four-tier structure, which includes client tier component, Web tier component and business logic tier component. Java EE has good compatibility, support for heterogeneous environment, good expansibility, stable practicability and high-efficient development, thus providing reliable technical guarantee for the construction of system.

2.3.2 System Technical Framework based on SOa architecture

As a software architecture specification model, SOA can organize and use distributed functions under the control of different owners. It can link the services in different applications to contracts through the well-defined interfaces. Therefore, the different services constructed in the unified system can interact with each other in a unified and universal way.

2.3.3 Integration of application systems based on wer service

Web Service is a remote call technology across language and system. In short, Web Service is the external interface of a program, which encapsulates some of its methods into Web services and provides them to the outside world, while other applications access Web Services by using network protocols and specified standard data formats (such as XML, HTTP, SOAP) to obtain the required methods and the desired results through their internal execution.

3. Research and Discussion

This paper first conducts preliminary investigation and summary on the current situation of informationization construction in Harbin Hi-tech Zone of Heilongjiang Province, thus pointing out the problems in the informationization construction and making a conclusion that it can not meet the requirements of economic development under the new normal situation. Then, According to the requirements of Management Committee of Harbin Hi-tech Zone in Heilongjiang Province, the economic operation system based on big data is studied, the overall framework and modules of big data economic operation is designed, and the big data economic operation system is established, thus the main interface of the system after realization is given and analyzed briefly.

The specific work of studying the model of big data economic operation system are as follows:

(1) By investigating the business demand departments of Harbin High-tech Zone in Heilongjiang Province, the information status of Harbin High-tech Zone is fully understood, as well as the data accumulation and data format. For the storage mode, whether there is a basis for establishing the big data economic operation system, and the research report is completed.

(2) Based on the informationization status of Harbin High-tech Zone, with the requirements of Management Committee and other departments as orientation, the design scheme of big data economic operation system is formed by combing with the current development of informationization technology.

(3) Based on the reference materials and demand analysis of Harbin Hi-tech Zone in Heilongjiang Province, the framework model of economic operation system with big data definition is designed, and the overall framework is divided into information resource layer, application support layer, application layer and standard system. Then the architecture, function and data flow of each subsystem of the system are designed. Finally, the data model of big data economic operation system is studied and designed in combination with the data needs, national documents, statistical indicators and methods of the relevant departments in the National Bureau of Statistics, as well as the literature data of big data bureaus around the country.

(4) According to the information acquisition forms, information gathering requirements and data models of various departments, a unified information acquisition system for management forms has been established step by step. The statistical index system of the National Bureau of Statistics, including evaluation index and evaluation model, is formulated to meet the development needs of Harbin Hi-tech Zone in Heilongjiang Province.

(5) Research and implement the main technology needed for the system, participate in the development and construction of the big data economic operation system, and complete the system development with the technical personnel of Beijing Dongtong Company (the main board listed company). By introducing some data from the National Bureau of Statistics, this system shows and introduces the main functional interfaces of the big data definition economic operation system.

4. Conclusions

This paper constructs a big data centre which integrates information and services in various economic operation fields of Harbin Hi-tech Zone in Heilongjiang Province through the big data operation system, and establishes a comprehensive multi-level big data application service system covering all aspects of managers and enterprises in Harbin Hi-tech Zone in Heilongjiang Province. Through the system construction, it can timely collect, integrate, process, monitor and early warn the relevant data of enterprise operation status, major project construction, economic operation, energy saving and emission reduction of Harbin Hi-tech Park in Heilongjiang Province, thus we can accurately grasp the economic operation and industrial development of Harbin Hi-tech Zone in Heilongjiang Province, so as to provide real-time and accurate data and early warning information for the Management Committee and relevant decision-making departments of Harbin Hi-tech Zone in Heilongjiang Province. It can also provide an accurate data basis for the government to formulate economic development policies and maximize the benefits of resource allocation, and provide decision support and comprehensive management services based on big data analysis for the sustainable and healthy economic development of Harbin Hi-tech Zone in Heilongjiang Province.

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