

# Exploration of Building a Big Data Ecosystem for Government Services

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**Keywords:** Government Services, Big Data Ecosystem, Models, Functional Design

**Abstract:** The big data of government services, which relates to public services and social sensor data can effectively make urban governance go out of a single mode, the city service system move towards sharing, and the city decision-making intelligent. Therefore, building a big data ecosystem for government services is an important link in building a smart city. On the basis of exploring and analysing the big data ecosystem structure of government service, we propose a model of the big data ecosystem structure of government service, and provide a detailed design of its structure and functions.

## 1. Introduction

Government services big data refers to the massive amount of data collected and produced by government departments to perform their statutory responsibilities<sup>[1]</sup>. Government services big data connects public service data and social sensing data, and the comprehensive shares, analyses and utilizes these resources, which will transform the city management mode from single to three-dimensional, the city service system from isolated to shared, and the city decision-making mode from mechanical to intelligent<sup>[2,3]</sup>. Efficient management and utilization of government service big data is an important link in the three-dimensional construction of a smart city. Government service big data ecosystem is a system that realizes the discovery and use of data value generated by government service. Building a big data ecosystem for government services has practical and technological value in improving government governance capabilities and levels.

## 2. Analysis on the Structure of Government Services Big Data Ecosystem

Similar to typical big data service systems, a big data ecosystem for government services includes data collection, processing, storage, analysis and application. Therefore, the government service big data ecosystem mainly composed of data collection and integration, data storage, data management, data analysis, big data application, and system monitoring. The structure of the government service big data ecosystem is shown in Figure 1.

## 3. Functional Design of Government Service Big Data Ecosystem

### 3.1. Data Acquisition

Due to institutional and lack of unified planning reasons, government service data has the characteristics of dispersed generation, heterogeneous data, and many channels. To build government big data application services, obtaining data from many heterogeneous systems and integrating them based on data standards is the basic premise<sup>[4,5]</sup>. Data acquisition is based on data exchange, event standards, and data standards, to achieve the integration of data collection from various systems and channels. The main functions of data collection are as follows:

- ETL timed batch extraction: Periodically extracts data from system exchange databases through the data exchange platform and load it into the corresponding database of the data storage system.

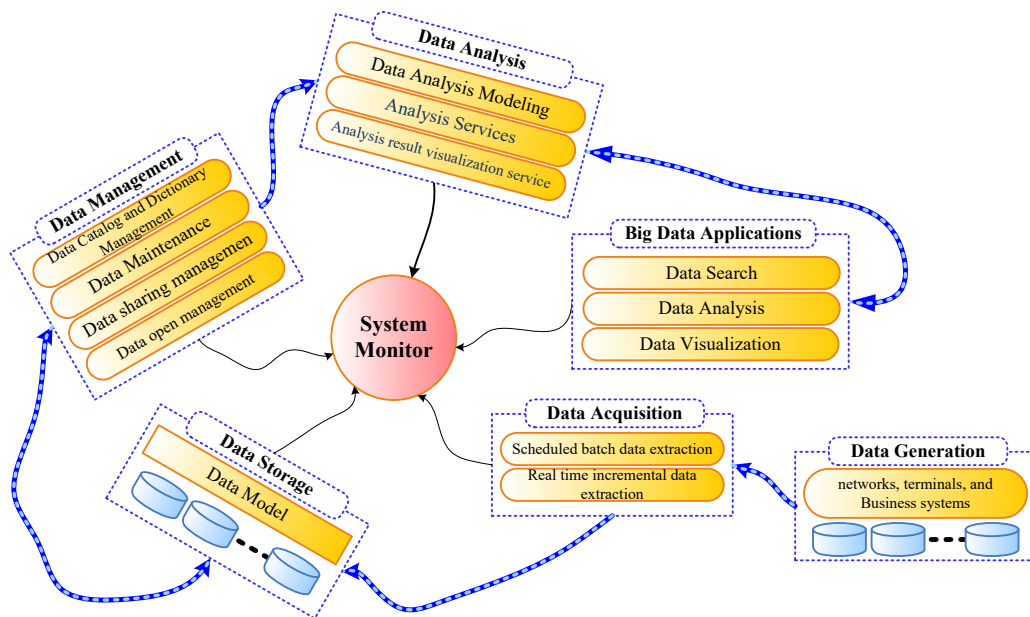


Figure 1 The structure of the government service big data ecosystem.

- Real-time incremental extraction: Based on the incremental capture mechanism, the data in the exchange database of each system is extracted in real time through the data exchange platform at a fixed time interval, and loaded into the corresponding database of the data storage system.

### 3.2. Data Storage

Data storage supports data storage for government big data services. According to the characteristics of government data, government services data storage can be established by selecting one or a combination of the following two options to establish a data warehouse

- Based on Hadoop technology expansion and encapsulation, it can realize big data application scenarios that are difficult to deal with traditional relational databases.
- Big data all-in-one machine. It is used to configure integrated server groups, storage devices, operating systems, database management systems, and specially pre-installed and optimized software for data query, processing, and analysis purposes, to meet the requirements of high stability and vertical scalability of data analysis requirements.

### 3.3. Data Management

Data management is the unified and standardized management of data creation libraries based on storage systems, which mainly includes the following functions.

#### 3.3.1. Data Catalogue and Data Dictionary Management

- The functions of establishing and maintaining multi-system and multi-channel data source directories and data dictionaries.
- The functions of establishing and maintaining common and personalized shared data directories and data dictionaries.
- The functions of establishing and maintaining the open data directory and data dictionary according to the government data opening system.

#### 3.3.2. Data Maintenance

Perform data management operations such as archiving, migrating, and restoring historical data from the basic database.

#### 3.3.3. Data Sharing

On the basis of a unified data exchange platform, data sharing mainly achieves the following

functions:

- Based on personal space, enterprise space and historical business data, shared databases for inter-department business handling such as public associated data, government open data, business norms and standards are established for the whole city, which mainly including license database, natural person database, legal person database, standard database, business database, etc.
- According to the shared data directory and data dictionary to control the shared data access, and provide the shared data access interface.
- Through comparison mechanism to achieve certification verification and material reuse.

### **3.3.4. Data Opening**

Data open management generates and manages open data views according to the open data directory, data dictionary, and government service data open system.

## **3.4. Data Analysis**

Data analysis is a core component of the government service big data ecosystem, which determines the service capability and performance of government service big data. It mainly includes the following functions.

### **3.4.1. Data Analysis Modelling**

- Users can establish data analysis models through system integration or external modelling tools, and can add the established algorithm models to the data analysis model library for other users to call. The data analysis modelling function only serves local big data applications.
- Data analysis model library and its management. The data analysis model library consists of a set of objects with standard calling interfaces, as well as retrieval, visualization, and algorithm analysis functions. The data analysis model library management implements operations such as adding, removing, and backing up analysis tools, and provides guidance for calling analysis models.
- The system provides local users with the establishment and maintenance functions of 'My Model Library'.

### **3.4.2. Data Analysis Service**

Data analysis service provides analysis service interface and completes data analysis process for government service big data applications. Its main functions include:

- The functions of completing local big data application data analysis, automatically or interactively control user data analysis model execution, output, store, and analysis results.
- The functions of completing data integration for big data applications and create data source views.
- The functions of providing analysis model invocation service for remote big data application, automatically or interactively control data analysis process according to big data application analysis rules, and output, store and analysis results.

### **3.4.3. Analysis Result Visualization Service**

The visualization service of analysis results is to call data visualization tools to visualize the analysis results according to the visualization requirements of big data applications.

### **3.4.4. Analysis Result Output**

- It provides analysis result call service for big data applications, and big data applications can process the results according to their own requirements.
- It provides visual analysis results call services for big data applications. Big data applications can process visual analysis results according to the requirements of display equipment and interactivity.

### **3.5. Big Data Applications**

In the government service big data ecosystem, local or remote big data applications only need to submit data source requirements, analysis service requests, and result invocation plans based on analysis requirements. The data analysis process is completed by the data analysis component, but the analysis process can be automatically or interactively controlled. Government service big data applications can be classified into the following three categories <sup>[6, 7]</sup>.

#### **3.5.1. Data Retrieval Application**

Data retrieval application mainly provides knowledge and simple statistical report services for users through keyword retrieval or semantic retrieval of business data <sup>[8]</sup>. For example: government service related policies, standards, guidelines search and browse; Search and browse location information, user information, channel information, etc.

#### **3.5.2. Data Analysis Application**

By establishing big data analysis models or rules, data analysis and application can analyse business data and reflect government service capability, system running state and some facts related to government affairs, so as to predict or make decision AIDS for system-related businesses and resources <sup>[9,10]</sup>.

#### **3.5.3. Data Visualization Application**

According to different application scenarios, the data visualization application reflects real-time or historical business statistics, resource allocation, network status, system operation status, field monitoring and other information by visualizing the data analysis results.

### **3.6. System Monitoring**

System monitoring mainly realizes the running state monitoring and service management of each component of the government service big data ecosystem.

#### **3.6.1. Real-time Monitoring**

- Real-time monitoring of server status, network connection status, system pressure status, data collection performance, data sharing and open interface status, etc.
- System running risk warning and log analysis.

#### **3.6.2. Service Management**

The government service big data ecosystem provides each component of the managing functions and services, including adding, changing, deleting, and providing external services.

## **4. Conclusion**

As an infrastructure of digital government, the government service big data ecosystem can effectively support the construction of a smart city. This paper explores the construction of government service big data ecosystem, proposes a big data ecosystem model for government service, and designs the structure and function of the model in detail. The aim of this exploration is to promote the construction of a digital government and better meet the growing needs of the people for a better life.

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