Research on a Decision-Oriented Domain Knowledge Fusion Service Model for Government Website Information Resources (Postprint)

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Abstract

[Purpose/Significance] This study innovatively introduces the concept of knowledge fusion into government decision-making, aiming to enhance government decision-making capabilities through deep mining and utilization of massive government website information resources with multiple decision-support values. [Method/Process] Based on the decision-support values of different types of government website information resources, this paper analyzes the requirements and functional positioning of decision-driven domain knowledge fusion services, constructs a decision-oriented domain knowledge fusion service model for government website information resources, and provides a case description of the model's application scenario by taking the knowledge fusion of relevant information resources regarding the "Streamlining Administration, Delegating Powers, and Optimizing Services" reform published on government websites as an example. [Results/Conclusion] The model provides new perspectives, ideas, and approaches for constructing scientific decision-making support service platforms for Party and government leaders.

Full Text

Preamble

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Abstract

[**Purpose/Significance**] This study innovatively introduces the concept of knowledge fusion into government decision-making. By deeply excavating and utilizing massive government website information resources with multiple decision-support values, it aims to improve government decision-making capabilities.

[**Method/Process**] Based on the decision-support values of different types of government website information resources, this paper analyzes the demand for and functional positioning of decision-driven domain knowledge fusion services. Accordingly, it constructs a decision-oriented domain knowledge fusion service model for government website information resources. Using the knowledge fusion of information resources related to the "Streamlining Administration, Delegating Powers, and Optimizing Services" reform published on government websites as a case study, the paper describes the application scenarios of the model.

[**Result/Conclusion**] The model can provide new perspectives, ideas, and approaches for the construction of current scientific decision-making support service platforms for party and government leaders.

Keywords: government website information; knowledge fusion; domain knowledge; decision-making; model

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Government websites serve as the primary platform and channel for government information disclosure and citizen-government interaction. The massive information resources they carry, as authentic records of government administrative processes, possess multiple decision-support values including data mining, policy analysis, public opinion aggregation, and governance reference, making them an important basis for government decision-making. In 2018, the significant proposition of "promoting scientific and democratic government decision-making and improving government decision-making capacity" was once again written into the government work report, placing higher demands on the level and efficiency of government decision-making. Against this backdrop, information services driven by government decision-making need to be elevated to the level of knowledge services. Transforming government website information resources into knowledge resources represents a powerful means to improve the level and efficiency of government decision-making, and knowledge fusion offers an excellent pathway for this transformation from information to knowledge. Knowledge fusion can address issues such as fragmentation, redundancy, and incompleteness in multi-source distributed information on government websites by extracting relevant knowledge from numerous data sources, processing it through knowledge transformation and merging, and generating new integrated knowledge objects to construct effective knowledge resources for problem-solving in the government decision-making process. This approach uncovers implicit knowl-

edge embedded in massive government website information resources, forms decision-making wisdom, and thereby promotes the enhancement of government decision-making capacity, providing new ideas and methods for solving knowledge service problems in the domain of decision-support-oriented government website information resources.

1. Research Status

Based on the research content of this paper, we conducted searches in literature databases such as SCI, Elsevier, Emerald, Springer, IET Electronic Library, and CNKI, as well as academic search engines like Google and Baidu, to obtain journal articles, research reports, and network resources related to themes such as government decision-making and knowledge fusion. Through content analysis of these materials, we summarized domestic and international research status and development trends.

1.1 Government Decision-Making Research

Government decision-making is the process by which government departments at all levels make decisions to address public affairs. Its essence is a process in which decision-makers use the information they possess to employ scientific methods to propose multiple solutions to problems and then make optimal choices from these solutions [1]. From an information theory perspective, Tan Biyong et al. [2] argue that government decision-making is essentially a series of processes for government information collection, organization, management, development, and utilization, emphasizing that government information resources are the foundation of government decision-making. Scholars generally agree that macro-level government decision-making requires rich, effective, and practical information resources, and that targeted organization, development, and utilization of various types of government information [3] and social public opinion information [4] are crucial for scientific and efficient decision-making. Government, for-profit organizations, and non-profit organizations serve as the main bodies for information resource development [5]. These three parties cooperate through models such as government self-development, market-oriented development, social development, and licensing system development to develop and utilize information resources [6], ultimately providing information products and services for government departments and the public in the form of government websites, open data platforms, and think tanks [7]. Additionally, as a knowledge-intensive behavior, government decision-making's processes, methods, and outcomes are all closely related to knowledge, with the decision-making process essentially being a process of achieving knowledge innovation through a series of knowledge management activities [8]. Against the current big data backdrop, scholars have conducted research on constructing knowledge management systems and knowledge bases for government decision-making using emerging technologies and methods such as knowledge reasoning, knowledge mining, and knowledge visualization [9-11].

1.2 Knowledge Fusion Research

Knowledge fusion research originates from knowledge engineering and is a new fusion concept developed on the basis of data fusion and information fusion. It has been widely applied in management, military, medical, industrial, commercial, and many other industries [12]. As disciplines such as library and information science continuously expand the concept of knowledge fusion, research on knowledge fusion from a knowledge management perspective has emerged, defined as a process that addresses domain knowledge service problems. Based on massive multi-source distributed data, it applies methods and technologies such as semantic web, knowledge ontology, and knowledge mining to extract knowledge factors and their relationships hidden in data through knowledge extraction and transformation, and then performs operations such as reorganization, redundancy elimination, and integrity verification to create new integrated knowledge objects [13].

From a knowledge organization perspective, related research mainly focuses on knowledge fusion model frameworks, implementation methods, and service mechanisms and strategies. For instance, Gao Jinsong et al. [14] constructed a knowledge fusion model framework based on linked data, which uses ontology matching technology to achieve knowledge fusion and thereby obtain new knowledge for problem-solving. Huang Xinping [15] explored implementation methods for domain knowledge fusion of government website information resources from three different dimensions—content dimension, structure dimension, and application dimension—supported by knowledge organization technologies such as semantic web, knowledge reasoning, and knowledge discovery. A. Smirnov et al. [16] analyzed influencing factors of knowledge fusion in context-aware decision system environments and proposed a knowledge fusion service mechanism to support decision-making needs by comprehensively applying simple fusion, extended fusion, and instantiation fusion methods. Zhou Liqin et al. [17] constructed a big data knowledge fusion service framework to address knowledge fusion needs in knowledge services under big data and network environments, and proposed knowledge fusion service strategies that can meet users' multi-level, personalized, and innovative knowledge service demands.

1.3 Research Status Review

Analysis of existing literature reveals that current academic research on government decision-making and knowledge fusion mainly focuses on the development and utilization of information resources driven by government decision-making and corresponding knowledge management under big data environments, as well as knowledge fusion model frameworks, implementation methods, and service mechanisms and strategies. However, there is scarce research applying knowledge fusion to government decision-making, and even less research on knowledge fusion services oriented toward government decision-making. The purpose of this study is to attempt to transcend the current research status on government decision-making and knowledge fusion by innovatively combin-

ing these two research areas, using massive information resources published on government websites as the object of knowledge fusion, revealing the paths and mechanisms of decision-driven domain knowledge fusion services, and accordingly constructing a decision-support-oriented domain knowledge fusion service model for government website information resources.

2. Decision Support Value of Government Website Information Resources

As the main carrier and channel for government transparency and citizen-government interaction, government websites carry information such as government documents, policies and regulations, planning documents, statistical data, and online public opinion. These authentic records of government administrative processes possess multiple decision-support values including data mining, policy analysis, public opinion aggregation, and governance reference, increasingly becoming an important basis for government decision-making in the big data era.

2.1 Data Mining

Economic and social development statistical data published on government websites, such as industry data, annual data, and regional data, constitute an important foundation for scientific government decision-making. Taking the National Bureau of Statistics website as an example, by the end of 2017, it had published 71,539 statistical indicators including GDP, CPI, total retail sales of consumer goods, and grain output, with a total data volume of 10.549 million entries [18]. Scientific evaluation and predictive analysis of these discrete statistical data can uncover useful information hidden in massive data that guides decision-making. For instance, the U.S. government open data website Data.gov integrates multi-dimensional, high-quality datasets from 14 different domains including agriculture, climate, energy, education, healthcare, and scientific research officially released by the government. It employs technologies such as data correlation analysis and data visualization to conduct in-depth value mining of these massive datasets and has developed a series of decision-support-oriented applications, maximizing the benefits of data-driven decision-making [19].

2.2 Policy Analysis

With the rapid development of government information disclosure in China, increasing amounts of government information are published through government portal websites. Taking Beijing as an example, in 2017, governments at all levels in Beijing disclosed 665,500 pieces of information through portal websites, covering government documents, government bulletins, policies and regulations, and planning documents [20]. Through quantitative analysis of the content and attribute characteristics of these isolated policy texts, we can

trace the evolution of policy formulation, changes, and diffusion, and analyze the complex relationships that commonly exist between policies. This not only clarifies policy intentions and grasps policy impact effects at the micro level but also understands policy evolution patterns, analyzes policy diffusion paths, and predicts policy development trends at the macro level, thereby helping the government to scientifically formulate relevant policies for decision-making issues in a problem-oriented manner during the decision-making process [21].

2.3 Public Opinion Aggregation

Online public opinion solicitation is an effective way adopted in the government decision-making process to collect public opinions and suggestions. Currently, an increasing number of government departments choose to promptly release information through official portal websites and publicly solicit public will and demands through online messages, work suggestion boxes, and people's suggestion collection, especially when policies relate to the vital interests of the public. For example, during the Two Sessions, the "Speak to the Premier" netizen suggestion collection activity launched on the central government website received over 400,000 suggestions from netizens in 2017, covering issues of widespread public concern such as housing prices, medical care, education, and employment [22]. Deep integration and analysis of these massive fragmented social conditions and public opinions help enhance the democratic nature of government decision-making.

2.4 Governance Reference

Government documents and policies and regulations are important references for government departments to grasp policy directions and administer according to law in fulfilling their management functions. Taking government documents as an example, they are often formed when a higher-level department issues an initial document, after which governments at all levels issue corresponding derivative documents to implement it. For instance, after the 2018 Central No. 1 Document "Opinions of the CPC Central Committee and the State Council on Implementing the Rural Revitalization Strategy" was released on the central government website, local governments successively issued local documents to implement its spirit, such as "Measures for Implementing the Rural Revitalization Strategy" released on the Beijing municipal government website and "Implementation Opinions on Implementing the Rural Revitalization Strategy" released on the Jiangsu provincial government website. However, due to changes in domestic and international situations, the creation, modification, and even nullification of various documents exist. In response to this situation, comprehensive collection and evolution analysis of government documents on a certain theme published on government websites can provide the document formation process and changes in document content (such as retention, modification, and deletion) to decision-makers for reference, thereby promoting scientific decision-making in government according to law.

3. Demand and Functional Positioning for Domain Knowledge Fusion Services

The government decision-making process, also known as the policy process, reflects the policy formulation process. According to policy process theoretical models [23], this paper divides the government decision-making process into stages including issue identification, policy formulation, policy implementation, and policy evaluation. Behavioral decision theory posits that decision-making, as a knowledge-intensive behavior, requires information and knowledge at each stage determined by the problems that need to be solved at that stage [24]. Knowledge fusion services address issues such as fragmentation, redundancy, and incompleteness in multi-source distributed information in big data environments by extracting knowledge from numerous data sources, processing it through knowledge transformation and merging, and generating new integrated knowledge objects to construct effective knowledge resources for solving decision-making problems. It uncovers implicit knowledge embedded in massive government website information resources, forms decision-making wisdom, and thereby promotes the enhancement of government decision-making capacity.

3.1 Demand Analysis for Domain Knowledge Fusion Services

Based on systems theory's holistic thinking, demand analysis for decision-oriented domain knowledge fusion services involves key elements such as demand subjects, demand motivations, demand content, and demand stages [25]. The demand subject is the decision-maker. Due to the strategic, procedural, and sequential nature of government decision-making, decision-makers focus more on authoritative, accurate, systematic, and comprehensive macro-level information such as policies, regulations, and statistical data. When facing decision-making problems, they need complete sets of feasible solutions that can be summarized to address different issues, and they need knowledge obtained through knowledge processing of massive, scattered data and information that can reflect essential characteristics, objective laws, and development trends. Demand motivation refers to the problems or goals faced in the decision-making process, including the determination of decision-making problem-solving goals in the issue identification stage, the formulation of multiple plausible decision-making solutions in the policy formulation stage, the selection of optimal solutions in the policy implementation stage, and the correction and improvement of selected solutions in the policy evaluation stage. These problems drive decision-makers' knowledge demand behaviors. Demand content refers to the decision-making knowledge required by decision-makers to solve corresponding problems, including domain knowledge, task knowledge, and reasoning knowledge. Demand stages correspond to the four stages of the government decision-making process. At different stages, decision-makers face different problems or goals and obtain different types of knowledge from specific information environments based on a dynamic knowledge supply-demand matching mechanism.

(1) Issue Identification Stage. Utilize online surveys, online messages, and work suggestion boxes on government websites to widely solicit opinions and demands from all sectors of society on decision-making issues. Classify, compile, and statistically analyze the collected information to form knowledge resources such as special reports that provide references for issue identification.

(2) Policy Formulation Stage. Conduct quantitative analysis and content interpretation of massive information resources such as government documents, policies and regulations, and statistical data related to decision-making issues published on government websites. Extract complete domain knowledge that accurately reflects the current situation of decision-making issues, clarifies influencing factors, and predicts future trends to provide intellectual support for scientific policy formulation.

(3) Policy Implementation Stage. Track the policy implementation process, integrate resources such as documents forwarded by government websites at all levels and new derivative documents issued after policy promulgation, and use data mining to discover patterns and laws of policy diffusion and evolution to form knowledge about policy outcomes.

(4) Policy Evaluation Stage. Use online evaluation and policy feedback forms on government websites to obtain feedback from the public during the implementation of decision-making solutions, and conduct comprehensive evaluation and analysis of relevant government performance information released by governments at all levels after policy implementation. Form knowledge resources such as policy feedback and evaluation reports to provide countermeasures and suggestions for policy revision and improvement.

3.2 Functional Positioning of Domain Knowledge Fusion Services

From a systems perspective, guided by knowledge demands in the government decision-making process and using knowledge services as the link, knowledge fusion methods, technologies, and tools are applied to extract, cluster, and reorganize knowledge from multi-source, multi-type government website information resources. By constructing a systematic and complete decision-making knowledge system, functional requirements such as knowledge discovery, knowledge innovation, and knowledge appreciation are achieved, with main presentation forms including comprehensive perception decision-making, multi-dimensional driven decision-making, intelligent assisted decision-making, and dynamic tracking decision-making. This constitutes the functional positioning of decision-oriented domain knowledge fusion services for government website information resources.

3.2.1 Comprehensive Perception Decision-Making Public opinion in the public domain helps supervise government power and influence government decision-making. "Online governance" with public participation has become an important component of government decision-making. When making decisions

concerning the vital interests of the masses, government departments should understand the interests and demands of policy target groups, gather public wisdom, and optimize decision-making. Therefore, facing massive fragmented public opinion and social suggestion information, knowledge fusion services capable of comprehensive integration and analytical condensation are needed to help decision-makers comprehensively perceive and predict public demands, promptly identify decision-making problems and incorporate them into the decision-making agenda, and simultaneously segment the diverse demands of the public to make government decision-making more democratic and precise.

3.2.2 Multi-Dimensional Driven Decision-Making Decision-making in the big data era emphasizes not only mastering large amounts of historical, real-time, and correlated data and information related to decision-making issues but also requiring the transformation of these fragmented data and information into complete domain knowledge that can assist decision-makers in making scientific decisions. The multi-source, distributed, regional, and hierarchical characteristics of government website information resources determine that they have multiple knowledge dimensions at the knowledge service level supporting decision-making. Therefore, when providing corresponding knowledge fusion services, it is necessary to conduct knowledge fusion of multi-source distributed government website information resources from different dimensions according to different classifications, methods, and paradigms. This provides decision-makers with multi-perspective, multi-level, multi-theme, and multi-granularity knowledge presentation methods and obtains new knowledge for problem-solving through multi-dimensional knowledge association to meet decision-support needs.

3.2.3 Intelligent Assisted Decision-Making The key to decision-making lies in predicting the future. During the decision-making process, corresponding data and information need to be quantitatively analyzed and knowledge-mined to judge the causes, development trends, and correlations of influencing factors of decision-making issues. The core of knowledge fusion is precisely prediction. It uses big data technology to scientifically process large-scale data, can discover objectively existing relationships that the human brain cannot imagine, and quickly depicts development patterns and deduces future trends. Therefore, when providing corresponding knowledge fusion services, massive government website information resources should also be scientifically analyzed and deeply mined to sort out the internal logical relationships of problems in disorderly information, find solutions, provide knowledge support for decision-making solution selection, and improve the forward-looking nature and accuracy of decision-making.

3.2.4 Dynamic Tracking Decision-Making Scientific decision-making requires the ability to track and observe policy implementation effects and to adjust and revise decision-making solutions in real-time according to policy implementation conditions and changes in the policy environment. Therefore,

during the decision-making implementation process, it is necessary to dynamically track and analyze feedback data and information on policy implementation in a timely manner. By providing corresponding knowledge fusion services, the decision-making evaluation, feedback, and correction mechanisms can be optimized, enabling decision-makers to grasp policy implementation conditions and implementation deviations in real-time. Additionally, it can simulate and present the policy implementation process and results, compare them with decision-making expectations, help decision-makers make targeted corrections and improvements to the overall policy solutions and detailed issues formulated in the decision-making process, and enhance the scientific nature of decision-making.

4. Model Construction for Domain Knowledge Fusion Services

Currently, academic research on decision-support-oriented knowledge management model construction mainly follows two approaches: one is structure design based on the knowledge value chain model [24, 26], which has relatively clear hierarchical dimensions and is mainly designed according to process models such as three-stage and four-stage decision-making theories. This approach can better express the knowledge demands and knowledge flow characteristics at different stages of the decision-making process, but due to the complexity of the decision-making process, there are often certain cross-cutting or unclear issues among its constituent elements. The other is structure design based on evidence-based decision-making theory [27-28], which mainly refers to the DIKW (Data-Information-Knowledge-Wisdom) concept and the knowledge management system in the decision-making field for comprehensive element model construction. From a systems theory perspective, this approach describes the knowledge management elements in decision-making activities and can systematically reflect the knowledge demands and corresponding knowledge service processes of each decision-making process link, but its definition of constituent elements at each stage is not detailed enough.

The research topic of this paper—decision-oriented domain knowledge fusion services—has certain particularities that make it difficult to directly apply either of the above approaches to its model structure design. To enhance the scientific nature and systematic nature of model construction, the above two approaches can be comparatively analyzed and comprehensively integrated. This research topic belongs to the research category of decision-support-oriented knowledge management. On the basis of clarifying the differences between the two approaches, existing research results on knowledge management models in the decision-making field can provide references for the model structure design of this research topic. Meanwhile, theories such as the knowledge value chain model and evidence-based decision-making referenced in related studies also provide important theoretical support for constructing the decision-oriented domain knowledge fusion service model for government website information resources.

4.1 Model Structure Framework and Component Analysis

Based on the overall approach to model construction described above, this paper proposes the model structure framework shown in Figure 2 [Figure 2: see original paper]. This framework includes four core components: basic resources, decision-making activities, knowledge fusion, and service application. Structural elements in different parts are guided by the decision-driven knowledge fusion service process and achieve interconnection and internal integration through decision business flows and decision knowledge flows.

4.1.1 Basic Resources Basic resources refer to various types of government website information resources relied upon in decision-making activities, including original documents or historical records generated by government departments during daily government management processes and published through their portal websites, such as government documents, policies and regulations, government bulletins, planning documents, statistical data, performance information, and online public opinion, proposals, and policy feedback formed by the public participating in "online governance" using government portal websites as the carrier. These resources serve as basic elements supporting decision-making and as data sources for providing domain knowledge fusion services. They mostly appear in the form of isolated documents or fragmented information but have certain content-based associations and logical deduction relationships between them.

4.1.2 Decision-Making Activities Decision-making activities occupy the core position in the entire framework, serving as the intermediate link connecting all parts. They follow the decision-making business flow of "issue identification → policy formulation → policy implementation → policy evaluation," adhere to the evidence-based decision-making concept that evidence is knowledge, emphasize that knowledge management is the foundation of decision-making, and apply knowledge fusion methods to conduct knowledge value chain management of procedural and patterned decision-making processes. This completes the transformation of various data and information resources in the basic resource layer into knowledge resources, combines static knowledge with dynamic decision-making processes to form decision knowledge flows interdependent with decision business flows, and enables decision knowledge to continuously innovate and appreciate in flow, ultimately presenting its decision-support value through specific service applications.

4.1.3 Knowledge Fusion Knowledge fusion involves using big data methods and technologies such as semantic web, linked data, data mining, and knowledge discovery to conduct knowledge source collection and processing, knowledge extraction and representation, knowledge reorganization, knowledge association, and knowledge clustering on massive, multi-source distributed government website information resources according to different knowledge demands in the decision-making process. This organizes scattered and fragmented network

information resources in an orderly and knowledge-based manner, ultimately forming various knowledge resources that support decision-making activities, such as public opinion and demand special reports, policy solutions, policy diffusion and evolution patterns, and policy feedback and evaluation reports. These knowledge products are important guarantees for achieving corresponding knowledge services.

4.1.4 Service Application Service application refers to the realization and application of domain knowledge fusion service functions oriented toward decision support. As a bridge connecting decision business flows and decision knowledge flows, it can conduct deep mining and correlation analysis of knowledge resources derived from knowledge fusion for different application scenarios of decision-making activities using technologies such as knowledge mining, knowledge reasoning, and knowledge association. This forms the complete domain knowledge required by decision-makers, meets decision-makers' personalized, precise, and intelligent knowledge needs by constructing a whole-process, multi-dimensional knowledge fusion service matching mechanism, and provides domain knowledge to decision-makers in visual forms such as knowledge navigation, knowledge graphs, and knowledge maps. Simultaneously, it can optimize domain knowledge fusion methods by obtaining feedback from decision-makers on the application of knowledge fusion service functions, thereby maximizing the decision-support value of basic resources.

4.2 Specific Model Construction

Based on the above analysis, this paper constructs the model shown in Figure 3 [Figure 3: see original paper] using evidence-based decision-making theory and the knowledge value chain model as theoretical foundations, combined with the demand for and functional positioning of decision-oriented domain knowledge fusion services for government website information resources. This model can systematically reflect the dynamic collaborative mechanism among the four components—basic resources, decision-making activities, knowledge fusion, and service application—and their structural elements in the above framework, avoiding the problem of static accumulation of system elements in traditional structural model construction.

The collaborative operation mechanism among the various components in the model forms a dynamically evolving system. This system uses massive information resources carried by government websites as its foundation, applies big data thinking, methods, and technologies, follows the requirements of evidence-based decision-making, and proceeds along the main line of knowledge value chain management to achieve "input" from the basic resource layer, "drive" from the decision-making activity layer, "transformation" from the knowledge fusion layer, and finally "output" and "feedback" from the service application layer. Among these, the basic resource layer is the starting point of system operation, and its various resource elements have mutually associated and interdependent

relationships. The comprehensive collection and orderly organization of these resource elements provide support for system operation. The decision-making activity layer plays an overall controlling role in the entire system operation and is key to ensuring collaborative linkage among all operational links. It can not only directly drive the operation of the knowledge fusion layer but also indirectly influence the selection of various resource elements in the basic resource layer and the scheduling of different service functions in the service application layer. The knowledge fusion layer serves as the core link in system operation and is key to achieving decision knowledge value chain management. Only through the operation of the knowledge fusion layer can the system achieve the extraction and activation of data and information from the basic resource layer, transform them into knowledge products usable by the decision-making activity layer, and directly determine the result output of the decision-support functions of the service application layer. The service application layer is the ultimate purpose and destination of the entire system operation. As the result of interactions among various structural elements of the system, it provides the required knowledge service functions for the decision-making activity layer and timely updates and adjusts the operation of all system links through feedback on the application effects of specific functions.

4.3 Model Application Scenarios

The "Streamlining Administration, Delegating Powers, and Optimizing Services" reform is an important decision and deployment made by the state in recent years to streamline administration, delegate powers, focus on special reforms, innovate regulatory methods, and optimize government services. Since the implementation of the reform, various government documents, policies and regulations, statistical data, and performance information related to the "Streamlining Administration, Delegating Powers, and Optimizing Services" reform have been successively published on government websites at all levels. As the reform involves the vital interests of the masses, social conditions and public opinions generated around the reform are increasingly expressed through government portal websites at all levels. This paper uses the knowledge fusion of information resources related to the "Streamlining Administration, Delegating Powers, and Optimizing Services" reform carried by government websites as an example to describe the application scenarios of the above model according to the decision-making process.

4.3.1 Issue Identification Stage Stakeholders in the "Streamlining Administration, Delegating Powers, and Optimizing Services" reform include service recipients, small and micro enterprises and individual businesses, and scientific and technical personnel from universities and research institutes. They typically use online surveys, online messages, and work suggestion boxes on government websites to express their opinions and demands on decision-making issues, thereby forming massive fragmented online public opinion information. Methods and technologies such as web information topical collection, incremental

crawling, and cluster analysis can be used to automatically obtain, incrementally cluster, detect themes, and focus on topics in this information, achieving deep integration and comprehensive expression of social conditions and public opinions. This forms special reports on public opinion demands such as "fewer trips for handling affairs," "integration of multiple certificates," "certificate before license," "approval procedures," "professional qualification certificates," and "bizarre certificates," enabling decision-makers to comprehensively perceive the interests and demands of policy target groups when identifying decision-making issues.

4.3.2 Policy Formulation Stage Since the central government launched the "Streamlining Administration, Delegating Powers, and Optimizing Services" reform, governments at all levels have carried out practices on many themes such as "maximum one trip," "approval without meeting," "immediate handling, online handling, one-time handling," "one-door, one-network," and "one seal for approval," and have published a large number of related government documents, administrative regulations, and statistical data on "matter lists," "power lists," and "responsibility lists" involved in the reform through their portal websites. This information mostly exists in the form of isolated texts but has certain content-based associations. Technologies such as natural language processing, semantic analysis, statistical forecasting, linked data, and knowledge mining can be used to intelligently screen, comprehensively integrate, and quantitatively analyze these isolated and scattered data and information. This forms complete domain knowledge covering current situation analysis, situation judgment, and trend prediction of decision-making issues, which can be presented in multi-dimensional knowledge association forms such as knowledge maps and knowledge graphs according to different themes, levels, and granularities using knowledge visualization tools, providing references for scientific policy formulation.

4.3.3 Policy Implementation Stage In October 2013, the central government website issued the first document on the "Streamlining Administration, Delegating Powers, and Optimizing Services" reform, "Opinions on Transforming Local Government Functions and Institutional Reform," which then rapidly diffused top-down to governments at all levels and all fields. A series of derivative documents on different fields such as "administrative approval," "power list system," "Internet + government services," "integration of multiple certificates," and "social credit system construction" were successively published on government websites at all levels. This information is disorderly but has some internal logical relationships that the human brain cannot imagine. Methods and technologies such as text knowledge extraction, thematic classification mapping, complex network analysis, and time series analysis can be used to conduct quantitative analysis and deep mining of this information, and social network analysis tools can be used to visualize the results. This helps identify patterns and characteristics of policy diffusion modes, paths, breadth, depth, and speed

after policy implementation, providing support for decision-making solution selection.

4.3.4 Policy Evaluation Stage The "Streamlining Administration, Delegating Powers, and Optimizing Services" reform adheres to the core concept of "people-centered" and emphasizes using public satisfaction and sense of gain to evaluate reform effects. Governments at all levels have included this reform in their performance assessments. After the implementation of relevant decision-making solutions, the public will provide feedback on policy opinions and suggestions through online surveys and online evaluations on government websites, and governments at all levels will also publish corresponding reform achievements and performance evaluation information on their portal websites. Methods and technologies such as text content mining, correlation analysis, scientific evaluation, and Agent simulation can be used to dynamically track and comprehensively evaluate this information, extract elements affecting decision-making effects, improve implementation results through policy simulation, and evaluate public satisfaction after policy improvement, helping decision-makers select optimal optimization solutions.

5. Conclusion

The core characteristic of government decision-making in the big data era is its high dependence on knowledge. Transforming massive government website information resources with multiple decision-support values into knowledge resources and providing corresponding knowledge services through knowledge fusion is an important way to improve government decision-making capacity. This paper has conducted beneficial explorations on this issue, attempting to transcend the current research status on government decision-making and knowledge fusion. Based on the analysis of demand for and functional positioning of decision-oriented domain knowledge fusion services for government website information resources, and supported by systems theory, evidence-based decision-making theory, and the knowledge value chain model, this study innovatively constructs a decision-oriented domain knowledge fusion service model for government website information resources. Structurally, the model breaks through the problem of static accumulation of system elements in traditional structural model construction and forms a dynamically evolving system through collaborative operation among its components. Functionally, it achieves the organic combination of static knowledge resources and dynamic decision-making processes, can flexibly reconstruct knowledge products according to changes in the decision-making environment and demands, and ensures that decision-makers receive the most needed knowledge services in the most appropriate way at the most appropriate time. The model provides new perspectives, ideas, and approaches for solving knowledge service problems in the domain of government website information resources and offers good reference value for constructing flexible, scalable, and integrated new scientific decision-making support service platforms for party and government leaders.

References

[1] Hu Xiangming. Public Sector Decision-Making Theory and Methods [M]. Beijing: Higher Education Press, 2007.
[2] Tan Biyong, Wang Xincai, Lü Yuanzhi. Research on Government Information Resource Management Based on Government Decision-Making [J]. Information Studies: Theory & Application, 2009, 32(4): 37-40.
[3] Wan Jiexi, Dong Weidong, Wu Peng. Organization of Government Information Resources for Government Decision-Making [J]. E-Government, 2009(2): 56-65.
[4] Wang Yuefen, Xing Mengting. Research on Semantic Organization of Social Public Opinion Information for Government Decision-Making Needs [J]. New Technology of Library and Information Service, 2016(S1): 21-31.
[5] Wang Cuiping, Hou Lu. Analysis of Current Status of Information Resource Development for Government Decision-Making Abroad [J]. Research on Library Science, 2017(13): 17-21.
[6] LATHAMB. American libraries and the US federal government: an overview of partnerships for enhanced resource access [J]. Reference reviews, 2015, 29(8): 2-6.
[7] KIM GH, TRIMI S, CHUNG JH. Big-data applications in the government sector [J]. Communications of the ACM, 2014, 57(3): 78-85.
[8] Rong Juntao, Wang Liying. Research on "Scenario-Response" Mechanism of Knowledge Management for Government Crisis Decision-Making [J]. Journal of Intelligence, 2016, 35(5): 188-194.
[9] Zhang Bin, Wei Kou, Hao Qi. Research on Construction of Archives Knowledge Base for Decision-Making [J]. Library and Information Service, 2016, 60(5): 118-124.
[10] ABDULRAHEEM MH, YUSOF SABM. Employing a knowledge base in the decision making in e-government [J]. Advanced science letters, 2017, 23(6): 38-41.
[11] PANAGIOTIS K, OURANIA M, SOTIRIOS K, et al. Towards more factual, evidence-based, transparent and accountable policy evaluation and analysis: the policy compass approach [C]//eChallenges Conference 2014. Dublin: International Information Management Corporation, 2014: 222-231.
[12] Qiu Junping, Yu Houqiang. Progress and Trends of International Knowledge Fusion Research from the Perspective of Knowledge Science [J]. Library and Information Service, 2015, 59(8): 126-132.
[13] Liu Xiaojuan, Li Guangjian, Hua Bolin. Knowledge Fusion: Concept Analysis and Definition [J]. Library and Information Service, 2016, 60(13): 13-19.
[14] Gao Jinsong, Liang Yanqi. Research on Knowledge Fusion Model in Linked Data Environment [J]. Information Science, 2016(2): 50-54.
[15] Huang Xinping. Research on Multi-Dimensional Semantic Knowledge Fusion of Government Website Information Resources [D]. Changchun: Jilin University, 2017.
[16] SMIRNOV A, LEVASHOVA T, SHILOV N. Patterns for context-based

knowledge fusion in decision support systems [J]. Information fusion, 2015, 21(1): 114-129.
[17] Zhou Liqin, Fan Hao, Pan Jianpeng. Big Data Knowledge Service Framework Based on Knowledge Fusion Process [J]. Research on Library Science, 2017(21): 53-59.
[18] 2017 National Bureau of Statistics Government Information Disclosure Work Report [EB/OL]. [2018-07-19]. http://www.stats.gov.cn/ztjc/xxgkndbg/gjtjj/201803/t20180305_{15863
[19] KRISHNAMURTHY R, AWAZU Y. Liberating data for public value: the case of Data.gov [J]. International journal of information management, 2016, 36(4): 668-672.
[20] 2017 Beijing Municipal Government Information Disclosure Work Annual Report [EB/OL]. [2018-07-19]. http://zhengwu.beijing.gov.cn/zwzt/2017nb/.
[21] Huang Cui. Quantitative Research on Policy Documents [M]. Beijing: Science Press, 2016.
[22] Speak to the Premier [EB/OL]. [2018-03-16]. http://www.gov.cn/zhuanti/2017wxzlsjh/index.htm.
[23] ANDEWEG RB, IRWIN GA. Governance and politics of the Netherlands [M]. Hampshire: Palgrave Macmillan, 2014.
[24] Hao Shuhong. Knowledge Value Chain of Government Decision-Making Process [D]. Shenyang: Northeastern University, 2006.
[25] Wei Kou, Hao Qi, Zhang Bin. Demand Analysis for Construction of Archives Knowledge Base for Government Decision-Making [J]. Archives Science Study, 2016(5): 32-35.
[26] Wu Peng, Su Xinning, Deng Sanhong. Knowledge Value Chain of Decision-Making Process [J]. Journal of Library Science in China, 2005(2): 25-29.
[27] Liu Zhiguo, Wu Qian, Luan Xiaohong. Research on Enterprise Knowledge Management Based on Evidence-Based Decision-Making [J]. China Management Informationization, 2015, 18(11): 99-101.
[28] CORRAO S, ARCORACI V, ARNONE S, et al. Evidence-based knowledge management: an approach to effectively promote good health-care decision-making in the information era [J]. Internal & emergency medicine, 2009, 4(2): 99-106.

Author Contributions

Huang Xinping: Paper writing and revision;
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Research on Knowledge Fusion Service Model of Government Website Information Resources in Policy-Making

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Abstract: [Purpose/significance] The concept of knowledge fusion is innovatively introduced into policy-making, through the in-depth excavation and utilization of massive government website information resources with multiple policy-making support values, to improve the level of policy-making. [Method/process] In view of the different policy-making support value of government website information resources, this paper analyzes the knowledge fusion service demand and function positioning in the policy-making process. Based on this, a knowledge fusion service model for policy-making of government website information resources is constructed, and takes the knowledge fusion of related government website information resources in the field of "reforms to streamline administration, delegate more powers, improve regulation and provide better services" as an example to describe the application scenario of the model. [Result/conclusion] The model can provide new perspectives, ideas and ways for the construction of the current party and government leadership scientific decision-making support service platform.

Keywords: government website information; knowledge fusion; domain knowledge; policy-making; model

Note: Figure translations are in progress. See original paper for figures.