The Formation Mechanism of Participation Dilemmas in Inter-agency Government Data Sharing: A Theoretical Framework

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Abstract

Purpose/Significance: Grounded in the perspective of government departments, clarifying the participation dilemmas encountered in cross-departmental government data sharing and their underlying formation mechanisms facilitates the cross-boundary flow of government data. Method/Process: Building upon an elaboration of the theoretical underpinnings of cross-departmental government data sharing and integrating findings from case investigations, this study constructs a theoretical framework designed to explicate the causes of participation dilemmas. Results/Conclusion: The essence of cross-departmental government data sharing constitutes a process whereby government departments jointly configure ownership rights of government data and co-create data asset value without undermining administrative boundaries. Inter-departmental collaboration systems that do not support sharing and the characteristics of shared data represent the primary drivers in the formation of participation dilemmas. Resolving these dilemmas necessitates concerted efforts across multiple dimensions, including inter-departmental coordinated management, coordination of the sharing process, and delineation of data ownership rights.

Full Text

Research on the Formation Mechanism of Participation Dilemma in Cross-Agency Government Data Sharing: A Theoretical Explanation Framework

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Abstract: [**Purpose/Significance**] From the perspective of government agencies, clarifying the participation dilemma and its formation mechanism in cross-agency government data sharing is conducive to promoting the cross-boundary flow of government data. [**Method/Process**] Based on the theoretical analysis of cross-agency government data sharing and case study findings, this paper constructs a theoretical framework to explain the causes of participation dilemma. [**Result/Conclusion**] The essence of cross-agency government data sharing is a process in which government agencies jointly allocate data stewardship rights and co-create data asset value without destroying administrative boundaries. Institutional arrangements for inter-agency collaboration that do not support sharing and the characteristics of shared data constitute the main drivers of participation dilemma. To resolve this dilemma, efforts should be made from multiple dimensions, including inter-agency coordinated management, sharing process coordination, and data stewardship definition.

Keywords: cross-agency government data sharing; institutional collective action; government data governance; digital government construction

1 Research Background and Problem Statement

In recent years, with the continuous implementation of the national big data strategy and the "Internet+" government service reform, the "three integrations and five cross-boundaries" construction of government data has gradually become the core task of digital transformation for governments at all levels, yielding many beneficial experiences in key areas such as people's livelihoods [1]. Nevertheless, national survey results indicate that cross-agency government data sharing across all levels of government in China still faces the problems of low departmental participation willingness and insufficient sustained participation behavior. To address this, the General Office of the State Council has successively issued a series of policies since 2021, including the "Opinions on Establishing and Improving Government Data Sharing Coordination Mechanisms to Accelerate Orderly Data Sharing," "Guiding Opinions of the State Council on Strengthening Digital Government Construction," and the "National Integrated Government Big Data System Construction Guide," hoping that governments at all levels can effectively apply policy tools to strengthen government data sharing and leverage its role in advancing the modernization of government governance capabilities [2]. However, national-level policy tools are relatively macroscopic and difficult to meet the practical needs of government data sharing at the micro level and in complex contexts, thus failing to provide effective institutional guarantees for resolving the real-world dilemma of "unwillingness to share" [3].

As rational actors within government organizations, government agencies' willingness to participate in sharing represents their comprehensive evaluation of

the costs, benefits, and risks of data cross-boundary flows in specific institutional environments [4]. The strength of this willingness is influenced by multiple external factors, including institutional characteristics, collaboration conditions, and sharing scenarios, reflecting government agencies' rational assessment and comprehensive response to environmental changes [5]. Previous studies have analyzed the decision-making logic behind government agencies' participation in data sharing from cost-benefit and political interest perspectives [6-8], and summarized influencing factors from technical, organizational, and policy dimensions [9]. However, whether it is Wang's (2018) [10] dynamic mechanism model for cross-agency government data sharing or Zhou's (2021) [11] "data stickiness" explanatory model, neither adequately explains: first, how the general characteristics of government institutions and data sharing institutional arrangements affect government agencies' sharing participation decisions; second, how the collaborative foundation and cooperative relationships between agencies influence participation decisions in cross-agency government data sharing; and third, how the asset attributes of government data affect government agencies' sharing participation decisions. To effectively address these questions, this paper, based on an analysis of the theoretical connotation of cross-agency government data sharing and combined with institutional collective action theory and typical case studies, constructs a theoretical explanatory model to enhance current understanding of participation dilemmas and their formation mechanisms.

2 Theoretical Connotation and Conceptual Definition of Cross-Agency Government Data Sharing

In early research, the concept of data sharing emerged in academic discussions during the initial stage of computer technology development, referring to the process of data moving between different computing physical devices via physical media [12]. With advances in data processing technology and the resulting increase in data sharing practice models, countries represented by the United States were the first to introduce information technology into government organizations and vigorously promote government informatization and digital construction [13]. In the e-government field, previous research often regarded government data sharing as part of government information sharing. Among them, Gil-Garcia (2010) [14] clearly defined the concept of integrated data and pointed out that such data, processed and exchanged through unified technical formats and central databases, constitutes the core content of the government information sharing concept. Yang and Wu (2013) [15] noted that raw, unprocessed data would combine with business knowledge and technical formats during the processes of data aggregation, transmission, and sharing to become government information; therefore, government data sharing should be considered a component of government information sharing. Overall, previous academia did not strictly distinguish between government data and government information concepts, and consequently did not discuss government data sharing as a separate topic. In recent years, with the rapid development of information technology and the sharing economy worldwide, the asset attributes of data have attracted

attention from all sectors, and characteristics of government data such as publicness, non-materiality, renewability, and dual value have been widely recognized [16]. Consequently, academic discussions on the attributes of data, particularly government data, have injected new connotations into the traditional topic of government information sharing while enhancing the independence of government data sharing as a research topic.

Specifically, on the one hand, academic research on the allocation of government data stewardship in cross-boundary flows has become increasingly abundant, promoting reflection on the theoretical connotation of cross-agency government data sharing. Recent studies have highlighted the fundamental and critical role of data rights confirmation in the sharing implementation process [17]. On the other hand, in-depth research on sharing phenomena has revealed its essential attribute as a multi-actor collective action [18]. Consequently, academic attention to government data sharing has gradually shifted from physical-level "infrastructure sharing" to the processes of consensus building, collective collaboration, and mutual benefit among multiple actors surrounding data stewardship definition. Against this background, this paper defines cross-agency government data sharing as: a collaborative behavior in which government data-supplying agencies, while ensuring their own rights and interests, share the right to use government data with data-using agencies within a certain spatio-temporal scope through methods such as data copying, system docking, or exchange platforms to fulfill public service functions. Essentially, cross-agency government data sharing is a process of co-creating data value through data flow, joint use, and reuse without destroying inter-agency boundaries [19]. It is both a complex socio-technical interaction phenomenon and a collaborative activity among government agencies surrounding data stewardship allocation, which must face and resolve collective action dilemmas [20].

3 Analysis of Participation Dilemma and Its Causes in Cross-Agency Government Data Sharing Based on ICAF

Participation refers to the preliminary willingness to join an activity, which is closely related to the allocation of resource control, ownership, and usage rights among participating actors in specific activities [21]. In academia, the participation dilemma in cross-agency government data sharing and its causes have always been hot research topics. The main development trajectory and core viewpoints include: First, in early research, the participation dilemma in cross-agency government data sharing was typically described as a collection of technical obstacles represented by fragmented government data distribution, low digitization levels of paper documents, and lack of interoperation solutions for information systems. The fragmented physical distribution of government information systems was regarded as the direct cause of participation dilemma at the technical level. As research deepened, scholars began to pay attention to the hindering effects of government organizational structures (including but not limited to China's "tiao-kuai" structure) on sharing participation and the

contradictions between agencies triggered by mismatches with sharing-required collaborative arrangements, and their promoting role in the formation of technical sharing dilemmas. On the one hand, the adoption and application of information systems in government organizations are influenced by "power-interest" games between agencies, meaning that the formation of technical sharing dilemmas is largely attributable to government organizational structural factors [22].

On the other hand, the implementation of existing technical solutions (including various data sharing platforms) still requires sharing actors to reach consensus on data formats, forms, and quality, while the lack of interoperability and policy arrangements in government practice further promotes the formation of technical participation dilemmas. Overall, previous research mostly revealed the participation dilemma faced by cross-agency government data sharing as a cross-agency information technology adoption and implementation from technical and organizational perspectives, frequently employing socio-technical interaction theory to analyze the causes of participation dilemmas [23].

However, as Gil-Garcia et al. (2019) stated, government data cross-boundary flow is an open socio-technical system with complex and dynamic characteristics. The smooth operation of this system and effective participation of government agencies largely depend on dynamic collaborative strategies jointly constructed by participating departments [24]. Particularly, as the asset attributes of government data have gained widespread social recognition and multi-actor government data stewardship allocation has replaced technical solutions as the biggest challenge for sharing [25], research based on socio-technical interaction theory has not fully revealed the behavioral motivations and decision-making rationales of multi-actor collaboration with data as the object. Specifically, on the one hand, with the improvement of government data accounting management systems, government agencies can clearly calculate the costs incurred by government data throughout its lifecycle, objectively promoting agencies' "proprietary asset protection consciousness." This means that without obtaining "equivalent" returns or accepting "strong" administrative pressure, agencies that have invested more resources in data collection and acquisition typically will not proactively provide data to external parties and may even retain their initiative and relative advantageous position in government data cross-boundary flows through "passive non-cooperation" [6]. On the other hand, the current practice-dominated sharing model of "centralized" platform construction, aimed at creating public value, aggregates and processes data from different government agencies to form "datasets" accessible and callable by different actors inside and outside government. From the formation process perspective, such datasets have certain "public goods" attributes, and the costs paid by some government agencies for providing data are difficult to obtain direct returns. The widespread "free-rider" phenomenon somewhat weakens agencies' willingness to participate in sharing [26]. Overall, the current participation dilemma facing government data can be summarized as "cannot" share caused by technical barriers and "unwilling" share caused by interest barriers, with the latter having a decisive influence on the former to a certain extent in government organizational envi-

ronments.

As mentioned earlier, the theoretical essence of cross-agency government data sharing is a cross-agency collaborative behavior in which government agencies co-create data value through data stewardship allocation. However, the essence of sharing—connection, openness, and joint use—contradicts the essence of government institutions—closure, competition, and self-interest-driven motivations. Resolving sharing barriers requires clarifying the influencing factors and internal logic of government agencies' participation decisions [27]. To this end, this paper introduces the Institutional Collective Action Framework (ICAF), a recent achievement in cross-agency collaboration research, to analyze the causes of participation dilemmas in cross-agency government data sharing. Inter-agency collaboration refers to the cooperative process in which government agencies cross their respective administrative boundaries for decision-making and management to achieve public goals [28], which typically faces obstacles and challenges from the "dilemma of collective action." ICAF is precisely a theoretical framework developed to analyze the causes of collective action dilemmas and their solutions. From its core perspective, ICAF posits that composite actors in institutional environments have bounded rationality, and their collaborative participation decisions depend on comprehensive assessments of expected net benefits and risks of collaborative actions. Currently, ICAF has been widely applied to topics such as cross-agency collaboration [29-30], with its constituent variables, basic assumptions, and behavioral prediction effectiveness having undergone preliminary empirical testing.

Compared with the Theory of Planned Action, Force Field Theory, and Knowledge Stickiness Theory used by Yang and Wu (2014), Wang (2018), and Zhou (2021) to analyze the causes of sharing participation dilemmas, ICAF's collaborative theoretical perspective and micro-analysis level are more compatible with cross-agency government data sharing. Its theoretical exposition of the relationships among collaborative benefits, costs, risks, and departmental participation is more explicit and more conducive to in-depth empirical research [31].

From the ICAF perspective, the essence of cross-agency government data sharing is cross-agency collaboration aimed at data stewardship sharing. The theoretical elements driving its participation dilemma can be divided into "general theoretical elements of cross-agency collaboration" and "special collaborative theoretical elements faced by data sharing." Based on existing ICAF research [27], the former includes government agency characteristics, sharing behavior institutions, and inter-agency collaborative foundations, focusing on the degree of support provided by the existing collaborative institutional environment for cross-agency government data sharing. The latter includes government data characteristics, sharing performance measurability, and government data asset specificity, focusing on the degree of asset specificity and performance measurability of government data as sharing objects and government assets. Overall, when the collaborative institutional environment provided by the government institutional environment is more suitable for sharing, participation dilemmas

in government agency sharing are less likely to emerge. Simultaneously, as bounded rational actors in the government institutional environment, government agencies' sharing participation decisions depend on their comprehensive evaluation of sharing risks, costs, and benefits. Sharing risks mainly originate from distribution and coordination dimensions: the former refers to the risk that agencies participate in sharing but do not receive corresponding returns or deserved treatment, while the latter refers to the risk that agencies must re-collect data, communicate between departments, and promote data flow when sharing fails. Sharing costs mainly originate from negotiation and execution dimensions: the former refers to the negotiation and bargaining costs required for sharing, while the latter refers to the time, effort, and material costs spent by departments to implement sharing. Expected sharing benefits are motivating factors that can be divided into collective and selective benefits: the former refers to direct benefits from data sharing (such as business problem resolution), while the latter refers to benefits endowed by specific institutional environments (such as departmental performance improvement). Overall, when forming data sharing participation willingness, government agencies assess participation risks and costs based on data sharing characteristics, departmental sharing guarantee conditions, inter-agency collaborative relationships, and data sharing institutional guarantees. The more supportive these conditions are for sharing, the lower the expected risks and costs, and the more likely agencies are to participate. With risk levels basically clear and relatively fixed, agency sharing participation depends on their comprehensive judgment of sharing costs and benefits. In summary, as shown in [Figure 1: see original paper], the formation of participation dilemmas in cross-agency government data sharing is closely related to the conditions of "collaborative foundation" and "data characteristics" dimensions in the institutional environment where government agencies are situated. Government agencies' sharing participation decision-making represents their comprehensive assessment of the institutional environment, aiming to achieve a balance between self-interest and collective benefits.

[Figure 1: see original paper] Motivation Analysis of Participation Dilemma in Cross-Agency Government Data Sharing Based on ICAF

4 Theoretical Explanation Framework Construction for Participation Dilemma Formation Mechanism Based on ICAF

A framework is a set of potentially related variables and their sub-components constructed around a specific topic [32]. To construct a theoretical explanation framework for the formation mechanism of participation dilemmas in cross-agency government data sharing based on ICAF, this study follows the research approach of "theoretical analysis-factor identification-relationship definition-framework construction." First, the study conducts content coding analysis on empirical research retrieved from CNKI and Web of Science databases using "government+information/data sharing" and "government in-

formation/data sharing" as keywords to clarify current research understanding of the key question "under what circumstances, prerequisites, or inter-agency characteristics are government agencies willing to participate in sharing" and extract theoretical driving elements of participation dilemma formation. Next, based on the induction and clustering of driving elements, this paper adopts an inductive-deductive logic and conducts second-round coding using field survey data from typical cases to verify, enrich, and refine current factor types and their identified content. The field survey data from typical cases come from voice transcription materials, local policy documents, and internal government materials obtained by the author's research team through interviews with government management and staff members from municipal big data bureaus and business departments in Beijing, Guizhou (Guiyang), Zhejiang (Hangzhou), and Jiangsu (Nanjing) between 2019-2021 regarding government data governance, government data sharing, and inter-agency collaboration. Finally, based on the identification of theoretical driving factors and combined with theoretical analysis and case study results, the study constructs a theoretical explanation framework and proposes corresponding theoretical hypotheses. Through preliminary classification, content coding, duplicate removal, and relationship mining, the study identified five theoretical dimensions to explain the causes of participation dilemmas in cross-agency government data sharing: inter-agency collaborative relationships, shared data characteristics, departmental expected sharing benefits, departmental perceived sharing risks, and departmental perceived sharing costs. The following sections elaborate on their content.

4.1 Theoretical Elements of Inter-Agency Collaborative Relationship Dimension

Inter-agency collaborative relationships refer to the cooperative relationships formed among various government departments in exercising administrative power and performing administrative functions through mutual coordination and joint action [33]. Based on content coding results, lists three specific elements: inter-agency business collaboration, previous collaboration experience, and collaborative structure.

(1) Inter-agency business collaboration. This refers to the degree of association among businesses behind shared data at the process, function, and execution levels, typically manifested as consistency in semantic expression of core business content across different departments. Generally, departments with strong business interconnections inherently generate data sharing needs, and due to their familiarity with each other's businesses and departments, they can propose more satisfiable demands during sharing.

(2) Inter-agency collaboration experience. This refers to whether departments have previous interaction experiences and joint work histories. This concept overlaps somewhat with inter-agency trust relationships. However, considering empirical research results from Fan et al. (2014) and Wang (2018) conducted in Chinese government contexts, which indicate that sharing activi-

ties driven by administrative commands are more influenced by comprehensive power-interest assessments than by trust relationships [35], and based on interview materials where respondents rarely used trust as a term to describe participation influencing factors, this paper selects inter-agency collaboration experience as a theoretical element to replace trust relationships. Such previous collaboration experience enables decision-making departments to develop the perception that "participating in cross-agency government data sharing with other departments will bring positive impacts to our department" [36], thereby promoting their participation in cross-agency government data sharing.

(3) Inter-agency collaborative structure. This refers to the organizational structure formed by departments for the purpose of promoting sharing participation, aimed at mutual communication, horizontal consultation, and activity integration. In descending order of structuralization degree, common collaborative structures in data sharing include: 1) legally mandated or locally administratively effective collaborative departments established at the first-level government tier, specifically manifested as provincial/municipal big data bureaus whose core function is coordinating departmental participation in data sharing; 2) "three-designations schemes" established around the government chief information officer function, aiming to promote data sharing and asset value realization while protecting sensitive government data and enhancing government data-driven decision-making capabilities; and 3) special work coordination meetings, the most common inter-departmental coordination method during sharing implementation, where business and data officials from various departments communicate on sharing-related matters.

Specific Content of Theoretical Elements in Inter-Agency Collaborative Relationship Dimension

Inter-Agency Collaborative Relationship	Specific Content
Inter-agency business collaboration	Business relevance, consistency, and compatibility
Inter-agency collaboration experience	Interaction history, mutual understanding, and trust level
Inter-agency collaborative structure	Communication methods, social networks, and collaborative structures

4.2 Theoretical Elements of Shared Data Characteristics Dimension

Characteristics are the features that distinguish things from others and represent abstract expressions of their objective attributes. Based on theoretical analysis

and content coding, lists shared data quality, sharing performance measurability, and data business specificity.

(1) Shared data quality. This describes whether data can meet user and usage scenario needs, with its accuracy and completeness being fundamental elements affecting the significance of departmental data sharing participation [38]. Based on sharing management requirements and field surveys, current government data quality focuses on completeness, trustworthiness, and consistency features of shared data, aiming to obtain more effective data under legal and compliant premises. "We conduct multi-dimensional assessments of data quality: first is consistency—whether the incoming data matches the catalog; second is completeness and accuracy—for example, ID numbers should be 18 digits, but if you provide 15 digits or missing information, we need to ensure data can meet basic processing requirements"[3].

(2) Sharing performance measurability. This refers to the measurability of data sharing effects, typically correlated with the structured degree of shared data. Generally, when measuring highly structured data, governments can obtain clear performance data (such as how many megabytes of data a department provided this quarter). However, when data is less structured and more scattered, the substantial work in data aggregation and integration processes is difficult to fully count, measure, and express through highly structured forms such as work hours and quantities. In such cases, sharing performance measurability is relatively low, and government agencies are usually more inclined to "do less" or "not do" data sharing with poor performance measurability.

(3) Data asset specificity. Asset specificity refers to the possibility of reusing an asset for other business production after achieving its specific purpose. If a specific asset has high specificity, it means higher costs are required to repurpose it for other uses. For the government data sharing phenomenon of concern in this paper, if certain shared data has high asset specificity, it is typically characterized by low sharing frequency, special business needs, and difficulty in application to other matters in other departments. Conversely, if shared data has low asset specificity, such data can typically be used by multiple departments for multiple matters, such as basic population data and basic legal entity data. When shared data has high asset specificity, such data is often transmitted between sharing actors in relatively fixed forms, frequencies, and channels. When shared data has low asset specificity, such data usually has relative advantages in information content, technical expression forms, and storage/transmission channels, can meet the needs of multiple departments and matters at different time points, and is relatively easier to share.

Specific Content of Theoretical Elements in Shared Data Characteristics Dimension

Shared Data Characteristics	Specific Content
Shared data quality	Data accuracy, completeness, trustworthiness, and consistency
Sharing performance measurability	Structured measurability level of data sharing outcomes
Data asset specificity	Possibility of reusing shared data for other businesses

4.3 Theoretical Elements of Departmental Expected Sharing Benefits Dimension

Expected benefits, also called anticipated benefits, refer to the benefits that decision-making subjects predict they can obtain based on known information without accidents or uncertainties. Essentially, they represent both a subjective judgment of decision-making subjects and a key element in explaining decision formation processes [39]. Based on Suo Liming (2020) and interview materials, common data sharing expected benefits include collective benefits and selective benefits. The former refers to common interests brought to all participating departments (regardless of their roles as data suppliers or users), such as fiscal funding inclination, business efficiency improvement, and public value creation. The latter refers to positive benefits brought to the overall government data relationship network construction, departmental official performance, and departmental overall performance evaluation. In digital government construction, the ultimate goal of cross-agency government data sharing is to improve government decision-making and service levels based on data flow. From this perspective, collective benefits of sharing mainly come from the overall improvement of first-level government digital government construction levels. Based on interview materials, current local governments use fiscal project inclination and government department performance assessment methods to promote departmental participation in sharing. Additionally, the chief information officer system implemented in some local governments mentioned earlier essentially associates sharing with departmental head performance evaluation results.

4.4 Theoretical Elements of Departmental Perceived Sharing Risks Dimension

Risk typically refers to future uncertainties, particularly potential losses and their likelihood caused by uncertainties, while perceived risk refers to the risk subjectively perceived by actors regarding specific matters [40]. Based on institutional collective action theory and Suo Liming (2020), decision-making departments' perceived sharing risks can be divided into distribution risks and coordination risks. Distribution risks come from the sunk costs departments invest in sharing participation, particularly for major data-supplying departments

that consume substantial human, financial, and material resources to "produce" data called collective public goods. The mismatch between input and output inhibits sharing participation willingness. Currently, fiscal project incentive schemes used by some local governments essentially encourage the establishment of departmental sharing data systems and innovative utilization based on shared data, but such incentives cannot replace the cost losses of major data-supplying departments in specific sharing activities. Therefore, such benefit loss risks remain relatively high.

Coordination risks mainly come from data usage security during the sharing process. When sharing parties lack effective coordination methods and good relationships, the authenticity, accuracy, and effectiveness of data provided by suppliers are usually difficult to guarantee. Whether recipients will abuse, misuse, or misappropriate authorizations constitutes another form of breaching sharing agreements. Overall, departmental perceived sharing risks come from multiple aspects, including benefit loss, political accountability, data request neglect and delay, data quality and security, data misuse and abuse, and sensitive data leakage [41]. Additionally, based on theoretical analysis and existing research, perceived sharing risks represent comprehensive assessments made by departments based on their own environments and are therefore influenced by shared data quality characteristics and inter-agency collaborative relationships.

4.5 Theoretical Elements of Departmental Perceived Sharing Costs Dimension

Cost refers to the resource price paid or payable for process value-added or effective results, while perceived cost refers to actors' subjective understanding of costs for specific matters. ICAF's understanding of transaction costs originates from Williamson's research on transaction costs, which posits that transaction costs are caused by actors' opportunistic behavior tendencies and asset specificity [42]. Regarding this paper's research topic, transaction costs include coordination costs and execution costs. Coordination costs are the costs of communication, negotiation, and bargaining between departments and other participating departments to achieve data sharing. Execution costs are the prices departments pay to participate in sharing and have been the focus of previous research, including technical construction costs, personnel training costs, and fiscal consumption costs [43]. Currently, Chinese local governments generally adopt the "platform coordination + institutional coordination" model to reduce supervision costs of cross-agency government data sharing within first-level governments. However, not all regional integrated government service platforms have achieved effective data connectivity or on-demand data retrieval. Cross-agency government data sharing in some regions still requires participating departments to conduct substantial communication, exchange, and negotiation. Additionally, while data sharing forms using platforms as coordinators and data flow supervision technologies including blockchain have greatly reduced departmental communication, negotiation, and supervision costs, they cannot

reduce departmental data collection, processing, and cleaning costs. Moreover, platforms cannot solve all coordination problems; departmental practice still requires introducing higher-level division leaders, data management departments, and third-party data professional organizations to coordinate data sharing [44]. Introducing coordination intermediaries themselves also requires sharing departments to pay certain explicit or implicit costs, such as communication costs for data platform access.

4.6 Theoretical Explanation Framework for Participation Dilemma Formation Mechanism Based on ICAF

In summary, combining existing literature and field surveys, this study identified and summarized five theoretical elements across five dimensions to explain the causes of participation dilemmas: inter-agency collaborative relationships, shared data characteristics, departmental expected sharing benefits, departmental perceived sharing risks, and departmental perceived sharing costs. Among these, inter-agency collaborative relationships and shared data characteristics belong to relatively objective external conditions, while departmental expected sharing benefits, perceived sharing risks, and perceived sharing costs belong to endogenous departmental elements. Based on case studies and mapping results, [Figure 2: see original paper] reveals the formation mechanism.

[Figure 2: see original paper] Theoretical Explanation Framework for Participation Dilemma Formation Mechanism in Cross-Agency Government Data Sharing Based on ICAF

Specifically, **(1)** Better inter-agency collaborative relationships and data characteristics supportive of sharing directly promote the formation of departmental sharing participation willingness, thereby inhibiting participation dilemma formation. Case surveys indicate that unclear rights and responsibilities allocation in sharing collaboration systems and government agencies' failure to classify and manage shared data according to their asset specificity are important causes of participation dilemmas. Meanwhile, there is a certain interactive and linkage relationship between inter-agency collaborative relationships and shared data characteristics, with better inter-agency collaborative relationships providing certain guarantee functions and promoting effects for the realization of data characteristics supportive of sharing.

(2) Higher departmental expected sharing benefits directly promote the enhancement of departmental participation willingness, whose formation is influenced by participating departments' comprehensive judgments of their institutional environments (inter-agency collaborative relationships and special sharing collaboration requirements) and sharing costs and risks. Case surveys indicate that for most government agencies, the benefits of participating in government data sharing mainly come from two aspects. The first aspect is the urgent requirement for improving their own business completion and processing efficiency. For such agencies, the greatest benefit of sharing is obtaining data to

promote their own business process operation. The second aspect is meeting the overall government construction benefits of promoting government service supply, integrated government data systems, and digital government construction. Overall, the more supportive the external institutional environment, particularly the collaborative environment, the higher the departmental expected sharing benefits, the stronger the participation willingness, and the less likely participation dilemmas are to form.

(3) Higher departmental perceived costs and risks directly hinder the enhancement of departmental participation willingness, whose formation is influenced by participating departments' institutional environments (inter-agency collaborative relationships and special sharing collaboration requirements). Case surveys indicate that data sharing with good inter-agency collaborative relationship foundations (including but not limited to establishing intermediary agencies to coordinate departments and policy arrangements) has greatly reduced negotiation costs and distribution and coordination risks. Overall, the more supportive the inter-agency institutional environment for sharing, the lower the departmental perceived sharing costs and risks, the more willing departments are to participate, and the less likely participation dilemmas are to form.

5 Research Findings, Summary, and Policy Recommendations

5.1 Research Findings

Based on the Institutional Collective Action Framework (ICAF) and case study findings, this paper identified five theoretical dimensions of participation dilemma formation in cross-agency government data sharing and constructed a theoretical explanation model for the formation mechanism. Overall, the findings indicate: **(1)** Better inter-agency collaborative relationships and data characteristics supportive of sharing directly promote the formation of departmental sharing participation willingness, thereby inhibiting the emergence of participation dilemmas. Among these, the degree of business association, common work experience, and clearly defined collaborative work systems constitute the main elements of inter-agency collaborative relationships, while data characteristics in terms of quality, performance measurability, and asset specificity constitute the elements of special data sharing collaboration. **(2)** Departmental expected sharing benefits, perceived sharing risks, and perceived sharing costs represent government agencies' subjective judgments of their institutional environments and data sharing, with their comprehensive judgment results being the determining factors for departmental participation willingness formation. Among these, the strength of departmental perceived sharing risks and costs is mainly influenced by the collaborative processes and institutional arrangements in inter-agency collaboration with government data assets as sharing objects. **(3)** There exists certain interaction between inter-agency collaborative relationships and special sharing collaboration requirements, as

well as between departmental perceived sharing risks and perceived sharing costs.

5.2 Research Summary

Overall, this paper's main contributions include: First, while continuing previous research discussions on the theoretical relationships among "information sharing, data stewardship, and cross-agency collaboration" [24,45], this paper expands the theoretical connotation of cross-agency government data sharing from a cross-agency collaboration perspective. Second, the identified elements of "inter-agency collaborative relationships" and "data characteristics supportive of sharing" and their specific content share the same dimension division as the "cross-agency environment" element in Bigdeli et al.'s (2013) framework, but this paper refines the specific content of elements through theoretical analysis and case surveys. Third, compared with Wang's (2018) and Zhou's (2021) frameworks, this paper more clearly articulates government agencies' sharing participation decision-making logic, revealing the causes of the "unwilling to share" participation dilemma.

Meanwhile, this paper has limitations: First, the theoretical explanation framework constructed still requires more abundant survey materials to refine the specific content of theoretical elements and their interrelationships. Second, considering the characteristics of the information resource management discipline, this paper does not provide a detailed introduction to ICAF; applications of this theory in government data sharing and governance can be found in references [27,46]. Third, due to space limitations, specific details of the case studies will be published separately.

5.3 Policy Recommendations

In summary, cross-agency government data sharing is a cross-agency collaborative process that jointly allocates government data stewardship and realizes its asset value without destroying administrative boundaries. In this process, when government agencies judge whether to participate in sharing, their decisions are influenced by the government sharing and collaborative institutional environment they inhabit. Previous collaboration foundations between sharing agencies, particularly collaboration experience and institutional provisions surrounding data sharing, and data characteristics in terms of quality, performance measurability, and asset specificity, are theoretical elements that affect government agencies' comprehensive judgments of sharing behavior's expected benefits, costs, and risks. In response, this study proposes that resolving participation dilemmas should involve multi-dimensional efforts including inter-agency coordinated management, sharing process coordination, and data stewardship definition to promote the construction of an institutional environment supportive of inter-agency sharing and collaboration. Specifically, local governments can: **(1)** Construct and improve a coordinated management system composed of data sharing governance committees, governance requirement research teams,

and major participating departments in data sharing, focusing on clarifying data sharing requirements and data classification coding identification, to help stakeholders effectively coordinate the disposal and arrangement of data stewardship allocation and related matters. **(2)** Effectively sort out and fully implement government data sharing and governance responsibilities in combination with existing "three-designations" provisions and responsibility task lists, assigning them to specific lifecycle stages, responsible persons, and coordination processes. **(3)** Reference existing digital government data governance architectures and stewardship allocation schemes from various countries to construct government data stewardship allocation and data governance architectures that meet China's practical needs, under the premise of fully integrating government business operations, administrative management planning, and information technology characteristics.

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