Research on Data Governance Framework for Fire Department

Zhenpeng An*
Shenyang Fire Science and
Technology Research Institute of
MEM, Shenyang, China
anzhenpeng@syfri.cn

Di Zhang
Shenyang Fire Science and
Technology Research Institute of
MEM, Shenyang, China
zhangdi@syfri.cn

Yunjie Liang
Fire and Rescue Department Ministry
of Emergency, Beijing, China
liangyunjie119@126.com

ABSTRACT

This paper analyzes data governance elements, models and frameworks, provides a clear plan for data governance for fire department. Using the method of literature research, network investigation and conclude data system of fire departments, the china domestic and foreign research status of data governance is reviewed. We build the framework of data governance for fire department, including Data resource directory system, Data technology support system and Data standardization system. This paper preliminarily forms the framework of data governance for fire department. This framework was applied to the fire information planning work. The results indicate that based on the status and characteristics of fire industry, the implementation of this framework is effective and feasible, and it is also the basis of standard fire control data governance in future.

CCS CONCEPTS

• **Applied computing**; • **Law, social and behavioral sciences**; • **Sociology**;

KEYWORDS

Data governance, Data standard system, Fire Department component;

1 INTRODUCTION

Government information resources are generated in every chain of government departments and all levels in the process of performing their duties. These information resources are the basis for each department to carry out the related business and play an increasingly important role in the management of various industries, scientific decision-making and external services. With the wide application of information system in fire departments, the fire department has accumulated relatively rich government information resources. In order to effectively improve the information resources open sharing

and utilization level, support the construction and development of "smart fire" effectively, it is important to study the technology of fire data governance framework. Based on the preliminary research of the fire department in the government information resources directory system, using the information resource management plan described in this paper, this paper makes a comprehensive combing and summarizing of the national firefighting information resources for the first time. It will establish a sound foundation for the establishment, management, sharing and utilization of the information resources government system for fire department.

2 OVERVIEW OF DATA GOVERNANCE FRAMEWORK RESEARCH

As the focus of research at home and abroad, data governance has made a great deal of achievements. Due to the different perspectives and focuses, there are dozens of data governance definitions given by the industry. But these definitions have not formed a unified standard so far. Based on the connotation and extension of the current mainstream data governance, data governance focuses on governance objectives, functions, scope, processes and specifications. Its essence is to evaluate, guide and supervise the management and utilization of users' data, and create value for users by providing continuously innovative data services[1].

(1) International Standardization Organization (ISO/IEC JTC 1/SC40)

International Standardization Organization IT service management and IT governance (ISO/IEC JTC 1/SC40) has developed ISO/IEC 38500 series standards[2]. The general model and methodology of information technology governance was proposed, and it is considered that the model is also applicable to the field of data governance. In the ISO/IEC 38505 standard of data governance specifications, the principle - driven data governance methodology is described, evaluate current and future data utilization, guide data governance preparation and implementation, and monitor compliance with data governance implementation standard were proposed. This model is actually a further extension of the IT governance methodology, it does not provide effective means for the implementation and implementation of data governance.

(2) The Data Governance Institute(DGI)

DGI summarizes the 10 key elements of data governance from the 3 levels of organization, rules and process, and innovatively proposes the DGI data governance framework[3]. The framework shows the logical relationships among the ten basic components in an intuitive way, forming a self-contained and complete system from method to implementation. DGI emphasizes that data governance is different from IT governance. Data governance is the process of enforcing the scope of governance for an organization

Table 1: The Research of Data Governance

Research field	Researchers	Research field
Data governance concepts	L. Cheong [7]	Data governance is the process by which an enterprise manages the quantity, consistency, ease of use, security, and availability of data.
	P. Sonia [8]	Data governance is a system of decisions, responsibilities, and processes that ensure the formal and unified management of critical data assets and information.
	D. Loshin [9]	Investigate five core concepts related to data governance: management of data consumer expectations, definition of key data quality dimensions, monitoring of metadata consistency, Data update and interpretation, data enhancement.
Data governance elements	G. Marinos [10]	The key elements of data governance are: responsibility and strategic responsibility, standards, management blind spots, meeting complexity, cross-departmental issues, measurement, collaboration, selection of strategic control points, compliance monitoring, awareness and training.
	S.Stockdale [11]	It summarizes five elements of data governance: governance structure; Roles and responsibilities; Data classification; Policies, standards, guidelines; The implementation.
	P. Sonia [8]	There are six key elements of data governance: strong start, quick win, leadership support, set funding, effectiveness measurement, and persistence.
Data governance model	K. Weber [12]	Based on a community action research project on data governance in six different types of multinational corporations, a data governance model consisting of three parts is proposed: data quality roles, decision domains, and responsibilities. The three together constitute a burden - sharing matrix.
	K. Wende [13]	An elastic model is proposed to describe and explain enterprise data governance, which consists of three parts: roles, decision domains, major activities and responsibilities.
	S. Kim [14]	A data governance model for business and IT alliances is proposed.
Data governance framework	L. Cheong [6]	A data governance framework composed of organization structure and policy, standard and process, and technology is proposed.
	B. Otto [15]	A data governance organization form composed of 28 individual organizations is proposed.
	DGI [3]	The DGI data governance framework and data governance life cycle theory are proposed.
	DAMA [16]	A DAMA data governance framework composed of functional sub-framework and environmental element sub-framework is proposed.

according to rules. The governance goal and governance domain need to be further defined.

(3) Information Systems Audit and Control Association(ISACA)

ISACA proposes COBIT, the best practice for process-oriented information systems auditing and evaluation[4]. A principle-based top-down framework for enterprise IT governance and management is proposed, which makes a strict distinction between governance and management. At the same time, five basic principles of data governance are proposed: meeting the needs of stakeholders, covering the enterprise from end to end, adopting a single integration framework, enabling a comprehensive approach, and distinguishing governance and management. Based on governance principles, COBIT analyses data governance stakeholders, enablers, scope, key areas of governance and management. But how to solve the big data governance life cycle, data application innovation and other aspects need to be further explored.

(4) IBM DG Council

The IBM DG Council proposed a maturity model for data governance by combining data characteristics and practical experience [5]. Data governance is divided into five levels, namely, the initial stage, basic management, active management, quantitative management and continuous optimization. At the same time, in the aspect of constructing the unified framework of data governance,

the data governance element model is proposed, which divides the data governance elements into four levels: supporting domain, core domain, enabling factor and achievement. The IBM DG Council believes that business goals or results are the most critical proposition of data governance. Under the role of supporting areas, core areas and enablers, organizations can ultimately achieve business goals or results and realize data value. This model focuses on data governance processes and methods.

In recent years, under the guidance of the thinking of "governance", foreign academic circles have carried out a large number of theoretical researches and practical explorations around data user data governance[6]. The representative theoretical researches are summarized as shown in Table 1

3 OVERVIEW OF RESEARCH ON FIRE DATA GOVERNANCE FRAMEWORK

In order to effectively improve the level of open sharing, development and utilization of information resources for the fire department, and solve the related technical and management problems such as decentralization of information resources, difficulty in sharing and poor sustainability of information sharing, this paper build the framework of data governance for fire department, including

Table 2: The Directory of Data Resources

Class		Item		Catalog		Table
Class code	Name	Item code	Name	Catalog code	Catalog Name	Name
1	Basic business class	01	Emergency rescue	01	Personal information	Basic information of personnel address list Social expert information Social expert domain information Personnel information of safety management organization
				02	Organization (unit) information	Joint Logistic Support Unit fire department Emergency linkage unit unit information

Data resource directory system, Data technology support system, and Data standardization system.

3.1 Data Resource Directory System for Fire Department

In order to build the government information resources, the first thing to do is to carry out information resources investigation and sorting. There are two options for combing the fire department information resources directory: First, the top-down approach, start from business sorting, survey business chains and business processing processes, and sort out information related to each business, so as to find out the government information resources generated by the department. The second is the bottom-up approach, start from the existing fire information system, to investigate and sort out the system situation and data resources in the database, and form a list of information resources.

Top-down approach is relatively simple and convenient, and the list of information resources carded out is orderly and standardized. However, because the actual information system and data resources are not one-to-one corresponding to the business chain and business processes, the list is not practical, and cannot be used as the standards for the future exchange and sharing of data resources. Therefore, considering with relevant scientific research and work experience of fire industry information resources directory, the second bottom-up approach is easier to be developed and implemented in the industry.

Starting with the investigation of information system, we carry out Fire information resources inventory work. We study and comb the basic situation of the main equipment basic situation, the basic information data resources (including the name of the database, data table, the number of data records, data storage, data update frequency) and data dictionary (field, what, field name, data type, length, etc.) and so on. We initially found out the ministry provided for e-government information resources, formed the information resource list. The directory of data resources is shown in Table 2

3.2 Technical Support System for Fire Data

Data support functions mainly include data access, data processing, data resource pool, data service, data management and control, data sharing and exchange and other construction contents.

(1) Data access. The unified data aggregation function is provided. Multi-source and heterogeneous fire service system database data, external sharing exchange data were accessed into data governance system.

(2) Data processing. Standardization and fusion process heterogeneous data from multiple sources. Forming data resources that can meet the needs of data application.

(3) Data resource pool. According to the local actual situation, the data resource pool has original database, resource database, topic database, thematic database, etc. shall be constructed according to the data use purpose and the requirements of hierarchical and classified management, so as to meet the landing storage and business support requirements of data related to the data governance system.

(4) Data control. Process control and quality supervision over the whole life cycle of data resources to realize registration, security, authorization and catalog management of data resources, improve data quality, guarantee safe use of data, and ensure that data resources are real, transparent, manageable and controllable.

(5) Data services. Contains services for upper-level business applications and external business systems, all of which can be registered, published, and consumed.

(6) Data sharing and exchange. It provides unified data authorization sharing and exchange function, horizontally realizes data exchange and sharing with other business systems at the same level, vertically realizes data aggregation and distribution with fire and rescue bureau and brigade level, and regularly synchronizes resource catalog to the emergency management big data application platform.

3.3 Standard System of Fire Data

The fire protection data standard system mainly includes three aspects: basic standard, management standard and application standard, as shown in Figure 1
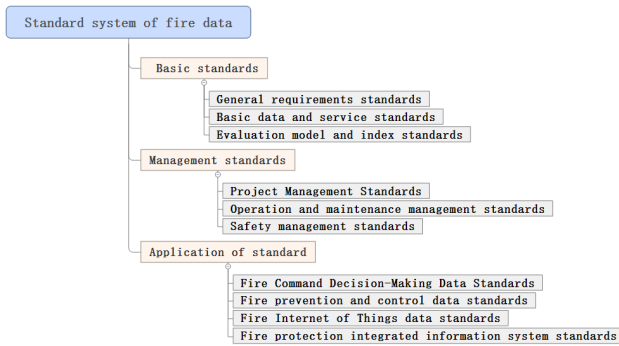
(1) Basic standard

Figure 1: Standard System of Fire Data.

Basic standard is a standard that has a broad scope of application or contains general provisions for a particular area. It mainly includes common requirement standards, basic data and service standards, infrastructure standards, evaluation model and indicator standards. General requirements standard should mainly include the general technical requirements and terms of fire information construction, which are used to regulate the general technical requirements of fire information construction, as well as the information technology terms, business terms and graphic symbols involved in the application. Basic data and service standards are used to normalize and standardize the basic data of fire protection informatization. It ensures the accuracy, reliability and sharing of the data, so as to realize data sharing and information integration. Evaluation model and index standards are used to standardize the standard of supporting system database, interface protocol, performance evaluation and so on.

(2) Management standard

Management standard refers to the standard of management matters that need to be coordinated and unified in the field of standardization. It contains a main program used in the standard system construction, construction, supervision, testing, acceptance and so on each link to follow the project management standards. It is used in the standard system construction operations of all kinds of hardware and software and environmental management standard, and used in standard system construction of the physical, system, network and application of safety management standard.

(3) Application of standard

Application of standard is special application standards for various business systems. It mainly include fire command decision data standards, fire prevention and control data standards, fire Internet of Things data standards, and fire integrated information system standards. The standard of fire command decision data is used to standardize the relevant standards of fire command operation, such as fire alarm reception, command and dispatch, auxiliary decision, digital plan, etc. Fire prevention and control data standards are used to standardize fire control supervision and inspection, fire safety risk assessment, fire risk prediction and early warning and other related fire prevention and control business standards. Fire-fighting IOT data standards are used to regulate the standards of building fire-fighting facilities, fire-fighting and rescue equipment,

emergency and disaster relief materials and other facilities and equipment. The fire protection integrated information system standard is used to standardize the standards supporting fire protection operations, intelligent integrated analysis and other services.

4 APPLICATION AND CONCLUSION

In the year of big data, data as a service is the inevitable trend in the future. Fire data governance framework can optimize and improve data, ensure the quality, security and privacy of data, and promote the service innovation and value creation of data. In this paper, based on the relevant data governance research results, around the needs of fire data governance, the fire data governance framework is proposed to describe the application of the data governance framework from a global perspective. At the china domestic level, the results are mainly applied to the Development Plan of Fire and Rescue Team Informatization (2019-2022). This framework can help organizations understand the overall picture of data governance and guide the application and practice of data governance. As a new research and application field, fire data governance has broad application prospects and is an important support for organizations to realize fire data service innovation and value creation. Because of this, the research and application of fire data governance have a long way to go and more organizations and scholars need to continue to in-depth research and exploration.

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