The Value of Open Government Data: Research Progress and Prospects Postprint

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Abstract

[Purpose/Significance] To systematically summarize and review the research findings on the value of open government data, thereby forming a comprehensive literature review to provide guidance for future domestic research in this domain.

[Method/Process] Through bibliometric and content analysis, this study depicts the distribution of literature in the field of open government data value research, comprehensively reviews and evaluates existing research findings, and proposes future research directions.

[Results/Conclusions] Currently, academic research on the value of open government data mainly focuses on three aspects: value types, value generation mechanisms, and value measurement. Most studies remain at the stage of discussing the expected value of open government data, lacking empirical validation of such expected value; lacking examination of the causal relationship between utilization and outcomes; and featuring insufficient research on value generation mechanisms and value measurement. It is recommended that future research pay greater attention to local practice, adopt a multidisciplinary perspective, and strengthen theoretical and empirical research related to the value of open government data.

Full Text

The Value of Open Government Data: Research Progress and Prospects

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Abstract

[**Purpose/Significance**] This paper provides a comprehensive literature review on the value of open government data, summarizing existing research findings to inform future studies in this field domestically. [**Method/Process**] Through bibliometric and content analysis, this paper maps the distribution of literature in the open government data value research domain, systematically reviews and evaluates existing research outcomes, and proposes future research directions. [**Result/Conclusion**] Current academic research on open government data value primarily concentrates on three aspects: value types, value generation mechanisms, and value measurement. Most studies remain at the level of discussing anticipated value, lacking empirical validation of expected value; there is insufficient examination of causal relationships between utilization and outcomes; and research on value generation mechanisms and measurement is inadequate. Future research should pay greater attention to local practices, adopt multidisciplinary perspectives, and strengthen theoretical and empirical studies on open government data value.

Keywords: open government data; value; mechanism; measurement; literature review
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Since the launch of the U.S. open government data platform in 2009, the open government data movement has swept across the globe. The United Nations E-Government Survey shows that by 2018, 139 countries and regions—accounting for 72% of UN member states—had provided open government data catalogs or platforms [1]. China's open government data initiatives began in 2012 and have since developed rapidly. According to the 2019 China Local Government Data Open Report released by Fudan University's Digital and Mobile Governance Laboratory, by the first half of 2019, 82 provincial, sub-provincial, and prefecture-level governments in China had launched data open platforms, representing an increase of 36 platforms (43.9% growth) compared to the same period in the previous year [2].

Governments worldwide actively open data primarily to promote societal utilization of government data resources and thereby create substantial value [3]. However, although value has always been one of the core issues of open government data, it has not received sufficient attention. At the research level, existing studies tend to focus on the supply and utilization dimensions of open government data, with relatively few examining the value dimension. At the practical level, evaluations of open government data value remain largely vague and ambiguous, affecting government agencies' motivation to further open data. Key questions such as what specific values open government data can generate, how value is created, and how it can be measured still lack systematic review and synthesis in academic circles. To comprehensively understand current research progress and deficiencies, this paper analyzes relevant domestic and interna-

tional literature on open government data value, 梳理其研究议题与现有成果，识别当前研究的薄弱环节，并探讨未来研究方向。

2. Literature Sources and Distribution

To concentrate on the academic research status of open government data value, this paper limits selected literature types to peer-reviewed journal articles, conference papers, and dissertations, supplemented by representative organizational research reports, book reviews, and monographs. For English literature, we used "open government data" and "value" as keywords, initially searching Web of Science, Scopus Database, ACM, and ScienceDirect, then supplementing with Google Scholar, yielding 231 papers. For Chinese literature, we searched the CNKI full-text database using "open government data" (or "government data open," "government open data") and "value" as keywords, obtaining 143 papers. The search cutoff date for both Chinese and English literature was December 18, 2019. After filtering irrelevant literature, we identified 81 English and 38 Chinese papers as the research objects for this study. In recent years, research on open government data value has increased significantly both domestically and internationally, with similar temporal distribution patterns between Chinese and English literature, as shown in Figure 1 [Figure 1: see original paper].

To extract the main research topics in current open government data value literature, this paper conducted preliminary exploration using grounded theory. Grounded theory is a qualitative research method in which researchers begin with actual observations, induce empirical generalizations from raw data, and gradually develop theory [4]. This methodology has also been applied in literature research [5]. Following the classic grounded theory of B. G. Glaser and A. Strauss [6], this study employed three-level coding to process and analyze the data [7].

The first level is open coding, which involves decomposing, testing, comparing, conceptualizing, and categorizing the data [7]. At this stage, we dissected the titles, keywords, and abstracts of the collected literature sentence by sentence, conducting open coding. Codes obtained included "economic opportunities," "business development," "value beliefs," "business model frameworks," "progress in national value assessment," and "public value assessment frameworks." The second level is selective coding, which involves discovering and clarifying core categories to summarize central phenomena [7]. For example, "economic opportunities" and "business development" could be merged into "economic value," "value beliefs" and "business model frameworks" could be integrated into "business models," progress in various countries' open government data value assessments could be summarized as "value assessment practice," and value assessment frameworks and indicators could be extracted as "value assessment methods." The third level is theoretical coding, which organizes the concepts or categories formed in selective coding to build theory [7]. Through further refinement of selective coding, we integrated research on the manifestations of open government data value into the study of "open government data value types,"

research on value realization methods, paths, and models into the study of "open government data value generation mechanisms," and research on value evaluation, measurement, or assessment methods and practices into the study of "open government data value measurement." Thus, we identified three main themes in current academic research on open government data value: value types (what value open government data can bring), value generation mechanisms (how various types of value are realized through what paths and mechanisms), and value measurement (how to measure the degree of value realization). The distribution of literature across these themes is shown in Figure 2 [Figure 2: see original paper].

3. Types of Value from Open Government Data

Value refers to an object's capacity to satisfy subject needs [8] and possesses multidimensionality. Existing literature indicates that open government data can generate multiple types of value. The Center for Technology in Government at the University at Albany, SUNY, proposes that open government data value can be divided into seven dimensions: economic, political, social, strategic, quality of life, ideological/cultural, and managerial [9]. Zheng Lei notes that open government data value includes economic, social, political, and other values [10]. Huang Ruhua et al. suggest that open government data value comprises four dimensions: political, social, economic, and technical [11]. Among the 67 papers examining open government data value types, we counted the number of papers corresponding to different value types, with results shown in Table 1 (the same paper could involve multiple value types; value types with $ $3 cumulative papers were not included). Political, economic, and social value emerge as the core values of open government data recognized in existing literature (with cumulative papers >30). Compared to political, economic, and social value, other value types have received less researcher attention. Based on the literature, we organized and summarized these eight value types, with results presented in Table 2 . Two points warrant attention when understanding open government data value types: No consensus exists in academia regarding classification standards and hierarchical divisions of open government data value. The pathways for generating open government data value constitute an open set [9], and new values may emerge as practice develops. Various value types are not clearly demarcated. From a static perspective, different value types can overlap and cooccur. For example, M. Janssen et al. found that the political and social value of open government data are difficult to completely separate—public service innovation based on open government data both enhances government governance levels (political value) and brings convenience to the public, improving their satisfaction (social value) [12]. From a dynamic perspective, the achievement of one value type may promote the realization of others. As T. G. Harrison et al. note, if transparency, participation, and collaboration are the initial values pursued by open government data, once achieved, they facilitate the realization of broader managerial value [9].

3.1 Political Value

Political value is the most frequently mentioned value type across all selected literature. Political value refers to benefits that open government data can bring to public governance. First, regardless of form or scale, open government data can reduce information asymmetry to some extent, thereby enhancing government transparency [13]. Second, open government data places higher demands on government responsiveness, and continuous data openness helps improve government capacity to respond to public needs [14]. Third, access to and utilization of open government data can empower citizens to participate in governance issues, making governance actors more diverse than in traditional models in some cases [24]. Finally, utilizing open government data helps improve public service efficiency and effectiveness, enhances service quality, drives public service innovation, leads to better governance [18,20,25], and enables more precise and personalized public services [26].

Although people are generally optimistic about the political value embedded in open government data, it is important to note that political value does not emerge naturally and immediately simply because government data is opened. The realization of open government data political value has many prerequisites, such as the public needing to know that government agencies are opening data, data must have relevance and utilization value, and the public must possess certain data interpretation and analysis capabilities [25]. Additionally, different elements of open government data political value have certain hierarchical characteristics. J. Attard et al. point out that transparency, accountability, and good governance constitute a value pyramid from bottom to top, where the achievement of lower-level values facilitates the realization of higher-level values [15]. Whether open government data can enhance public trust in government agencies remains controversial in academia. Some studies indicate that issues such as poor-quality open government data may reduce public trust in government [27].

3.2 Economic Value

Economic value refers to benefits that open government data can bring to the economic domain. Existing literature discusses economic value second only to political value. Acquiring economic value is one of the main motivations for countries to join the open government data movement [28]. At the micro level, open government data can provide enterprises with more data sources, reducing costs for obtaining certain data and information [22]; through linking, aggregating, analyzing, and utilizing open government data and other commercial big data, enterprises can optimize decision-making [18,29-30], achieve business innovation [20,31-32], improve product and service quality [33], and enhance competitiveness [12]. At the macro level, open government data injects raw materials into the data and information industry, creates employment opportunities [34], improves returns on public investment [35], and ultimately promotes economic growth [16-17].

While people are generally optimistic about the economic value contained in open government data, some scholars point out that the economic value of open government data is uncertain [28,36] and difficult to measure [27]. This is particularly evident in countries and regions where open government data is still in its early stages [37]. Furthermore, government data producers often lack understanding of which data has high economic value [14], and the quality, type, and continuity of opened data often fail to meet commercial utilization requirements, which may constrain the output of open government data economic value [38].

3.3 Social Value

Social value refers to social utility that individuals and organizations obtain from open government data. Most literature points out that open government data has the potential to create enormous social value. Discussions of open government data social value in the literature focus on two main aspects: Government data openness and utilization help lower the threshold for public participation in public affairs, enhancing public willingness and capacity for participation and collaboration [12,39-40]. In some cases, the public achieves common goals through participation, cooperation, knowledge sharing, and crowdsourcing [41].

Utilizing open government data helps improve overall social welfare. On one hand, it helps save social costs and improve overall social efficiency [28]; on the other hand, business innovation and public service innovation based on open government data can bring better goods and services, generating benefits for the public in transportation, healthcare, education, food safety, and many other aspects [20,25], thereby improving quality of life, subjective satisfaction, and overall welfare [18].

Literature review reveals that open government data social value is mostly indirect, demonstrating a certain value spillover effect. However, some studies note that realizing open government data social value highly depends on a series of preconditions, including eliminating technical and institutional obstacles to data utilization, providing a favorable policy environment for utilization, and cultivating an utilization ecosystem [12].

3.4 Technical Value

Technical value refers to the usefulness characteristics of open government data in the technical domain. Huang Ruhua et al. believe that open government data technical value should focus on promoting the reuse of open government data [11]. By analyzing policy texts on open government data from China, the U.S., and the U.K., they summarized that open government data technical value includes openness, compatibility, reliability, and security, covering specific content such as open data protocols, linked data, data sharing and interoperability, and data resource reuse [11]. M. Janssen et al., through qualitative interviews, noted that open government data technical value includes open access and free use of open government data, linking and integration of multi-source data, data quality improvement, and optimization of data archiving and sustainability [12].

Based on case studies, J. Kucera and D. Chlapek pointed out that the process of open government data can prompt data-opening agencies to enhance relevant data management technologies and capabilities [42].

3.5 Strategic Value

Strategic value refers to political or economic opportunities or advantages that open government data can bring to individuals or groups, as well as resources available for innovation and planning [9]. Utilizing open government data can provide references for individual decision-making [33]; help enterprises test the feasibility of creative solutions, discover potential markets, and achieve business innovation [43]; assist government agencies in making "smarter" decisions and driving public service innovation [10]. Additionally, open government data can boost smart city construction [44]. A case analysis of a smart city project in Rio de Janeiro indicated that open government data can bring strategic value to the public by facilitating the development of innovative industries [19].

3.6 Scientific Research Value

Scientific research value refers to benefits that open government data can bring to scientific research. Open government data has contributed to research in public health, medicine, environment, economics, computer science, and even energy and engineering. Open government data can provide new, freely accessible data sources for scientific research, spawn new research findings, or provide new evidence for existing research hypotheses [21,45-46]. Additionally, using government data helps increase the visibility and transparency of scientific research outcomes, improving research efficiency and the utilization and impact of research results [20]. A. Yan and N. Weber found that since 2009, researchers' use of open government data has shown a steady growth trend. Among all research outcomes utilizing open government data, those using the U.K. open data platform data.gov.uk as a data source accounted for the highest proportion. Open data from some developing countries, such as India and Kenya, have also received widespread attention from researchers [21].

3.7 Ideological/Cultural Value

Ideological/cultural value refers to value that open government data can bring to people's beliefs, recognition, and culture [9]. Open government data fosters a culture of openness [47], helping government agencies shift from conservative, closed organizational cultures to open, sharing, and customer-demand-oriented cultures [48]. C. N. Bonina noted that utilizing open government data helps citizens enhance cooperative awareness and volunteer spirit, strengthening connections among citizens [14]. Si Linbo et al. believe that the popularization and deepening of open government data contributes to the formation of a data culture [20].

3.8 Environmental/Ecological Value

Environmental/ecological value refers to benefits that open government data can bring to protecting the natural environment and maintaining ecological diversity. Utilizing open government data helps improve public transportation while also reducing carbon emissions [22]; disclosing environmental protection data helps the public stay informed about and supervise environmental pollution governance [49]; integrating and utilizing environmental/ecological data helps protect natural resources and improve capacity to address climate change [23]. Some studies indicate that open government data has already generated certain environmental benefits in waste classification and recycling, air pollution control, and energy conservation and emission reduction [50].

Existing literature has provided relatively comprehensive elaboration on potential value types of open government data. Several issues deserve attention: A prominent problem in current research is that the vast majority of literature only discusses "anticipated value" of open government data, lacking empirical research to verify its "actual value" [51]. Considerable literature only provides superficial overviews of various potential values of open government data, lacking in-depth and detailed analysis and demonstration of one or several value types. Only a few studies provide structured analytical frameworks, and systematic research on open government data value remains weak, particularly regarding classification standards, hierarchical composition, and static and dynamic relationships among various values.

4. Value Generation Mechanisms of Open Government Data

Research on open government data value generation mechanisms aims to open the "black box" from open government data development and utilization to value realization, revealing the value generation mechanism. Existing research has explored this from several perspectives, as shown in Table 3 .

4.1 Economic/Business Perspective

Literature from the economic/business perspective has made progress in understanding how open government data creates value, especially economic value. Some scholars have mapped out business models for open government data. F. A. Zeletti et al., following the design science research paradigm, extracted keywords from literature on commercial utilization of open government data and conducted coding to construct a universally adaptable 6-V business model for open government data. The six Vs represent six modules: value proposition, value-added process, value return, value capture, value network, and value management [52]. G. Magalhaes and C. Roseira analyzed 178 U.S. companies utilizing open government data and found that commercial utilization of open government data can be summarized into 12 business models: advertising, consulting, data optimization, data structuring, single-purpose APPs, interactive

APPs, data platforms, open data portals, business intelligence, process optimization, product/service improvement, and R&D [53].

Other scholars have analyzed the open government data value chain to explain value-added processes. Xia Yizhi noted that open government data value realization is a process of gradual increase from low to high, primarily through innovation in data utilization methods, tools, and techniques, enriching the connotation of the open data industry value chain and continuously extending the length of the data development and utilization value chain [54]. Based on value co-creation theory, K. McBride et al. pointed out that public service innovation driven by open government data exhibits value co-creation characteristics [55]. Based on value creation and value capture theories, Shen Jing and Hu Guangwei defined multiple value flows of open government data [56].

4.2 Data/Technical Perspective

From the data and technical perspective, literature has analyzed the open government data value realization process. Based on data/information lifecycle theory, J. Attard et al. noted that open government data value runs through the entire data lifecycle, including data generation, processing, publication, linking, utilization, and management, achieving value addition through data collection, format conversion, data linking and integration, data analysis and visualization, and data updating and maintenance [57]. Xia Yizhi divided open data value realization into three stages: raw material production and supply (provision of data resources), core data product development (exchange and provision of information and knowledge), and comprehensive development (provision of data products/services formed by the integration of information and technology) [54]. Based on the technology acceptance model, information systems success model, and information systems evaluation theories, C. Alexopoulos et al. proposed an open government data value model examining the relationship between efficiency (including data provision capacity, data search and download capacity, feedback capacity, ease of use, performance, and data processing capability), effectiveness (supporting user goal completion), and future user behavior. The authors tested this model through surveys of potential users of a European open government data project [58].

4.3 Social/Environmental Perspective

From the social/environmental perspective, literature has examined participants, environments, and value generation mechanisms of open government data. Based on stakeholder theory, public value theory, and ecosystem theory, T. M. Harrison et al. proposed that open government data value generation mechanisms should be an open set, including efficiency, effectiveness, internal improvement, transparency, participation, and collaboration [9]. Shen Jing and Hu Guangwei used a "power-interest" matrix to analyze 12 types of open government data stakeholders and constructed a nine-dimensional government data open value model based on value creation and capture scenarios for

three stakeholder categories: government organizations, non-governmental organizations, and individuals [56]. Xia Yizhi identified various stakeholders along the open government data value chain and analyzed their value demands and realization methods in detail [54]. Based on the technology-organization-environment framework, Wang Jing et al. analyzed factors influencing open government data value realization and constructed a system dynamics model for open government data value realization [59]. Based on ecosystem theory, T. M. Harrison et al. noted that open government data value emerges from the ecosystem composed of government, data users, the public, and the external environment [60]. Zheng Lei further pointed out that the process from government data opening to utilization to value creation is a dynamic cycle: the more data government opens, the higher its value and quality, and the stronger users' data utilization capabilities, the better the utilization effects and public value created, which in turn encourages government to open more high-value data, forming a virtuous cycle. Conversely, a vicious cycle may form [61].

4.4 Comprehensive Perspective

Additionally, a few studies have proposed new theoretical frameworks based on multiple disciplinary foundations to explain open government data value creation mechanisms. For example, T. Jetzek et al. proposed a three-level conceptual model of open government data value creation, arguing that enablers include openness, resource governance, capability, and technology; value generation mechanisms include efficiency, innovation, transparency, and participation; and ultimate impacts include economic and social value [62]. T. Jetzek et al. further used macro-level data from 61 countries and partial least squares regression to test the model, with results largely validating the hypotheses [63]. X. Song et al. used structural equation modeling to construct a value output model with open government data supply characteristics as driving factors, decision support, new goods and services, and transparency and responsiveness as value generation mechanisms, and environmental, economic, and social impacts as outcome indicators, though it has not yet been validated with empirical data [23]. Wang Wei et al., based on value models and absorptive capacity theory, noted that open government data value generation mechanisms can include efficiency, transparency, participation, collaboration, and trust mechanisms, and constructed an open government data value realization framework [64].

Understanding how open government data creates value has always been a key focus and challenge in open government data value research. Only with sufficient understanding of value generation mechanisms can targeted measures be proposed to promote government data opening and utilization to better realize its value and impact. Existing literature has explored value creation mechanisms from multidisciplinary backgrounds (business administration, information management, public administration, etc.). However, compared with literature discussing open government data value types, studies examining value generation

mechanisms remain insufficient. Current research problems mainly manifest as: Few empirical studies, with even fewer able to explain causal relationships between opening and value through empirical data; Few verifiable theoretical frameworks, with relevant theoretical research still in its infancy; Research perspectives also need further enrichment.

5. Measurement of Open Government Data Value

Currently, open government data value measurement is still in its infancy, with limited research outcomes. Existing results follow two main paths: The first path emphasizes theoretical discussion of open government data value measurement methods, analyzing or proposing value assessment frameworks and indicator systems. The second path emphasizes practice, introducing, analyzing, and comparing international open government data value assessment projects, or conducting actual evaluations of open government data value.

5.1 Value Measurement Methods, Frameworks, and Indicators

From a stakeholder perspective, the public value analysis framework developed by the Center for Technology in Government at the University at Albany, SUNY, can be used to measure multiple values that open government data brings to different stakeholders [65]. The public value analysis framework is an analytical tool that helps policymakers and project managers understand the public value returns of information technology projects (including government data open projects). The measurement process includes six steps: describing the program, identifying stakeholders, identifying public value, identifying value generation mechanisms, summarizing assessment results, and evaluating different options. The research methods employed in measurement analysis are primarily qualitative, including interviews and focus group discussions. Notably, the value gains and losses that open government data brings to different stakeholders vary, and the interests of some individuals, groups, or organizations may be harmed [9]. G. V. Pereira et al. applied this analysis framework to evaluate the Rio de Janeiro open government data project in Brazil, finding that open government data brought different types of public value to citizens, enterprises, government agencies, and their employees, while also revealing some problems (such as exacerbating the digital divide) [19].

From a user evaluation perspective, Y. Charalabidis et al. proposed a value model for evaluating open government data programs. This model uses user utilization as the outcome variable to examine the degree to which open government data platforms support user goals and data provider goals. Through user questionnaire surveys, the authors used this model to evaluate a European Union open government data project, finding that improvements in open government data infrastructure could benefit users and generate social and commercial value [66]. C. Origlia et al. argued that evaluating users' subjective perceived value is equally important. By investigating user satisfaction and subjective perceived value of open government data, they measured the comprehensive impact

of an Italian open government data case, finding that increased transparency was the primary value perceived by users [67].

From a third-party evaluation perspective, some scholars have analyzed or proposed indicator systems for open government data value assessment. Zheng Lei and Guan Wenwen reviewed authoritative open government data assessment projects domestically and internationally, finding that the effectiveness dimension should be the "ultimate goal" of open government data assessment, yet currently receives the least attention, with only the Open Data Barometer and the Common Assessment Framework addressing it. In the effectiveness dimension, Zheng Lei and Guan Wenwen identified four indicators: public society, ecological environment, political government, and economic business, with multiple secondary and tertiary indicators under each [37]. Huang Ruhua et al. proposed that the basic value of open government data consists of political, social, economic, and technical value, with 16 secondary indicators and 43 tertiary indicators under these four values [11]. Wang Linchuan added a public value dimension to open government data platform performance evaluation, specifically comprising three indicators: vision and mission, data service quality, and user satisfaction [68].

Some scholars have also summarized characteristics and limitations of different assessment methods at the macro level. Chen Mei notes that open government data economic value measurement methods can be broadly divided into two categories: "top-down" approaches from a macroeconomic perspective and "bottom-up" approaches from a microeconomic perspective. The "top-down" method may overestimate the economic value of open government data, while the "bottom-up" method may underestimate it. How to appropriately measure the indirect value and spillover benefits of open government data remains a point of divergence in current research [69].

5.2 Value Measurement Practice

Currently, some countries and regions have conducted various open government data value assessment projects. For example, the U.K. has conducted socioeconomic impact analysis of the Open Data Challenge Series and value assessment of Ordnance Survey open data [70-71]. Some international organizations and multinational institutions have also evaluated the economic and social benefits of open government data, such as the EU report estimating the economic value that open government data brings to its member states [50], the McKinsey report estimating the benefits that open government data brings to the global economy [72], and the Sunlight Foundation analyzing the social value of open government data [73]. Domestically, Chen Mei cited and introduced some foreign open government data value measurement practices, briefly summarizing their assessment results [69].

A. Zuidewijk et al., through questionnaires and interviews with stakeholders, evaluated the goals and current-stage effectiveness of open government data

cases in 156 countries and regions. They found that open government benefits are not necessarily closely related to goals; at present, open government data benefits concentrate on improving government transparency, enhancing data reuse, empowering citizen participation, improving decision-making processes, and improving administrative processes. In contrast, respondents considered the least achieved benefits to be improving government efficiency and obtaining external resources [74].

Zheng Lei and Lv Wenzeng took the 2015 Shanghai Open Data Innovation Competition as an example to measure beneficiaries, utilization outputs, and effects of open data utilization. By analyzing competition entries, the authors found that the main beneficiaries were individuals (ordinary citizens), government agencies, and enterprises, with most solutions benefiting two or more groups. The study also assessed the potential value of competition entries, finding that potential commercial value included cost reduction, revenue increase, promoting precise advertising, and providing new services for customers; while social value included using data analysis to manage urban traffic congestion, saving social costs, improving resource utilization, and promoting energy conservation and emission reduction [22]. Wen Zuqing and Zheng Lei further measured and analyzed the utilization and output of open data from 82 local Chinese governments, finding that existing utilization outcomes were single-type, small in quantity, narrow in topic coverage, and generally concerning in quality, noting that the fundamental reason for the lack of utilization outcomes was not lack of demand or capability among data users, but that the vast majority of high-demand, high-value government data remains unopened [75].

Many studies emphasize the importance of measuring open government data value and effects [77]. However, existing literature still has significant limitations. Regarding research on open government data value measurement methods, frameworks, and indicators, current studies are diverse in perspective but fragmented, lacking systematic review and comparison of available methods, frameworks, and indicators for open government data value measurement. In actual measurement research on open government data value, existing studies often have insufficient sample sizes, making it difficult to measure global impacts and separate and control the effects of other variables. Comprehensive evaluation of open government data impact and value remains quite challenging, but this issue is significant for the next stage of open government data research and practice and requires deeper exploration by scholars.

6. Summary and Outlook

6.1 Summary of Research Status

Creating value is the purpose of open government data and should also be its ultimate destination. Through systematic review and synthesis, we found that existing research outcomes at home and abroad mainly revolve around open government data value types, value generation mechanisms, and value mea-

surement. The relationship among the three is shown in Figure 3 [Figure 3: see original paper]: government data opening and utilization are prerequisites for value realization, value generation mechanisms are the pathways for open government data value realization, and value types are the results of value realization. Value measurement runs through the entire process from government data opening to utilization to driving further opening, serving as a means to confirm whether open government data value has been realized and a dynamic transmission mechanism determining whether data will be further opened. If measurement results prove that open government data indeed brings increased total social value, it will further promote government data opening and utilization; conversely, if measurement results prove that open government data fails to bring obvious benefits but generates high costs and risks, it will hinder the continuous advancement of open government data.

Analysis shows that although existing research has made progress, it still has many deficiencies, prominently manifested in: Overall, current research focuses more on potential value types of open government data, with fewer in-depth studies on value generation mechanisms and value measurement. Discussions of open government data value mostly remain at the anticipated level, lacking empirical research and testing of anticipated value using rigorous research designs, operationalized measurement indicators, and firsthand research data. Whether utilization of open government data can truly generate various types of value still lacks empirical research testing the causal relationships between utilization and effects. Compared with foreign research, domestic research also has issues such as insufficiently rich perspectives, relatively single research methods, and insufficiently specific and in-depth research content.

6.2 Future Research Outlook

Based on the above analysis and considering the development needs of China's open government data practice, this paper recommends that domestic academia be more grounded in local realities, strengthen research on China's open government data value issues by fully drawing on international research outcomes and combining multidisciplinary research perspectives. Specific suggestions for future research are as follows:

6.2.1 Deepen Understanding of Open Government Data Value Types

Although academia has produced relatively rich research outcomes on open government data value types, most concentrate on discussing political, social, and economic value. Future research could conduct in-depth empirical analysis of some value types that have received less academic attention, such as scientific research value, environmental/ecological value, and ideological/cultural value. Simultaneously, attention should be paid to the openness and dynamism of open government data value, and future research could examine how open government data value evolves and develops over longer time periods. Additionally, identification of open government data value should delve into the micro level,

analyzing specific value gains and losses that open government data brings to different stakeholders.

6.2.2 Strengthen Research on Open Government Data Value Generation Mechanisms Current research on open government data value generation mechanisms remains weak, with even fewer models that can be tested empirically. Future research could enrich such studies by expanding research perspectives. For example, causal relationships between opening and value could be established through empirical research; value networks of open government data could be studied to explore value generation mechanisms from multiple perspectives. Particularly noteworthy is that current academic research on the economic value of open government data remains insufficient. Research should focus on the generation mechanisms of open government data economic value, deeply exploring how economic value is generated, transmitted, and captured, and attempting to establish micro and macroeconomic models for open government data.

6.2.3 Conduct Research on Open Government Data Value Measurement Since open government data remains in its early stages of development in most countries and regions, measurement of open government data effects and value dimensions has been rarely conducted, and related research is clearly insufficient. China's open government data has accumulated nearly eight years of practice, and the next step could gradually involve measurement of open government data effects and value dimensions, continuously deepening methodological research on open government data value measurement in practice. For academia, there is an urgent need to organize available methods, frameworks, and indicators for open government data value measurement and conduct research on causal relationships between open government data utilization and effects through different research methods (such as natural experiments and experimental research). Through rigorous research designs, operationalized measurement indicators, and firsthand empirical data, anticipated value of open government data should be assessed and validated.

6.2.4 Enrich Theoretical Systems of Open Government Data Value Literature analysis shows that current academic theoretical discussion of open government data value remains insufficiently rich and deep. Few theoretical frameworks are available for analyzing open government data value types and value generation mechanisms, and theoretical research on open government data value measurement is particularly lacking. Future research could draw on theories from different disciplinary fields such as ethics, economics (including behavioral economics and welfare economics), psychology, and data science, combined with empirical research, to enrich theoretical systems related to open government data value.

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The Value of Open Government Data: Insights from Literature and a Research Agenda Fu Xiwen[1], Zheng Lei[2] [1]School of Public Management, Northwest University, Xi'an 710127 [2]School of International Relations and Public Affairs, Fudan University, Shanghai 200433

Abstract: [Purpose/significance] To create value is the ultimate goal of open government data. This paper presents a comprehensive overview of the literature on the value of open government data, and provides suggestions for future research. [Method/process] Based on systematic literature review, this paper analyzed the distribution of existing literature and summarized research findings through bibliometric analysis and content analysis. [Result/conclusion] The discussions on the value of open government data in existing literature mostly center on the potential value types, the value generation mechanism and the value assessment. This paper shows that the majority of studies focus on the assumed value types without empirically testing. Future research is proposed to examine the causal linkages between data utilization and potential outcomes and value of open government data, and to pay more attention to the value generation mechanism and assessment of the value of open government data in China.

Keywords: open government data; value; mechanism; assessment; literature review

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