Research on Empowerment and Value Enhancement Pathways of Government Open Data: Postprint

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Abstract

[Purpose/Significance] This study summarizes and explores the pathways for government open data empowerment and value enhancement, enriches the theoretical foundation of this field, opens up channels from integrated utilization to value enhancement of government open data, and provides references for current government open data resource construction and social environment building. [Method/Process] Based on analysis of data usage on government open data platform websites and relevant policy release situations, this study explores the foundational pathways for government open data empowerment and value enhancement from three driving aspects: data, policy, and market, and proposes future development strategies. [Results/Conclusion] The foundational internal and external driving pathways for government open data empowerment and value enhancement can be divided into three types: data value-added, policy release, and market promotion. Implementable strategies for the current stage are proposed, namely releasing the value of government open data, enhancing the utilization efficiency of government open data, and constructing a "three-capable, two-good, three-usable" government open data value enhancement strategy system.

Full Text

Preamble

Special Issue on Knowledge Management and Knowledge Services in the New Technology Environment
Research on the Path of Government Open Data Empowerment and Value Enhancement

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Abstract

[**Purpose/Significance**] This study summarizes and explores the pathways for empowering government open data and enhancing its value, aiming to enrich the theoretical foundation in this field, establish channels from integrated utilization to value enhancement, and provide references for current government open data resource construction and social environment development. [**Methods/Process**] Based on an analysis of data usage on government open data platforms and related policy releases, this paper examines the fundamental pathways for empowering government open data and enhancing its value from three driving perspectives: data, policy, and market, and proposes future development strategies. [**Results/Conclusions**] The basic internal and external driving pathways for government open data empowerment and value enhancement can be categorized into three types: data value-added, policy release, and market promotion. The study proposes implementable strategies for the current stage: releasing the value of government open data, improving utilization efficiency, and constructing a "Three Accessible, Two Good, Three Useful" government open data value enhancement strategy system.

Keywords: government open data; empowerment; value enhancement; path

1. Introduction

The rapid development of big data technology has enriched its application scenarios. As industries compete to undergo digital and intelligent transformation, the value of data is self-evident. Government open data, as foundational data opened to society for development and utilization and closely related to public life, holds unprecedented value across multiple dimensions—such as promoting socio-economic development, improving citizens' quality of life, enriching cultural development, and enhancing government public governance capabilities [1]—demonstrating considerable development potential. In April 2020, the Central Committee of the Communist Party of China and the State Council issued the "Opinions on Building a More Perfect System and Mechanism for Market-oriented Allocation of Factors of Production" (hereinafter referred to as the "Opinions"), which explicitly called for accelerating the cultivation of data factor markets and promoting government data opening and sharing [2]. The Opinions included data as a factor of production for market-oriented allocation for the first time, emphasizing the value of data resources and requiring institutional-level regulation of government open data management to further advance data sharing. This document once again highlighted the extraordinary significance of government open data for the nation and society.

Value creation is the purpose and ultimate goal of open government data [3]. Value research should be an enduring core issue in any discipline or field. Studying value enhancement pathways helps grasp the developmental direction of the field at the strategic level and provides further development ideas. The government open data process involves three stages: integration and opening, integrated utilization, and utilization evaluation. This framework leads experts in the field to focus more on utilization-related research while paying insufficient attention to the value generated through utilization. In today's society, which emphasizes data empowerment, the goal is to accelerate data market circulation, transform data into social productivity, and maximize data value. For government open data, which serves as a bridge for data circulation between government and market and acts as the main entity for data market circulation, how to empower government open data and enhance its value becomes particularly crucial. Therefore, this study employs literature survey and analysis methods to explore the pathways for empowering government open data and enhancing its value from multiple dimensions. Building upon existing research on government open data value, it discusses current development directions and implementation strategies, aiming to enrich the theoretical foundation of the field, establish channels from integrated utilization to value enhancement, fundamentally adjust and enrich its development direction, provide scientific guidance for development strategies, and effectively promote the circulation of government open data in the data market to support the development of the digital industry.

2. Related Research

Current domestic and international research on the value of government open data primarily concentrates on three aspects: value representation, value generation, and value measurement. Value representation research focuses more on interpreting and analyzing related concepts [4-5], clarifying specific forms and types of value [6], and mostly adopts literature survey methods for theoretical discussion. Value generation research emphasizes implementation pathways and mechanisms for value creation, often through model construction methods such as the DIKW model [7], multi-dimensional utilization process models [8], and ecosystem theoretical models [9] to enrich the theoretical foundation of government open data value realization [10-12] and provide corresponding countermeasures and suggestions [13-15]. Value measurement research is relatively scarce, generally involving the development of evaluation frameworks [16-18] and empirical studies of government open data platforms [19].

By the end of 2019, more than 100 provincial and prefecture-level government open data platforms had been launched nationwide. Guided by the aforementioned research, a basic model for value generation of domestic government open data has been formed. At the current stage, more research should focus on value enhancement of government open data, exploring how to further empower government open data and release its value based on existing achievements.

This study primarily examines the fundamental implementation pathways for empowering government open data from three internal and external driving perspectives—data, policy, and market—and proposes specific implementation strategies for value enhancement.

3. Pathways for Government Open Data Empowerment and Value Enhancement

3.1 Data-Driven: Achieving Government Open Data Value-Added

For government open data, data is its first and only identity. Exploring pathways for its empowerment and value enhancement inevitably requires starting from its essence—the data itself. Scholars in macroeconomics often treat endogenous variables as key considerations in economic models and systems, viewing them as primary economic variables that play a decisive role. Similarly, data itself, as a driving factor, is endogenous in the government open data opening system and can be considered a decisive factor. The evolutionary process of data is traceable: data is aggregated and organized into information, which through integrated utilization develops into knowledge, and knowledge through open integration and exchange ultimately evolves into intelligence. Each link in this chain has its inherent driving force and represents a step in achieving data value-added.

China's steady development of the digital industry, through the deep integration of digital technology and the real economy, has achieved increasingly higher levels of technologization, networking, and intelligence, accelerating the reconstruction of economic development and governance models into new economic forms [20]. The advancement of industrial digitalization has expanded the scope of data sources in the data-driven process. Whether in social media, e-commerce, financial markets, communication networks, government governance, smart manufacturing, or smart cities, massive amounts of data are constantly generated during digital operations across various fields. Meanwhile, the widespread use of various intelligent terminals has made data granularity increasingly fine, significantly enhancing social "pixel density" [21]. Multi-source data is considerable in terms of speed, depth, breadth, and precision, laying a solid foundation for accelerating data valorization. Multi-source heterogeneous data (such as structured data, network data, text data, time series, spatial trajectories, etc.) exhibits significant differences in data precision, type, and format, requiring ETL (Extract, Transform, and Load) processes to extract, transform, and load data, thereby improving data quality and facilitating subsequent analysis and mining.

In the big data era, data fusion methods can be categorized into three levels based on the degree of interaction: data combination, data integration, and data aggregation, progressively achieving deeper interaction between data from low to high levels. Knowledge is generated during the data fusion process, and knowledge itself also undergoes fusion. Data fusion and knowledge fusion are not isolated: knowledge obtained through knowledge fusion can serve as a ref-

erence factor for data fusion, assisting the process; while data fusion not only provides integrated data for knowledge fusion but also offers methodological references. Processed data through ETL can address big data problems characterized by three features: granularity scaling, cross-boundary correlation, and global view—solving problems that can be represented through data, correlating elements within and beyond problem boundaries, and achieving panoramic results that provide complete understanding. The effective combination of data and algorithms also addresses the issue of intelligence asymmetry in the artificial world [24], and the development of artificial intelligence (AI) technology ultimately completes the effective transformation from data to intelligence, achieving large-scale enhancement of data value.

3.2 Policy-Driven: Releasing Government Open Data Vitality

As a market-oriented production factor, data inevitably requires policy's external driving role in stimulating and regulating the market. Each release of government open data-related policies represents a continuous process of releasing data vitality. Through statistical and text analysis methods, an examination of the release status, themes, and distribution of government open data-related policies reveals that since 2016, the state has vigorously promoted demand-oriented government information sharing with sharing as the principle, advancing digital government construction and strengthening effective data sharing. Government open data policies demonstrate high continuity, with the consistent goal of serving the people. They also reflect that China's government open data work focus has shifted from balancing construction and utilization to emphasizing utilization based on construction, with utilization characteristics evolving from special to universal, from complex to simple, and from low to high levels.

Analyzing policy themes from a policy-driven implementation perspective, the main issue addressed is the gradual transformation of China's government open data utilization development direction from "how to utilize" to "how to efficiently and rationally utilize," and from "special utilization" to "ubiquitous utilization," expanding the scope of government open data utilization fields. In terms of geographical distribution, policies present a pattern centered on national policies with local policies blossoming comprehensively. Temporally, they have experienced three stages: a long 萌芽 and slow development period, a deep development period with slight upward trends but unclear patterns, and a continuous improvement period that has sparked waves of government open data initiatives. Regarding type distribution, more comprehensive and unified programmatic policy documents need to be formulated. Departmental distribution overall shows a multi-centered characteristic, requiring strengthened inter-departmental cooperation and enhanced policy implementation and enforcement.

3.3 Market-Driven: Promoting Government Open Data Exchange

The efficient operation of society cannot be separated from division of labor and cooperation. Adam Smith proposed labor division to improve social productivity, while economist Hayek enriched the meaning of "division" by proposing knowledge division. Data is the foundation of knowledge, and through analysis and processing, data is transformed into information, which after mental processing becomes knowledge. The big data era requires adjusting our perspective on observing the world, viewing problems through a data lens, and necessitates the proposal of data division—treating data as a data asset to fully realize its value. However, data does not completely equate to data assets; certain transformation conditions are required: a complete data lifecycle management system from data generation to destruction, including data standard management, data quality management, data security management, user-friendly metadata management, and continuous data value management [25].

The socialist market economic system requires that all factors of production, in addition to all commodities, must enter the market as commodities and be allocated through commodity exchange. Current national policies propose listing data alongside traditional production factors such as land, labor, capital, and technology, aiming to promote data exchange in the market, improve data management systems, formally establish data exchange relationships in the market, and through accelerating the cultivation of data factor markets, fully leverage the multiplier effect of data factors on other factors, making big data a new driver for high-quality economic development. Accelerating the cultivation of data factor markets also promotes government data opening and sharing, enabling government open data and social data to form synergies that jointly enhance data resource value and strengthen data resource integration and security protection.

3.4 Specific Implementation Strategies for Government Open Data Empowerment and Value Enhancement

Through an analysis of datasets and their usage on 108 launched government open data platform websites, and based on the three drivers of data, policy, and market, this study proposes specific implementation strategies for government open data empowerment and value enhancement by integrating these three aspects.

3.4.1 Releasing Government Open Data Value Government departments at all levels, as the main bodies responsible for data opening, bear crucial primary responsibility throughout the entire process. They are the information actors in the government open data ecosystem, playing the roles of information producers, decomposers, and disseminators. For these government departments, the goal of opening government data is to release data value and empower government, enterprises, and the public. From the perspective of government open data participants, this study proposes

implementation strategies centered on releasing data value, focusing on data standards, comprehensive data inventory, data aggregation, data quality, data rights confirmation, and management systems (see [Figure 1: see original paper]), thereby comprehensively improving user experience, increasing user satisfaction, enhancing data accessibility, and improving data security and privacy.

Establish unified data standards. A unified government open data metadata standard system and thematic classification system should be established as soon as possible to ensure consistent data formats and classification standards across departments, facilitating public utilization and feedback of open data. The metadata elements, their value ranges, and metadata file formats require further unification and standardization. Reference and integration should be made to current international mainstream metadata standards, with additional metadata elements added according to actual needs. A universal government open data thematic classification system should be established with a reasonable number of themes that both meets data opening needs and avoids hindering data classification management, user retrieval, and development and utilization.

Establish a comprehensive open data inventory. A government open data inventory should be created, including both open lists and negative lists. The procedures for establishing these lists should be transparent, scientific, and democratic. The open list should specify all elements of openness, including content standards, opening methods, and time limits, eliminating gray areas in data opening. Annual records and analysis of user data requests should be maintained to comprehensively expand the open list, providing users with data across more fields and broader scopes. A negative list should define which data is not open, clarifying prohibited areas for data opening. After establishment, appropriate adjustments and supplements should be made within certain timeframes according to changes in economic and social development. Government data opening departments can conduct self-inspections based on the comprehensive inventory to improve data opening efficiency.

Strengthen data aggregation. Data aggregation should be strengthened to broaden its breadth and depth. In terms of breadth, data from different aspects, departments, and types should be aggregated and correlated to build unified data management rules and standards. Data should be classified according to data classification guidelines to achieve categorized management, integrated sharing, and effective allocation of data resources. In terms of depth, data should not be simply aggregated and stored; aggregated data must be fusible and shareable, with strengthened correlations between aggregated data. New-generation information technologies such as blockchain should be leveraged to enhance cross-level, cross-regional, cross-system, cross-departmental, and cross-business data fusion and sharing. Data operation and maintenance in the later stages of aggregation is a relatively heavy task, for which specialized agencies can be established to conduct data operation and maintenance and provide specialized guidance and planning for the application and mining of government

open data.

Improve data quality. Data quality is key to value creation in open data. It encompasses multiple aspects including completeness, accuracy, timeliness, consistency, and usability. Government agencies should establish and improve quality assessment standards and guarantee mechanisms for government open data, enhancing quality through data collection, publication, and circulation. Dark data that is redundant, outdated, and valueless should be minimized as its value is not yet clear. Governments can consider incorporating government open data quality assessment into government performance evaluations or utilize third-party institutions for evaluation and assessment to support optimization of data quality. Specifically, governments should actively conduct social surveys before opening data to understand actual user needs and open targeted data. During the opening process, emphasis should be placed on data management and evaluation to ensure the quality of supplied data, stimulate public enthusiasm for data usage, improve utilization rates, and promote value realization. Converting open datasets into data applications should be encouraged, with multiple application forms provided to attract public utilization and release data value.

Accelerate data rights confirmation. Data rights confirmation is the foundation and guarantee for data sharing and trading. After rights confirmation, responsibilities can be divided, accountability clarified, and benefits shared. The rights and interests of different subjects at different stages must be protected, including data ownership, usage rights, and revenue rights. Protection models for these rights should be explored around different subjects in the government open data process. Additionally, personal privacy must be protected from leakage during data opening, and data must be protected from malicious tampering to ensure data and privacy security. Effective legal regulations that balance user data privacy protection and data rights confirmation should be formulated.

Improve management systems. Regulations on government open data should be formulated and issued promptly to provide rules and legal basis for government data opening work. Management systems for data opening should be improved, clarifying objects, content, principles, and boundaries of government data opening. Coordination, supervision, guarantee, and performance evaluation systems should be established to define data authorities and responsible entities at all government levels, effectively ensuring implementation strength. During policy formulation, opinions from not only government agencies and domain experts but also various users should be considered to ensure scientific and rational policies. Furthermore, emphasis should be placed on implementing laws, regulations, and related policies to truly achieve rule-based, mandatory, and strictly enforced governance, making government data opening more standardized and effective. For user management, relevant departments can organize experts and scholars to form data opening and utilization cultivation teams to promote data utilization skills training and education through open courses and new media channels, while providing various guides and tool

manuals on open data platforms. Additionally, governments can guide public utilization of open data through various publicity channels, gradually cultivating a social atmosphere for data utilization. For work evaluation, performance evaluation systems for local government open data platforms can be established by drawing on government website evaluation methods, with regular assessments of platform construction and data development and timely publication of relevant results.

3.4.2 Enhancing Government Open Data Utilization Efficiency Government data opening is a public issue closely related to every organization and individual. Enterprises, social organizations, and the public, as beneficiaries of government open data, also play the role of information consumers and are important information actors in the ecosystem. For users, the benefits obtainable from utilizing government open data are of primary concern. From this perspective, this study proposes implementation strategies centered on enhancing utilization efficiency, focusing on data literacy, data thinking, data culture, data fusion, and data circulation (see [Figure 2: see original paper]). Data literacy, thinking, and culture promote user utilization of government open data from consciousness and technical levels, thereby enhancing utilization efficiency. Data fusion is key to breaking data silos, releasing data value, and improving utilization efficiency, while data can only realize value through circulation.

Enhance data literacy. User data literacy affects the utilization effectiveness of government open data. Users should continuously improve their data sensitivity, collection capabilities, analysis and processing abilities, and decision-making capabilities using data. They can enhance data literacy through open courses, special lectures, and collaborative teams. When collecting government open data for analysis and utilization, the management and control of data usage and analysis results are crucial. Enterprises and the public should consciously comply with data norms and ethics, use data rationally, and publish data application results. Before using data, quality checks should be performed, with problems promptly fed back to data platforms. Users should also actively provide feedback to relevant government departments regarding issues such as inaccessible websites, mismatched data content, or unsatisfactory open formats. After utilizing data, users should actively comment and rate data to improve its quality and provide support for government departments to optimize data. Additionally, users can supervise government behavior and assist government decision-making through government open data, achieving comprehensive utilization.

Cultivate data thinking. Data thinking represents a holistic understanding of data, transforming problems into data analysis problems. Users should convert problems in specific scenarios into data-analyzable questions. On one hand, they should possess certain discrimination, abstraction, and generalization abilities regarding collected data to avoid over-reliance on and blind trust in data. On the other hand, they should be able to effectively manage and use data, possessing

the mindset and ability to utilize tools rationally, leveraging data value to make optimal decisions while avoiding data hazards and applying data appropriately. Data analysis results should be applied to specific fields to create value. When generating data needs, users should consider high-value government open data, integrating it into all aspects of work and life. During analysis, they should respect facts and carefully verify, gradually developing the habit of utilizing government open data. Meanwhile, enterprises should be encouraged to use government open data to provide quality data services for various industries, collectively fostering a favorable environment for government open data culture.

Form data culture. Data culture is one that respects facts, emphasizes precision, and promotes rationality and logic. The formation of government open data culture cannot be separated from the development of government open data practice. Enterprises, social organizations, and the public need to enhance their participation awareness and capabilities in government open data practice, improving their sense of ownership and responsibility in participating in public affairs. Government open data users should actively participate in related work, playing their roles as service and dissemination subjects during policy formulation and data opening processes. They should actively express their data needs to make government data opening work more targeted and provide references for policy and standard formulation. As beneficiaries, they have an obligation to respond to questionnaire surveys and opinion solicitations provided on open data platforms, offering feedback and support for data opening work. As dissemination subjects, they should actively promote government open data to surrounding publics or organizations, creating a favorable atmosphere for joint application of open data.

Promote data fusion. Data fusion is key to breaking "data silos," releasing "data dividends," and advancing government data opening. Fusing users' own data with government open data can fully enhance utilization efficiency. Matching and fusing data from different sources emphasizes not data ownership but the breadth and richness of data access and return. Massive, real-time, and diverse data can dynamically change, expand, and evolve. Once aggregated, they can interact and complement each other. A layered and classified storage architecture of metadata, master data, and full data should be constructed to enable multi-source comparison and dynamic optimal perception. Users can determine optimal data indicator combinations for specific businesses and objectives, thereby selecting optimal data sources.

Facilitate data circulation. Data can only realize value through circulation. The circulation and fusion of multi-dimensional related data can maximize data value. After government data opening, a multi-subject co-governed, co-built, and shared data factor market system should be accelerated. The role of market intermediaries such as data exchanges should be actively leveraged. The data factor circulation environment should be optimized, circulation management strengthened, and institutional norms established to promote effective data resource flow, driving the development of government open data industries

and supporting the construction of data development and utilization scenarios. Data transaction models and data product pricing methods should be innovated to meet the needs of data asset transactions through market mechanisms, enabling data to be truly priced according to value. Data products should focus on fields closely related to users, such as economy and education, to further expand application scenarios, while also using existing data to predict social needs and identify social issues, promoting social governance precision through data.

3.4.3 Constructing a Government Open Data Value Enhancement Strategy System Government open data focuses on discovering data utilization value. Government, enterprises, social organizations, and the public should form synergies to jointly improve the value conversion rate of government open data and construct a "Three Accessible, Two Good, Three Useful" value enhancement strategy system (see [Figure 3: see original paper]). Against the backdrop of government data opening, the supply-demand relationship flow generated by the collaborative interaction between government and users as information actors in the entire ecosystem is the key factor maintaining dynamic balance. Sustainable development of the ecosystem is achieved through data empowerment. To ensure this sustainability, government, as a participant, must assume corresponding responsibilities to achieve control over data opening, making it "traceable," "shareable," and "controllable," while presenting open data that enables users with needs to "find easily," "view pleasantly," and "use effectively," "willingly," and "beneficially." The "Three Accessible" aspects focus on government control at the data level during the opening process, while "Two Good" and "Three Useful" focus on user perception of platforms and utilization.

"Three Accessible." Shareable. The focus of shareability lies in establishing standards and norms for data opening and sharing. On one hand, the government should accelerate the establishment of a unified, statutory data opening and sharing standard system, clarifying technical and management standards for open data. It should also improve government open data sharing mechanisms, strengthen departmental coordination, pursue goal-oriented and demand-based sharing, standardize construction processes, ensure shared data quality, and guarantee data sharing security. On the other hand, data sharing agreements should be clarified during the sharing process, specifying what data to share, reasons and methods for sharing, access permissions, risk control, and liability assumption to fully safeguard shareability. **Traceable.** Data traceability is the evaluation foundation for open data quality and credibility. The construction of traceability metadata for government open data should be strengthened to ensure clear data sources, paths, and times. Current government open data metadata contains corresponding traceability information, but overall quality remains low with weak traceability capabilities and some chaotic or erroneous field values. Therefore, further strengthening of the full lifecycle-based government open data utilization traceability metadata system is needed to improve metadata quality in terms of standardization and normalization. **Controllable.** A comprehensive management and control mechanism for the entire government

open data utilization process should be established, providing all-round guarantees from institutional, technical, and public opinion dimensions. Institutionally, the government should continuously issue policies on government open data utilization, clarifying norms for data utilization and services while strengthening policy implementation and coordinated development of supporting policies. Scientific and rational management systems for open data utilization should be established, clarifying management approaches and departmental responsibilities at each stage. Technically, business processes for data opening and utilization should be clarified, with strengthened control at each link from data screening, opening, sharing, to downloading, clarifying technical specifications for each link and emphasizing the application of blockchain, cloud computing, and other technologies in government open data utilization and platform data analysis. Additionally, the government should strengthen public opinion guidance for open data utilization, fully leveraging the public's role as dissemination subjects and encouraging public participation in the management and control process to achieve co-governance, co-construction, and sharing.

"Two Good." Easy to find. This means users can not only find government open data but find it quickly and accurately, with the focus on the functionality and convenience of government open data platforms. As the primary channel for users to obtain open data, platform design should be fully functional with reasonable information classification. Where necessary, classification modules should be problem-oriented to accurately convey data information, enabling users to precisely obtain information content and avoid misunderstanding. In terms of retrieval functionality, platforms should offer rich retrieval and sorting methods to meet users' personalized retrieval needs in specific contexts, providing analysis and visualization of retrieval results. Platform operations should be intuitive, requiring no learning curve. Government departments should gradually enhance the humanized design of open data platforms, reducing cumbersome operations during user registration and data downloading. Relevant departments should increase technical investment to achieve rapid website response and reduce users' time costs for data acquisition. **Pleasant to view.** This means government open data should provide good visual experiences—visible, understandable, and comfortable—with the focus on platform design and aesthetics. Visual information is more easily received than text, and data visualization can help users quickly receive information, enhancing the attractiveness of government open data. First, visible government open data should be ensured, gradually strengthening visualization construction. Data dynamic changes should be displayed in charts and graphs, while modern communication tools, multimedia technology, or 3D virtual reality information search environments could be creatively utilized to enhance immersion in computer-generated virtual environments for better user experiences. Second, government open data visualization interfaces should be clean and clear, conforming to user cognitive characteristics while guiding visual flow for smoother information reception. The theme expressed through data should be highlighted to ensure users understand displayed data content. Visualization design should conform to aesthetic principles, enhanc-

ing visual effects in layout, color schemes, and contrast to provide comfortable visual experiences.

"Three Useful." Effective in practice. Government open data should be practical for real-world application, addressing user concerns or meeting information needs. Government departments should open multi-domain, multi-theme data while ensuring information security and timely updates to guarantee completeness and comprehensiveness. Data aggregation should be well-executed to fully leverage correlation relationships and 挖掘 the enormous value within. Following a problem-oriented principle, data application scenarios should be highlighted during the opening process, developing relevant data interfaces and applications for specific scenarios. Scenarios or fields could be incorporated as metadata elements into the metadata system to facilitate user retrieval. **Willing to use.** Users should be willing to use government open data, reflecting their recognition of and loyalty to it. On one hand, the government should actively open high-quality data that meets user needs, providing rich data formats to reduce user acquisition and utilization costs, thereby enhancing user comfort and cultivating long-term usage habits. On the other hand, the government should improve data transparency and completeness, ensure data security, strengthen its own capacity building, and enhance user trust and recognition of government open data work, thereby comprehensively increasing user stickiness. **Beneficial to use.** Users should feel they benefit from government open data, enhancing their sense of gain from utilization. This sense of gain includes both material and spiritual dimensions. Material gains involve solving problems and value-added benefits, such as enterprises increasing profits or researchers improving performance through data utilization. Spiritual gains involve achieving a sense of accomplishment and enjoying the fairness and rights brought by government open data utilization.

4. Conclusion

Current national policy guidance and rapid scientific and technological development have made data increasingly important in China's economic market. However, many aspects of open data resource construction and related social environment development still require attention and improvement. This study summarized the fundamental internal and external driving pathways for government open data empowerment and value enhancement from three perspectives: the data value-added process, policy formulation achievements, and market promotion status. It proposed implementable strategies for releasing government open data value and enhancing utilization efficiency, and constructed a "Three Accessible, Two Good, Three Useful" government open data value enhancement strategy system.

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Author Contributions

Duan Yaoqing: Provided overall research ideas and writing guidance.
He Junyu: Responsible for initial draft and revision, final version revision.
Shang Ting: Responsible for initial draft and revision.