

Construction and Empirical Study of a Three-Dimensional Analytical Framework for Open Government Data Policy (Postprint)

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Abstract

[目的/意义] Against the backdrop of the big data era, government data openness and sharing has become an inevitable trend. Policy serves as a “catalyst” in the process of government data openness and sharing, playing a vital role. This study investigates the government data openness policies of China’s urban agglomerations, analyzes their characteristics and deficiencies, provides recommendations for policy improvement, and promotes coordinated policy implementation. [方法/过程] This research constructs an analytical framework across three dimensions: policy instruments, policy objectives, and policy intensity, using 23 government data openness policies of the Chengdu-Chongqing urban agglomeration (comprising 218 policy provisions) as samples, conducting text coding for each policy and statistically describing the coding results. [结果/结论] The findings reveal that the structural characteristics of the Chengdu-Chongqing urban agglomeration’s government data openness policies demonstrate overutilization of command-and-control and incentive-based policy instruments, alongside underutilization of capacity-building and system-change policy instruments. Policy objectives emphasize government data openness and sharing at the data level and big data applications, while showing insufficient attention to smart government construction goals. Overall policy intensity aligns with trends in government data openness but requires strengthening. Therefore, government data openness policies should comprehensively integrate all four types of policy instruments, coordinate the structure of policy objectives, enhance policy intensity, and foster systematic development of government data openness.

Full Text

Construction and Empirical Study of a Three-Dimensional Analysis Framework for Government Data Open Policies

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Abstract: [Purpose/Significance] In the era of big data, the opening and sharing of government data has become an inevitable trend. As a “booster” in this process, policy plays a crucial role. This study examines government data open policies in China’s urban agglomerations, analyzing their characteristics and shortcomings to provide improvement suggestions and promote co-ordinated policy implementation. [Method/Process] The research constructs an analytical framework from three dimensions—policy tools, policy objectives, and policy intensity—and analyzes 23 policy documents (218 detailed provisions) from the Chengdu-Chongqing urban agglomeration through text coding and statistical description. [Results/Conclusion] The findings reveal that the Chengdu-Chongqing urban agglomeration’s government data open policies exhibit structural characteristics: command-type and incentive-type policy tools are overused, while capacity-building and system-change tools are underutilized. Policy objectives focus heavily on data-level government data opening/sharing and big data applications, with insufficient attention to smart government construction. Overall policy intensity aligns with government data open trends but requires strengthening. Therefore, policies should comprehensively integrate all four policy tool types, coordinate objective structures, and enhance intensity to promote systematic development of government data opening.

Keywords: government data opening and sharing; policy tools; policy content analysis; urban agglomeration

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Government data opening refers to the practice of government agencies providing public sector data to the public free of charge in open formats for access and utilization [1]. Since the United States proposed open government data in 2009, the practice and research of government data opening have attracted global attention, with multiple countries establishing national open government data portals, making it an irreversible worldwide trend [2]. China has successively issued documents such as the *National Informatization Development Strategy Outline*, *Action Outline for Promoting Big Data Development*, and *Pilot Work Plan for Opening Public Information Resources* since 2014, explicitly requiring the advancement of government data opening [3]. Currently, 54.83% of provincial-level administrative regions (excluding Hong Kong, Macao, and Taiwan), 73.33% of sub-provincial cities, and 32.08% of prefecture-level administrative regions have launched government data open platforms (growing from 18 in 2017 to 56 in 2018, 102 in 2019, and 130 in the first half of 2020), indicating

that “open data” has initially flourished. However, regional disparities in data opening levels persist [4].

As authoritative documents with legal force, policies provide crucial guidance on the direction, approach, and content of government data opening and sharing management [5]. Policy vitality lies in implementation and execution. During policy implementation, reducing inconsistencies and conflicts between policies, addressing policy fragmentation, and enhancing practical effectiveness require strengthening coordination among policy subjects, objects, tools, and objectives [6]. The 19th Party Congress emphasized “implementing regional coordinated development strategies, strengthening measures to advance western development and form new patterns, and establishing more effective regional coordinated development mechanisms.” Against this backdrop of regional coordinated development, the cross-regional nature of urban public affairs continues to grow, making coordination and cooperation between cities increasingly important [7]. Coordinated policy implementation among cities not only advances regional coordinated development but also enhances policy execution and continuous improvement. In 2016, the State Council’s *Chengdu-Chongqing Urban Agglomeration Development Plan* stated that the Chengdu-Chongqing urban agglomeration should “play a more important role in regional development and promoting national regional coordination.” In January 2020, the Central Financial and Economic Affairs Commission meeting explicitly proposed “promoting the construction of the Chengdu-Chongqing dual-city economic circle to become a nationally influential important economic center, science and technology innovation center, new highland for reform and opening up, and high-quality livable place, boosting high-quality development.” In July 2020, the General Offices of Sichuan Province and Chongqing Municipality signed the *Cooperation Agreement on “Streamlining Administration, Delegating Power, and Optimizing Services” Reform in the Chengdu-Chongqing Dual-City Economic Circle*, explicitly establishing a government information resource sharing mechanism, strengthening the construction of cross-regional government data exchange and sharing platforms, promoting government information resource sharing and opening, breaking government data silos, and providing a new environment for coordinated Chengdu-Chongqing urban agglomeration development.

As a typical urban agglomeration in western China and the region with the strongest comprehensive strength in the area, studying the Chengdu-Chongqing urban agglomeration’s government data open policies is crucial for promoting the construction of the Chengdu-Chongqing dual-city economic circle.

1 Literature Review

Searching CNKI with the title terms “government data open policy” or “open government data policy” and Web of Science with “TI=(‘open government data policy’ OR ‘government data open policy’ OR ‘public data open policy’)” reveals that domestic research on government data open policies started later than abroad but has produced more recent results.

Government data open policy refers to the codes of conduct adopted by government agencies to regulate and guide the behavior of organizations and individuals in achieving government data opening goals, including various strategic plans, regulations, ordinances, action guidelines, rules, and procedures [8]. Current research has not yet formed a unified system, with three main categories of abundant results: policy description and comparison, policy content analysis, and policy implementation investigation.

Regarding policy description research, domestic scholars primarily introduce and draw lessons from developed countries' policies, such as those of the United States [9-10], United Kingdom [11-13], Canada [14-15], New Zealand [16], and Australia [17-18], and compare differences between Western developed countries [19-20] and between China and the US [21] to inform China's policy development.

Policy content analysis research focuses primarily on framework construction. A. Zuidervijk et al. [22] initially constructed a comparative analysis framework for policy environment, content, performance indicators, and public value to analyze Dutch open government data policies at different levels. R.P. Nugroho et al. [23] refined this framework by adding cultural factors to compare policies in the US, UK, Netherlands, Kenya, and Indonesia. Zhao Rund [24] extracted core policy issues to construct a content framework for open government data policies, analyzing and validating it through detailed examination of US, UK, and Australian policies. For deeper comparative research, Tang Zhiwei et al. [25] built a two-dimensional framework of instrumental and content evaluation dimensions for comparative policy text analysis of Chinese and US open government data policies. Building on this, Yang Zheng et al. [26], Meng Yue et al. [5], and Zhao Yupan [27] constructed three-dimensional frameworks for national-level (administrative level, external structural characteristics, and internal themes), Yangtze River Delta urban agglomeration-level (policy tools and government data open sharing management), and provincial-level (policy form, tools, and content) analyses.

Regarding policy implementation, scholars have examined implementation status [28] and trends, exploring innovation diffusion patterns, mechanisms, and influencing factors. A.T. Chatfield et al. [29] used event history analysis based on policy innovation diffusion theory to study Australian open government data policy diffusion patterns. R.P. Nugroho et al. [30] revealed differences in innovation diffusion patterns at Pakistani government departments and public institutions, with political, legal, institutional, and ethical factors causing variations in adoption timing. Liu Cheng [31] used EHA models to study provincial-level policy diffusion mechanisms in China, confirming their dynamic nature. Wu Jinpeng et al. [32] analyzed panel data from 40 Chinese cities (2012-2018) using event history analysis, finding that institutional environment and competitive pressure most significantly influence policy adoption.

In summary, scholars have conducted in-depth research from various perspectives, providing analytical frameworks for policy improvement. However, few

studies focus on urban agglomeration-level policies. Under regional coordinated development strategies, research from an urban agglomeration perspective is particularly important and requires strengthening. Previous theoretical frameworks for government data open policies have not incorporated “policy objectives” or “policy intensity,” though objectives represent policymakers’ expectations for implementation effects, and intensity represents their level of commitment [6]. This study attempts to incorporate both into a three-dimensional framework of policy tools, objectives, and intensity, conducting cross-analysis at two-dimensional (tools-objectives) and three-dimensional levels to enrich the research framework.

2 Construction of a Three-Dimensional Analysis Framework for Government Data Open Policies

Ma Haiqun et al. [6] argue that government data open policy systems are complex, requiring synergistic effects to ensure mutual coordination rather than conflict among subsystems, with policy tools interacting rather than operating in isolation, which significantly impacts objective achievement and efficiency. Wang Luozhong et al. [33] identify policy synergy as including appropriate objectives, tool coordination and combination, and coordination among policy-making bodies. In measuring synergy, the three dimensions of policy objectives, tools, and intensity are widely used, though often analyzed separately. This study attempts to use these as three dimensions for content analysis with cross-analysis to identify problems. This three-dimensional framework has been applied in studies on independent innovation [34], industrial [35-36], and talent policies [37]. Following this approach, policy tools serve as the X dimension (using L.M. McDonnell and R.F. Elmore’s classification), policy objectives as the Y dimension, and policy intensity as the Z dimension, with sub-dimensions established for each, constructing the framework shown in Figure 1 [Figure 1: see original paper].

2.1 X Dimension: Policy Tools

Policy tools are methods and approaches for governing public affairs and achieving policy objectives [38], directly associated with objective realization [39]. They represent the specific means of policy implementation, and analyzing policy texts through this lens helps stakeholders deepen understanding while enabling policymakers to grasp existing patterns and future directions [40].

Current research often uses Rothwell and Zegveld’s classification [42] from supply, demand, and environmental perspectives [25-27], potentially overlooking the mandatory nature of government data open policies. Therefore, this study adopts McDonnell and Elmore’s classification [43], dividing tools into four types: command-type, incentive-type, capacity-building, and system-change. Command-type tools use state or government authority to compel development; incentive-type tools use positive/negative feedback to encourage participation;

capacity-building tools employ supportive measures, institutional supply, and policy 倾斜; system-change tools reallocate power to enhance efficiency.

2.2 Y Dimension: Policy Objectives

Policy objectives are the expected results of policy formulation and implementation, defining tool purposes [46]. The same tool can serve different purposes across various stages of government data opening. The three sub-dimensions under policy objectives are determined based on central policy documents, scholarly research, and practical significance. The State Council's *Action Outline for Promoting Big Data Development* identifies three major objectives: (1) promoting interconnection and open sharing of government information systems and public data; (2) deepening big data application innovation across industries; and (3) creating a precise governance, multi-party collaborative social governance model [47]. Additionally, Tan Biyong et al. [48] identified frequent objective themes including big data development, e-government, smart city construction, and improved governance through analysis of 15 sub-provincial cities. In practice, data reuse and digital government construction have become prominent. This study thus categorizes objectives into three progressive aspects: government data open sharing, big data application, and smart government construction.

2.3 Z Dimension: Policy Intensity

Policy intensity reflects policy importance and can be standardized based on China's administrative power hierarchy and policy type levels. Functional division and cooperation networks among issuing agencies provide accessible approaches for studying inter-departmental relationships and implementation strength [49]. This study uses policy intensity as the Z dimension, referencing the State Council's *Regulations on Procedures for Formulating Rules* [50] and previous quantitative standards [51-53] to stratify intensity into five levels based on administrative authority, as shown in Table 1 .

Table 1 Quantitative Standards for Policy Intensity of Chengdu-Chongqing Urban Agglomeration Government Data Open Policies

Score	Policy Type
1	Government-issued notices, announcements, etc.
2	Opinions issued by government commissions, bureaus, and offices
3	Local regulations issued by people's congresses and standing committees
4	Government-issued interim provisions, plans, decisions, opinions, measures, standards, etc.
5	Government-issued regulations

3 Policy Text Selection and Coding

3.1 Policy Text Sources

First, policies were searched and collected using keywords including “data opening,” “open data,” “government data,” “data resources,” “government information,” “government affairs information,” and “government affairs data” in policy databases such as Beida Fabao and Law Star, with secondary searches on Chengdu and Chongqing government websites.

Second, texts were screened to select those most relevant to government data opening or information disclosure, focusing on government data open policies. A total of 23 policy texts were selected as analytical samples, numbered by release date for subsequent content analysis unit coding. Specific texts are listed in Table 2 .

Table 2 List of Chengdu-Chongqing Urban Agglomeration Government Data Open Policy Texts

No.	Policy Title	Document No.
1	Opinions on Comprehensively Deepening Government Affairs Openness Work	Chengdu Office Issue [2015] No. 28
2	Guiding Opinions on Comprehensively Promoting B2G and R2G Construction	Chengdu Office Issue [2015] No. 45
...	...	...
23	Interim Measures for Chongqing Municipal Government Data Resource Management	Chongqing Government Order [2019] No. 328

3.2 Policy Text Coding

After identifying the policy texts, content analysis units were coded according to their sequence number in the policy document and the document number. For example, 1-5-24 represents the 24th provision under the 5th major category of the first policy document *Opinions on Comprehensively Deepening Government Affairs Openness Work*, and is the first coded unit in that policy. This coding rule was applied consistently. A total of 218 provisions were coded (see Table 3), with Tables 4 and 5 showing examples of policy tool and objective dimension coding.

Table 3 Coding of Chengdu-Chongqing Urban Agglomeration Government Data Open Policy Content Analysis Units

Policy Content Analysis Unit	Coded Provision
Chengdu Office Issue [2015] No. 28	Actively explore and encourage enterprises, third-party institutions, and individuals to conduct in-depth analysis and application of public data
Chengdu Office Issue [2015] No. 45	Coordinate the construction of government cloud platforms, integrating with existing Chengdu government cloud computing centers
Chongqing Government Order [2019] No. 328	Municipal government data resource management departments coordinate city-wide management and establish management systems

Table 4 Policy Tool Dimension Description and Coded Provision Examples

Tool Type	Description	Example
Command-type	Clarifies main responsibilities or obligations of government departments, society, and individuals	“City-wide government data resource integration and sharing work is uniformly guided and promoted by the Municipal Informatization Work Leading Group”
Incentive-type	Supervises specific stages/processes of government data opening	“Disclose key area information in government information openness annual reports, accepting social supervision”

Tool Type	Description	Example
Capacity-building	Infrastructure construction (cloud platforms, networks, centers, sharing/open platforms)	“Coordinate planning of city-wide government information basic database construction”
System-change	Government internal system or institutional reform for data opening	“Promote integrated management system reform of intellectual property ‘patent, trademark, copyright’ ”

Table 5 Policy Objective Dimension Description and Coded Provision Examples

Objective	Description	Example
Government data open sharing	Integrating government data resources, guiding and promoting openness/sharing	“Municipal Development and Reform Commission leads adjustment and optimization of the city-wide social public information resource integration and application joint meeting mechanism”
Big data application	Provisions on applying big data to industries, talent cultivation, and security mechanisms	“Encourage public enterprises and institutions to use municipal public data infrastructure for applications”

Objective	Description	Example
Smart government construction	Supporting government information openness and platform construction through data opening	“Integrate and build a unified municipal government service platform based on the provincial unified platform”

4 Policy Text Analysis

4.1 Policy Tool Dimension Analysis

Based on the coding examples, the 218 coded provisions were categorized by policy tool dimension, as shown in Table 6. The Chengdu-Chongqing urban agglomeration uses command-type, incentive-type, capacity-building, and system-change tools, with command-type being most frequent (43.12%) and system-change only 3.21%. This imbalance indicates that the Chengdu-Chongqing governments show clear preferences, relying heavily on command and incentive tools. Underuse of capacity-building and system-change tools may hinder sustainable development.

Further analysis reveals that within command-type tools, the three sub-tools show similar usage rates, with “clarifying responsibilities” being most frequent, indicating a preference for defining responsibilities for public data collection, updating, and maintenance within government departments to create favorable internal environments. Within incentive-type tools, “infrastructure construction” significantly exceeds “encouraging development” and “capital investment,” showing structural imbalance. The current focus remains on building information resource platforms and basic databases, lacking incentives to mobilize market participation, with insufficient attention to social organizations with specialized technologies and limited special funding measures that could accelerate development. Capacity-building tools are generally underused, potentially leaving insufficient capacity to address future challenges. Notably, “personnel training” policies are relatively abundant, showing greater emphasis on talent than data itself, while neglecting platform management capabilities. Finally, system-change tools are minimally used, with few provisions addressing institutional adjustments or power reallocation, possibly because development has not yet reached a deep enough stage, though future attention and appropriate use are needed.

Table 6 Distribution of Policy Tool Dimensions in Chengdu-Chongqing Urban Agglomeration Government Data Open Policies

Tool Type	Provision Numbers	Percentage
Command-type	12-2-5, 12-2-11, 12-3-15, ...	43.12%
Incentive-type	12-3-17, 12-4-18, 12-5-27, ...	36.70%
Capacity-building	12-1-5, 10-1-5, 10-4-15, ...	16.97%
System-change	12-1-6, 12-5-33, 13-5-4, ...	3.21%

4.2 Policy Objective Dimension Analysis

The 218 coded provisions were categorized by policy objective based on keywords and meanings, as shown in Table 7. Provisions for government data open sharing total 102 (46.79%), dominating the three objectives. Big data application provisions number 70 (32.11%), and smart government construction provisions total 46 (21.10%). These results show that current policies primarily focus on serving government resources themselves, emphasizing infrastructure building, basic database establishment, and data security mechanisms to facilitate convenient and secure access. For big data applications, the governments vigorously introduce and cultivate talent, establish special funds, and encourage market participation. Although smart government construction receives less attention, support is provided for government information openness and e-government platform development. Overall, objective priorities are clear, with government data open sharing receiving far more emphasis than smart government construction, requiring structural adjustment.

Table 7 Distribution of Policy Objective Dimensions in Chengdu-Chongqing Urban Agglomeration Government Data Open Policies

Objective	Provision Numbers	Percentage
Government data open sharing	12-2-5, 12-2-11, 12-3-15, ...	46.79%
Big data application	3-3-2-1, 8-2-3-4, 6-1-1, ...	32.11%
Smart government construction	10-1, 3-4-2, 4-3-1, ...	21.10%

4.3 Policy Intensity Historical Evolution Analysis

The historical evolution of policy intensity (Figure 2 [Figure 2: see original paper]) shows that since 2013, Chengdu-Chongqing government data open policy intensity has experienced growth, relative stability, and then decline, primarily correlating with the number of policy texts. From 2013-2015, policy texts began emerging and increasing as the initiative started, with intensity strengthening. Between 2015-2019, intensity remained relatively stable, peaking in 2015, 2016, and 2019 when numerous opinions and notices were issued. Chengdu and Chongqing respectively issued specialized regulations—*Chengdu Public Data Management Application Regulations* (2018) and *Chongqing Government Data Resource Management Interim Measures* (2019)—further strengthening intensity. The COVID-19 outbreak in January 2020 reduced policy releases from

January to July 2020, decreasing intensity. Overall, policy intensity varies with the development process and requires future strengthening.

4.4 Cross-Analysis of Policy Objectives and Tools

Among the 218 provisions (Figure 3 [Figure 3: see original paper]), in the government data open sharing dimension, command-type tools are most used (51 provisions), system-change tools least (2 provisions), with incentive and capacity-building tools totaling 35 and 14 respectively. The smart government construction dimension shows similar patterns, with command-type most frequent, followed by incentive and capacity-building, and system-change least. Notably, in the big data application dimension, incentive-type tools (35 provisions) exceed command-type tools, while system-change remains minimal. This suggests that command-type tools are more effective for initial-stage objectives, but as opening deepens, governance capacity and smart government construction capabilities require enhanced tool structure balance. In big data applications, intensive incentive tool use helps stimulate market vitality, aligning with that objective's characteristics.

4.5 Three-Dimensional Cross-Analysis of Tools, Objectives, and Intensity

Three-dimensional analysis (Figure 4 [Figure 4: see original paper]) shows that across all three objectives, command-type tools are most used with highest intensity. Other tools' intensity varies by objective: capacity-building tools for government data open sharing show highest intensity but lower quantity than big data application; incentive tools for big data application are numerous and more intense; system-change tools for smart government construction are most used and more intense than command-type tools. This reveals inconsistency between tools and intensity in the current policy system. While command-type tools dominate all objectives for steady development, long-term reliance on single tools may prove ineffective. The three-dimensional framework clearly reveals gaps: system-change tools are minimally used across objectives, capacity-building tools are insufficient, while coordinated development requires synergy among all four tool types.

Figure 4 [Figure 4: see original paper] Three-Dimensional Analysis of Chengdu-Chongqing Urban Agglomeration Government Data Open Policies

5 Conclusions and Recommendations

5.1 Comprehensive Policy Tool Integration and Optimization

Data analysis reveals that Chengdu-Chongqing's government data open policies overuse command and incentive tools while underusing capacity-building and system-change tools, creating structural imbalance.

(1) Strengthen command-type regulatory tools to shape policy push. Currently, command-type tools frequently clarify responsibilities, legal constraints, and supervision, but legal instruments are underused and lack specialized data open policy laws. Only *Chongqing Municipal Government Data Resource Management Interim Measures* and *Chengdu Public Data Management Application Regulations* are relatively high-intensity “regulations” and “measures,” while other “opinions” and “notices” are fragmented and non-mandatory. Future specialized laws and regulations should be introduced to strengthen legal tools and create policy push.

(2) Adjust incentive-type tool structure to enhance policy pull. Incentive tools heavily favor “infrastructure construction” over “encouraging development” and “capital investment,” indicating current focus on platform and database building while neglecting incentives for enterprises, social organizations, and individuals to develop secondary data applications. With relatively mature infrastructure but immature market environments, increased capital investment is needed to stimulate market vitality. Future policies should adjust structure by increasing “encouraging development” and “capital investment” while moderately reducing “infrastructure construction” frequency to align structure with objectives.

(3) Enhance capacity-building tool application to enrich policy instruments. Capacity-building tools are underused despite strong auxiliary functions. Government data opening requires not only examining openness and sharing depth but also capacity building in data security, platform management, and talent cultivation—aligning with “smart government construction” objectives. Future policies should emphasize capacity enhancement across all development stages, providing pathways for talent cultivation, platform management, and data security to support all three objectives.

(4) Time system-change tool usage appropriately with flexible combinations. System-change tools are least used, as they are most suitable for bottleneck periods to reshape environments [44]. Different development stages require different tools, necessitating both primary tool identification and tool combination. While currently in initial development with limited system-change experience, future use should be timed appropriately, starting with transition work and combining with other tools, such as cross-using system-change with command-type tools to specify power reallocation in legal provisions for better effects.

5.2 Improve Policy Objective Structure and Enhance Synergy

Current objectives prioritize government data open sharing, followed by big data application, with smart government construction last. This data-level focus with weak government construction objectives creates structural imbalance, affecting further development. While direct objectives involve social sharing of government data, ultimate goals expect secondary utilization to create greater social

value [54]. As big data and digital applications deepen, Chengdu-Chongqing should gradually adjust objective structures to emphasize deeper-level goals, matching objectives, tools, and intensity to promote sharing while emphasizing application and smart government construction.

5.3 Strengthen Strategic and Systematic Construction to Enhance Policy Intensity

Chengdu-Chongqing's policy intensity is relatively weak, with only one local regulation, numerous opinions, and primarily notices issued by Chengdu government. Chongqing's intensity is even weaker, lacking strategic and systematic planning. Future policy formulation should strengthen intensity by consolidating existing policies into holistic frameworks, focusing on long-term trends and implementation effects, enhancing inter-departmental communication, and systematically advancing implementation.

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Author Contributions:

Peng Chuanyu: Research framework design, paper revision and finalization.

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

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