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Exploring the Multiple Paths to Improve the Construction Level of Digital Government: Qualitative Comparative Analysis Based on the WSR Framework

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Abstract: The construction of digital government is an essential premise and foundation to improve a national governance system. Based on the Wuli–Shili–Renli (WSR) framework, this paper applies fuzzy-set qualitative comparative analysis (fsQCA) to data from 31 Chinese provinces to investigate how six conditional variables (information-infrastructure construction, organizational construction, financial support, digital-policy support, public demand, and digital talent) jointly affect the construction level of digital government (CDG). The results show that none of the six conditions is necessary for the CDG, and three paths exist to enhance the CDG. Information-infrastructure construction and digital-policy support play a more significant role in digital-government transformation than other variables. As a subjective and controllable approach, digital policy may significantly affect the CDG in the short term. Based on the findings above, we propose policy recommendations for strengthening the elements of coordination, enhancing the construction of information infrastructure in each province, and enhancing the digital-policy support system. This study provides a new research framework and theoretical perspective for improving global digital-government construction.

Keywords: digital government; e-government; WSR approach; qualitative comparative analysis

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1. Introduction

The new generation of information and communication technology, represented by big data, cloud computing, blockchain, and artificial intelligence, has triggered a global wave of digitalization [1,2]. Digital technology provides sturdy technical support for human society's growth and accelerates global digitization [3–5]. Nonetheless, digital risks and privacy security concerns have become increasingly prominent during the digital transformation process, and digital-governance issues have gradually attracted the focus and consideration of all sectors of society [6–8]. As a pillar of global government construction and governance, digital government is of great theoretical and practical relevance for enhancing the operational efficiency of government organizations and public services, promoting the interaction and transparency between the government and the public, and promoting the transformation and upgrading of governments [9–11]. How to create a digital-development strategy to enhance the construction of digital government has become the focus of attention of all countries in the world [12]. The research on the construction of digital government has been increasing. However, the influencing factors and development strategies of the structure of digital government still need to be further explored and studied. China has made significant progress in developing a digital government but still confronts numerous obstacles. According to the United Nations e-government survey report, China's e-government development level improved substantially between 2012 and 2022, rising from 78th place in 2012 to 43rd place in 2022, making it one of the countries with the highest growth rates in the world. At the provincial level, however, there is a significant disparity in the extent of digital-government construction. According to the Research Report on the

Development of China's Digital Government (2021), published by the Data Governance Research Centre of the School of Social Sciences at Tsinghua University, China's provincial digital-government development index shows a gradient distribution, namely, leading, high-quality, characteristic, developmental, and catching-up. Shanghai, Zhejiang, and Beijing have considerably higher digital-government development indices than Yunnan, Xinjiang, and Qinghai, indicating significant regional differences in the level of digital-government construction. Consequently, it is of significant value to investigate the factors influencing the level of digital-government construction in the process of government transformation in China and to determine the efficient configurations of strengthening the level of digital-government construction in various provinces. This study provides a new solution for China to promote the modernization of the governance system and governance capacity. It also provides useful experience and illumination for the construction of digital government in other countries and makes a contribution to the promotion of digital governance on a global scale.

Previous studies have shown that technology is the means to support change in promoting the digital transformation of government and building a digital government [13]. In addition, it is necessary to consider internal factors such as government organizational capacity [14], organizational-management innovation [15], legislation [16], and external factors such as inter-governmental competition and citizen acceptance [17]. Therefore, the change in digitally transforming the government might be fostered by the combined action of technology, organization, and environment [14]. The level of digital-government building varies significantly from one region of China to the next due to several factors, including but not limited to the economic environment, resource endowment, geographical position, and other factors. The construction of digital government at the regional level is a complex issue that is challenging to analyze using a single case study or conventional methods and requires a system-level holistic analysis. Based on the WSR methodology, this paper develops an analytic framework (comprising information-infrastructure development, organizational development, financial support, digital-policy support, public demand, and digital talent) to systematically analyze the complex cause-and-effect relationships that influence the level of digital-government construction. In this paper, qualitative comparative analysis (QCA) is used to surmount the limitations of traditional methods, which enables the identification of multiple paths leading to the same outcomes [18,19]. This study can help relevant decision makers decide how to allocate limited resources or prioritize certain elements to accomplish the same results, enhancing the level of digital government.

Section 2 of this paper is a literature review that introduces digital-government research and the WSR-analysis framework. Section 3 is dedicated to the research methodology and data calibration. The research findings constitute Section 4. The conclusions and policy recommendations comprise Section 5.

2. Literature Review

With the advance of digital technology, constructing a digital government is crucial to improving the national governance system and enhancing the national governance capacity. Digital government has long been a focus of government and academia as a highly interdisciplinary research field and a crucial lever for modernizing national governance [20]. Scholars have conducted extensive research on this subject in recent years, concentrating primarily on the following aspects.

First, the concept and development stage of digital government is defined differently in academic circles. There is no current consensus regarding the concept of digital government, and different concepts emphasize various aspects and highlight different priorities [21–24]. In early research, digital government and "e-government" were frequently conflated. Marchionini et al. [25] argued that using information technology in government services was often called "e-government". In contrast, the larger concept of government that relies on information technology to perform fundamental tasks is known as "digital government". Robertson and Vatrapu [20] considered digital government (also known as e-government) as the use of information and communication technologies to enable citizens, politicians, government agencies, and other organizations to collaborate to carry out activities that support the lives of citizens. With the progression of society and digital technology, emerging technological tools such as big data, cloud computing, and artificial intelligence are progressively being applied to governance and infrastructure construction. The distinction between the two has been clarified. Katsonis and Botros [26] argue that digital government and e-government differ in two ways: on the one hand, they differ in their use of emerging information technologies; on the other hand, the digital government creates a two-way relationship between government and citizens, so that citizens can participate. Gil-Garcia and Flores-Zúñiga [27] defined digital government as the access and use of government-provided electronic information and services by citizens and other users. Janowski [3] argued that the concept of digital government has evolved toward greater complexity, contextualization, and specialization and proposed a model of digital-government evolution consisting of four stages: digitization (technology in government), transformation (e-government), engagement (e-governance), and contextualization (policy-driven e-governance). Huang [28] asserted that e-government and digital government were two distinct phases of the Chinese government's use of modern computing technology and that the digital transformation of the Chinese government could be comprehended on two levels: theory of technology implementation and governance.

Second, scholars have avidly investigated the development of digital government in various nations. Katsonis and Botros [26] employed the United Kingdom as a case study of digital government. They discovered that the function of information technology is not only rooted in the evolution of public administration but also serves as a means to create public value. As a result of the evolution and growth of communication technologies, the challenges confronting the public sector will transcend the technical level. Ziemba et al. [29] identified eight critical success factors of e-government in Polish public administration, such as government finances, hardware, availability of network and telecommunications, and integration of front- and back-office information systems, influencing the development of digital government. By analyzing the four stages of digital-government development in Singapore, Hu and Yang [30] argued that measures such as establishing a policy and regulatory system, establishing efficient management mechanisms, enhancing data sharing and transparency, and improving the quality of government services can assist in accelerating digital-government development. Pittaway and Montazemi [31] conducted a comparative case study of eleven Canadian local governments. They made several recommendations, such as promoting public–private partnerships between local governments and information-technology service providers and strengthening cooperation with academic institutions to reduce managers' barriers to acquiring expertise in digital transformation. Gil-Garcia and Flores-Zúñiga [27] proposed a digital-government success model from the comprehensive implementation and adoption perspective using data from 32 Mexican states. They discovered that it is essential to consider both government implementation variables and user adoption variables to comprehend digital-government initiatives better. Using Milan, Barcelona, and Munich as case studies, Gasco-Hernandez et al. [14] found that organizational capacity is crucial for both the development of smart cities and the facilitation of the digital transformation of local administrations.

Finally, academics have comprehensively investigated digital-government construction's influencing factors and challenges. Through an exhaustive review of research on information integration, Pardo and Tayi [32] determined that inter-organizational information integration is a crucial driver of digital government. Hong and Kim [33] discovered that social media, such as Twitter, may contribute to partisanship, providing evidence that social media affects the decision-making process and the integrity of digital government. Yuan et al. [34] found that the quality of information and trust in government social media had a positive effect on public engagement by analyzing the role of government social media in advancing the Chinese government's digital initiatives (government-backed digital currency), thereby providing a rationale for government social media to facilitate the digital transformation of government. In addition, the establishment of digital government encounters numerous obstacles. Legislation and policy support are the foundation of government data openness and digital transformation. Legislation and policies have a dual impact on the release of government data and the digital transformation of government, which can either promote or impede their growth [35]. Yang et al. [36] found that legislation and policy are the primary influencing factors for government data openness, and institutions' existing regulations and policies play a restrictive role. At the same time, the construction of digital government will also be challenged by the technical dimension [32,37,38], organizational dimension [39,40], the complexity of the institutional environment [41,42], data quality [32,43,44], and data security and privacy issues [45,46]. Ineffective project planning, project definition, project management, and a disconnect between design and practical issues can also contribute to the failure of digital-government projects [47].

The existing literature has explored many aspects of digital government in terms of its connotations, development stages, practice cases, influencing factors, and challenges. However, there is still ample room for research, particularly in systematically analyzing the complex causal factors affecting the development of digital government. The existing research has the following limitations: (1) The current studies primarily examine a single excellent case, lacking horizontal comparison between different cases. (2) The existing research mainly focuses on the factors affecting the digital government, such as government website-construction performance, the level of government information disclosure, etc. It lacks an analysis of digital-government construction from the configuration perspective. (3) The traditional analysis methods are frequently dominated by regression analysis, making it challenging to analyze the complex causal relationship and multiple concurrent mechanisms between different factors and disregarding the synergistic effects of intricate logical connections between other conditions. Therefore, based on the WSR framework, taking the digital-government construction of 31 provinces in China as a case study, this paper makes a configuration analysis of the digital-government construction level from the three dimensions of Wuli, Shili, and Renli, and it explores the driving factors and paths to improve the level of digital-government construction. The innovation of this paper is reflected in the following aspects: (1) Based on the WSR method and the fuzzy-set qualitative comparative analysis method, this paper systematically analyzes the factors and driving paths that affect the level of digital-government construction. (2) It proposes a digital-government analysis framework including information infrastructure, organizational construction, financial support, digital-policy support, public demand, and digital talents, which makes up for the shortcomings of the existing research. (3) Taking the digital-government construction of 31 provinces in China from 2020 to 2021 as a case, it can accurately reflect the development of provincial digital government in China.

3. WSR Methodology and Analytical Framework

The Wuli–Shili–Renli methodology (WSR), proposed by Chinese system-science experts Professor Gu and Dr. Zhu in 1994, is a systematic tool for solving complex problems [48]. This theory refers to the Western system methodology and is transformed based on classical Oriental philosophy and Oriental system methodology. It analyzes complex issues through the three dimensions of Wuli, Shili, and Renli to realize the dynamic unity of the material universe, system organization, and humans. Wuli refers to the objective existence in nature or human society, primarily of the physical environment and structural organization. Shili refers to the interaction between humans and the world, mainly to comprehend and observe how the world is modeled and managed [48]. Renli refers to the relationship between individuals in the system, emphasizing the role of individuals in addressing problems. This dimension focuses on how individuals generate and cultivate potential collaborative factors and avoid or overcome obstacles to achieve system objectives [48]. As depicted in Figure 1, the WSR methodology consists of seven steps: understanding desires, setting goals, investigating conditions, creating models, choosing solutions, coordinating relations, and implementing proposals, in which collaborative relationships play an essential role [49]. This methodology is ideally suited for analyzing the problem of complexity synthesis. It can not only decompose the complexity problem into the three dimensions mentioned above and coordinate the relationship between things sensibly, but also decompose the complexity problem into concrete stages, which is beneficial for achieving the objective and maximizing the benefit [50]. Numerous academics conduct research in their respective disciplines utilizing the WSR methodology. Wang and Zhong [51] researched avionics software quality through the WSR methodology. Zhou et al. [52] examined the impact of government credit on the government performance of public–private partnership initiatives in China utilizing the WSR methodology. Gao and Jin [53] used the WSR methodology to investigate the variables that influence the participation behavior of problem solvers. Yang et al. [54] combined qualitative analysis, grounded theory, and the WSR methodology to analyze the public opinion of the COVID-19 outbreak network. Their research shows that the objective material basis is the root cause of public opinion triggered by hot events, and multi-agent coordination is a long-term public-opinion governance strategy.

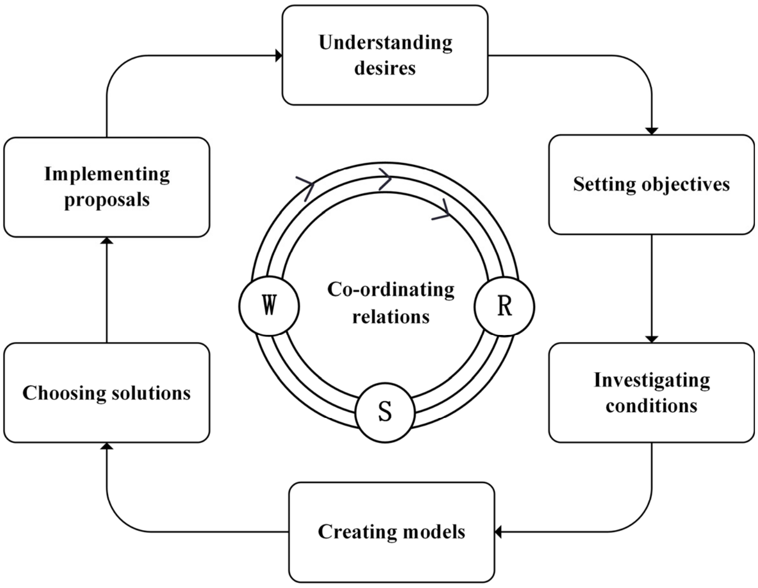

Figure 1. The WSR process.

From the standpoint of research methods, the WSR methodology combines quantitative and qualitative analysis that considers not only objective material constraints but also environmental changes and human initiative and adaptability [48]. As an essential measure to improve the national governance system, digital-government construction is a complex system of engineering involving the mutual influence and synergistic effect of many internal and external variables. Therefore, the WSR methodology is appropriate for investigating the development and construction of digital government. Based on the WSR theory, this paper conducts a configuration analysis to investigate the factors and numerous driving paths that influence the level of digital-government construction. As depicted in Figure 2, based on prior research findings, this study develops an analytic framework comprising information-infrastructure construction, organizational construction, financial support, digital-policy support, public demand, and digital talent.

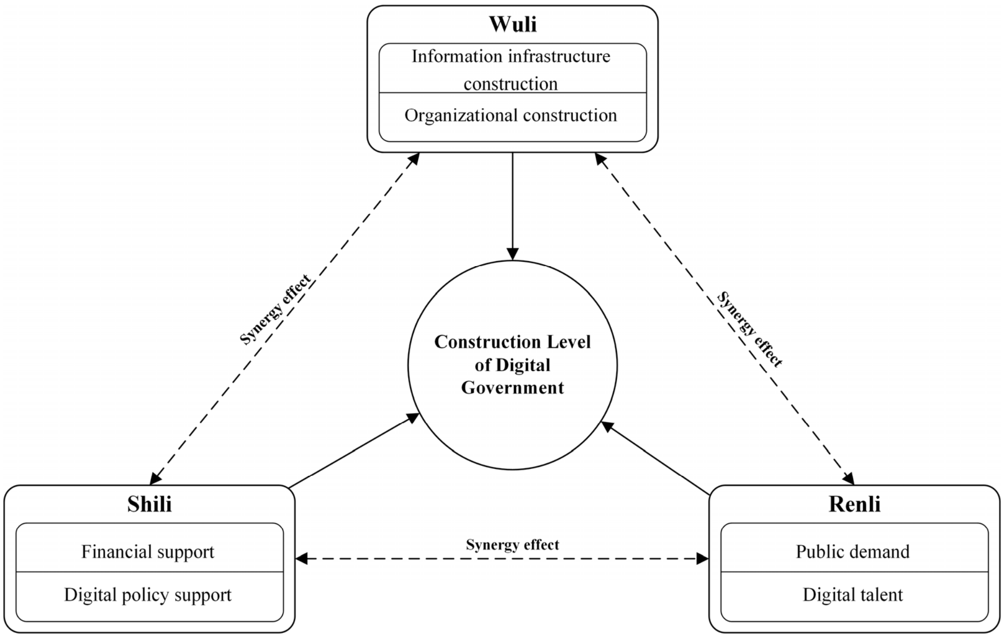

Figure 2. Analysis framework.

3.1. Wuli Dimension

With the advent of the era of big data and the information society, the field of digital government is investigating the potential of information technology to enhance the value of the government as a citizen asset [32]. A new generation of information technology supports the development of digital government by applying information technologies such as big data, cloud computing, blockchain, and artificial intelligence to develop governance systems and the integrated management of government affairs. The implementation of government digitalization contributes to the optimization of government organizational structure and associated operating procedures, the improvement of government performance and governance, and the enhancement of public satisfaction with government services [55]. To integrate, share, and open government data, organizations must possess specific information-technology capabilities during the digital-government-construction process [56]. The essence of information technology is the collection, storage, processing, transmission, and use of data. In addition, data resources are the core elements of information technology, and the essence of information technology is the collection, storage, processing, transmission, and application of data. This series of activities is based on information infrastructure; otherwise, information technology cannot transform data resources into economic and social benefits [57]. Information infrastructure provides a necessary guarantee for data exchange between government agencies, consumers, and suppliers and significantly affects the release and sharing of government data [35]. In addition, the functions of the information infrastructure make it simpler for all parties to work together, thereby fostering the growth of digital government [58]. Furthermore, the transformation of digital governance does not occur in isolation but instead evolves in tandem with technological, organizational, and system elements [59]. According to research, the organizational resources, including organizational arrangements, rules and regulations, and organizational culture, positively affect the accessibility of government data [40,60]. Promoting public innovation may be challenging without government organizations' participation and support [61,62]. Tangi et al. [39] found that digital-government transformation (DGT) will be affected by a variety of factors, including a sense of urgency, the need for change, and a collaborative environment, and that organizational obstacles and lack of support are the primary factors impeding DGT. This paper focuses on the role of organizational construction in government digital transformation and its impact on improving digital-government construction.

3.2. Shili Dimension

According to the resource-relaxation theory, resource relaxation can loosen internal constraints and provide financial support for projects with significant capital investments and lengthy construction cycles. Resource-rich organizations are more prone to change and innovation [63]. However, innovative projects or policies that lack funding can be challenging to move forward [64]. The construction of a digital government depends on the construction of information infrastructure and the continuous R&D investment in information technology, which requires a substantial amount of human, material, and financial maintenance and support, requiring a significant amount of financial resources [65]. Ma [66] found a significant positive correlation between government financial resources and the level of development of government websites, and that continued financial support is conducive to promoting the construction of government websites, thereby enabling the development of digital government. Rodríguez-Abitia and Bribiesca-Correa [67] found that higher-education institutions lag behind other organizations in digital transformation, which may be caused by a lack of effective leadership and cultural change, and this phenomenon will be exacerbated by insufficient innovation and financial support. In addition, legislative and policy support is the basis for promoting and implementing government digitization projects and producing actual performance [68]. The construction of digital government is inseparable from a good policy environment and continuous digital-policy support. In this paper, "digital-policy support" refers to a series of policies formulated to promote the development of the digital economy and the construction of a digital China. These policies include digital-economy policy, digital social policy, digital-government policy, and digital-government governance policy. Support for digital policy facilitates the elimination of barriers between organizations, the unification of their objectives, the promotion of the interconnection of government data, and the destruction of information islands. Continuous implementation of digital policies contributes to optimizing the business environment, strengthening cooperation among all parties, and providing a foundation for innovation among stakeholders [69,70]. At the micro level, Peng and Tao [71] found that the public policy with digitization as the core promoted the continuous improvement of enterprise performance, and its effect on enterprise innovation was the most significant.

3.3. Renli Dimension

With the continued growth of mobile internet and social media, the demand for government services is progressively diversifying and becoming more personalized. Public demand and advocacy pressure have become significant propelling forces to promote the disclosure of government information and data [60,72]. Public demand has the following effects on digital-government construction: first, digital-government transformation can provide the public with high-quality, convenient, and efficient public services; second, government agencies can help digital government improve its working mechanism, enhance technological adaptability and accurate policy-making ability by collecting general needs and solving public demands; third, through public participation, it can effectively improve the quality and efficiency of government services [36]. Guo and Lin [73] incorporated public demand, human resources, and other elements into their research framework. They discovered that areas with strong public demand, adequate supply of digital talents, and strong innovation ability are conducive to the construction of digital government. In addition, human resources play an important role in enterprise innovation and creativity [74], enterprise-innovation performance [75], as well as in public-sector innovation [62,76]. With the deep integration of digital technology and various fields, accelerating the introduction and training of digital talents has become the consensus of most countries. For example, in 2021, China issued the Action platform for improving national digital literacy and skills, proposing to build a powerful nation of digital talents by 2035 and promote a higher level of digital literacy and skills. The U.S. House of Representatives passed the 2022 American Competition Act to strengthen further the United States' talent reserve in the field of scientific and technological innovation. Britain issued the British Digital Strategy in

2022, which proposes enhancing the cooperation between the government and schools, educational institutions, and enterprises to train and introduce advanced digital skills. Kane [77] argued that, in the process of digital transformation, the challenges of culture, talent, leadership, and strategy are more difficult to solve than the challenges of technology. Karaboga et al. [78] proposed that digital talent is crucial for the government and enterprises to realize digital transformation. At the same time, they also emphasized that strengthening cooperation among all parties to build a digital-talent ecosystem would help alleviate the digital-talent gap.

4. Research Methods and Data Calibration

4.1. Fuzzy-Set QCA

This paper employs the fsQCA method to empirically analyze the multiple driving mechanisms behind the development of digital government based on the WSR framework. Qualitative comparative analysis (QCA) is a case-oriented method proposed by the American sociologist Ragin [79]. The method integrates set theory and Boolean algebraic operations to analyze the grouping effects of multiple antecedent condition variables on outcome variables. The following are some of the benefits of the QCA method: (1) Unlike traditional correlation analysis and regression analysis, which only consider the "net effect" of a single variable, the QCA method can effectively explain complex causal relationships and multiple concurrent mechanisms, helping to explain how conditional variables in the three dimensions of Wuli, Shili, and Renli affect the level of digital-government construction in different regions. (2) Using the QCA method, researchers can identify the condition configurations with equivalent results, which can further explain the multiple driving mechanisms leading to the results in the complex factor configuration scenarios and analyze the combination or substitution relationships between various condition variables [80]. (3) The QCA method possesses "causal asymmetry" [80,81], which permits a comparative analysis of the condition configurations leading to the emergence and disappearance of results, thereby broadening the explanatory dimension of research problems in particular scenarios. The QCA method consists of three types: a crisp-set qualitative comparative analysis (csQCA), fuzzy-set qualitative comparative analysis (fsQCA), and multi-value-set qualitative comparative analysis (mvQCA) [81]. As this paper's condition and outcome variables are continuous variables, fsQCA is utilized for the empirical analysis.

4.2. Data Collection

4.2.1. Outcome Variable

The outcome variable of this paper is the construction level of digital government (CDG) and uses the score of the provincial digital-government development index in the China Digital Government Development Research Report (2021) published by the Data Governance Research Center, School of Social Sciences, Tsinghua University. That report provides a comprehensive overview of the provincial digital-government construction situation from four perspectives: organizational structure, institutional system, governance ability, and governance effect. It also investigates the gradient distribution, regional differences, and fundamental provincial digital-government construction trends. It has significant guidance for digital-government governance and government digital transformation. The report uses expert discussions, computer reviews, and big-data cross-comparisons to ensure the validity and credibility of the evaluation results.

4.2.2. Condition Variables

(1) Information-infrastructure construction (IIC). The data are derived from the information-infrastructure index in the China New Infrastructure Competitiveness Index report (2021). The index measures the construction of provincial information infrastructure in China from three dimensions: communication-network infrastructure, new-technology infrastructure, and computing infrastructure. Moreover, this index comprehensively measures the construction of mobile communication networks, 5G networks,

artificial-intelligence patent research and development, and various data centers in multiple provinces of China.

(2) Organizational construction (OC). This paper uses the provincial big-data organizational construction index in the China Big Data Regional Development Level Assessment Report (2021) issued by the China Institute of Electronic Information Industry Development to measure organizational construction. The index measures the organizational structure of each province from the perspectives of whether it has a big-data bureau, whether there is big-data leadership, and whether it has a chief data officer.

(3) Financial support (FS). The construction of a digital government necessitates corresponding financial support to ensure the orderly progress of critical links, including constructing a government platform, introducing digital talents, and procuring information systems. Therefore, the support of financing has an essential impact on the construction of digital government. This paper uses general public budget expenditures to measure the financial support of each province, and the data comes from the China Statistical Yearbook 2021.

(4) Digital-policy support (DPS). This paper uses the digital-policy development index from the Digital Ecology Index 2021, published by the National Laboratory of Big Data Analysis and Application Technology of Peking University, to assess the support for the digital policy in each province. The digital-policy development index comprises four first-level indicators and twelve second-level indicators, including digital economic policy, digital social policy, digital-government policy, and digital-government governance policy, which comprehensively reflect the development of each province's digital-policy environment.

(5) Public demand (PD). This paper measures the intensity of public demand by comparing the number of internet users to the number of permanent residents in each province. The information comes from the China Statistical Yearbook 2021 and provincial statistical yearbooks.

(6) Digital talent (DT). This paper uses the digital-talent index from the 2021 Digital Ecology Index, published by the National Laboratory for Big Data Analysis and Application Technology of Peking University, to assess the status of digital talents in each province. The index evaluates four dimensions, including human structure, dynamics, supply and demand, and environment, to produce a digital-human index. In this index, 31 provinces are divided into five gradients: 50–60, 60–70, 70–80, 80–100, and 100–150. According to the echelon to which different provinces belong, this paper assigns values to the digital-talent index of each region. In this paper, areas belonging to the 50–60 range are assigned a value of 1, the 60–70 range is assigned a value of 2, the 70–80 range is assigned a value of 3, the 80–100 range is assigned a value of 4, and the 100–150 range is given a value of 5.

4.3. Variable Calibration

In the fsQCA method, each case's condition variables and outcome variables are considered to be a corresponding set. Calibration is the process of designating the case to the membership degree of the set, with the membership degree of the calibrated case set falling between 0 and 1 [82]. The six antecedent condition variables and outcome variables in the WSR model lack exact theoretical and external standards as a basis for calibration, so this paper uses the direct calibration method to calibrate the data. Based on Andrews et al. [83], the 95%, 50%, and 5% quantiles are selected as the threshold values of full membership, intersection, and non-membership. The calibration points and descriptive statistics for each variable are shown in Table 1.

Table 1. Fuzzy-set calibrations and descriptive statistics.

Outcomes and Conditions	Fuzzy-Set Calibrations			Descriptive Statistics			
	Fully in	Crossover	Fully out	Mean	SD	Min	Max
Construction level of digital government (CDG)	75.38	58.7	40.26	57.41	10.63	39.6	76.7
Information-infrastructure construction (IIC)	92.38	76.45	61.51	76.34	8.26	60	94.48
Organizational construction (OC)	53.54	33.62	12.11	32.23	12.49	12.11	53.54
Financial support (FS)	16,049.96	5879.21	1683.86	6794	3759	1428	18,247
Digital-policy support (DPS)	4	2	1	2	1.09	1	4
Public demand (PD)	1.40	0.95	0.78	0.97	0.14	0.76	1.49
Digital talent (DT)	5	2	1	2.19	1.35	1	5

5. Results

5.1. Necessity Analysis of Variables

Before the sufficiency analysis, it is necessary to determine if the individual condition variables constitute necessary conditions for the outcome variables [84]. A critical condition in QCA means a condition variable is always present when the outcome variable occurs. Then, that condition is required for the outcome variable [81]. When the consistency level of the condition variable exceeds 0.9, the condition is deemed necessary for the outcome variable [82]. The results of the necessity test for high and non-high levels of digital-government construction were analyzed using fsQCA3.0 software, and the results are shown in Table 2. In this study, the consistency levels of the six antecedent condition variables were all less than 0.9. Therefore, each condition variable is not necessary for both high and non-high levels of digital-government construction.

Table 2. Necessity analysis of variables.

Condition Tested	High CDG		Non-High CDG	
	Consistency	Coverage	Consistency	Coverage
IIC	0.816	0.810	0.516	0.546
~IIC	0.543	0.513	0.820	0.826
OC	0.740	0.751	0.534	0.578
~OC	0.583	0.540	0.769	0.76
FS	0.758	0.753	0.549	0.582
~FS	0.579	0.546	0.767	0.772
DPS	0.717	0.837	0.397	0.495
~DPS	0.717	0.837	0.869	0.766
PD	0.678	0.732	0.529	0.610
~PD	0.639	0.560	0.768	0.717
DT	0.737	0.847	0.396	0.485
~DT	0.552	0.461	0.875	0.780

5.2. Sufficiency Analysis

Sufficiency analysis is the core of the QCA method, and its primary purpose is to reveal the adequacy of the configuration composed of multiple antecedents to the outcome variable. In analyzing adequacy, this paper employs the following steps: (1) The consistency level is the criterion for determining whether the conditional configuration is sufficient. Referring to the research of Fiss [85], the consistency threshold selected in this paper is 0.8. (2) The number of observed cases in this paper is 31. To meet the standard of retaining 75% of the observed cases, the threshold of case frequency is set to 1 [82]. (3) To avoid the problem of simultaneous subsets and reduce the potential for contradictory configurations, this paper assesses the PRI threshold at 0.70, citing the research of Du and Kim [86]. Since the existing research has not yet concluded how the conditional variables affect the direction of the outcome variables, "presence or absence" is set as the default option in the counterfactual solution process. The analysis ultimately yields complex solutions, straightforward solutions, and intermediate solutions. According to the previous research, this paper reports the intermediate solution and distinguishes the core condition from the edge condition through the nesting relationship between the intermediate key and the simple answer. The outcomes of the analysis described above are presented in Table 3. The results indicate three configurations capable of producing high CDG, namely H1, H2, and H3. Since the core conditions of H1a and H1b, H2a, and H2b are identical, they can form two second-order equivalent configurations. The consistency level of the three configurations in Table 3 is more significant than 0.92. The overall level of consistency is 0.94, and the general level of coverage is 0.65, indicating that the three paths provide an excellent explanation for the high level of digital-government construction.

Table 3. Configurations sufficient for high CDG and non-high CDG.

Condition Variable	High CDG					Non-High CDG			
	H1		H2		H3	N1			
	H1a	H1b	H2a	H2b		N1a	N1b	N1c	N1d
IIC	⊗	•	●	●		⊗	⊗	⊗	•
OC	●	●	⊗	•	●	⊗	⊗		⊗
FS	⊗			•	•	⊗		⊗	•
DPS	●	●	•		●	⨂	⨂	⨂	⨂
PD	⊗	⊗	●	●	●		•	•	⊗
DT	⊗	•	●	●	●	⨂	⨂	⨂	⨂
Consistency	0.9842	0.9834	0.9978	0.9299	0.9979	0.8832	0.9129	0.8987	0.9616
Raw coverage	0.2959	0.3595	0.3080	0.3892	0.3287	0.5955	0.4586	0.4769	0.2981
Unique coverage	0.0693	0.0622	0.0907	0.0619	0.0007	0.0925	0.0043	0.0239	0.0225
Overall consistency			0.9437				0.8795		
Overall coverage			0.6503				0.6475		

Note: ● (present) and ⨂ (absent) represent core conditions. • (present) and ⊗ (absent) represent peripheral conditions. Blank spaces indicate "not significant".

In configuration H1a, the consistency level and unique coverage are 0.98 and 0.06. In addition, 29.5% of the cases show that a high CDG can be produced with OC and DPS as the core conditions. This situation indicates that other condition variables have little impact on improving digital-government construction when organizational construction and digital-policy support are present. Explanatory cases for configuration H1a include Guizhou and Guangxi, as shown in Figure 3. Taking Guizhou as an example, although the information-infrastructure index and digital-talent index are lower than the average level, the reform of the organizational structure and the introduction of digital policies have extensively promoted the digital transformation of Guizhou Province. Guizhou Province established the Big Data Development Administration in 2015 and became a directly affiliated provincial government institution in 2018. With the continuous advancement of institutional reform, Guizhou Province has issued a series of policies to support the development of the big-data industry and the electronic-information manufacturing industry. As of 2022, Guizhou Province has gathered over 400 big-data enterprises and 37 data centers are under construction or in operation. The scale of computing power and significant data-industry clusters are at the forefront of the country. For configuration H1b, the core conditions are OC and DPS, while the peripheral conditions are IIC, DT, and the absence of DP. This path shows that the core of organizational construction and digital-policy support, supplemented by good information-infrastructure construction, developer level, and strengthening the social-governance relationship with enterprises, can improve digital-government construction [87]. H1b's consistency level and unique coverage are almost identical to those of H1a, and basic coverage is higher than H1a. As shown in Figure 3, the cases belonging to configuration H1b include Guangdong, Shandong, Anhui, and Henan. Building big-data management institutions in these cities has achieved remarkable results. In the Digital Ecology Index 2021, the digital-policy indices of the above provinces are in the first and second gradients, reflecting full support for the construction of digital government. Considering that the core conditions of configurations H1a and H1b are identical, this group of configurations is known as the organization–policy-support type.

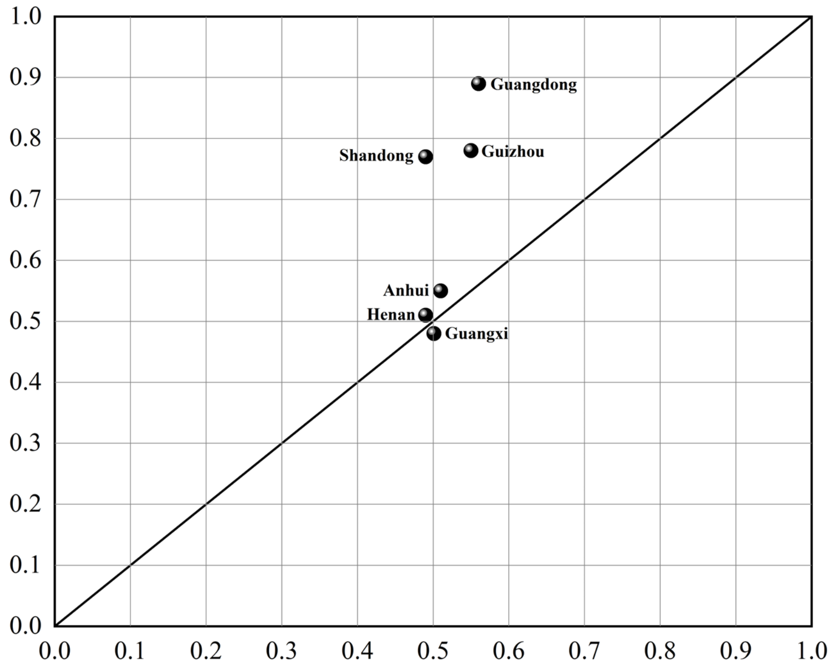

Figure 3. Explanation case of configuration H1.

In configuration H2a, the core conditions are IIC, PD, and DT, while the peripheral conditions are DPS and the absence of OC. This configuration reflects that in the case of insufficient financial support and incomplete institutional settings, a high level of digital-government construction can be achieved through good basic-information construction, high public demand, and high-quality digital-talent supply as the core, supplemented by digital policy. The consistency level and basic coverage for this configuration are 0.99 and 0.3. As shown in Figure 4, the cases of H2a are in Beijing, Tianjin, and Shanghai. These three cities are located in eastern China and are in a leading position in constructing information infrastructure, public demand, and digital talents. Although the development index of big-data management organizations is lower than the national average, the three regions can still promote the construction of digital government through three core advantages. Unlike configuration H2a, the peripheral conditions of H2b are OC and FS. In H2b, the consistency level is 0.92, and the basic coverage is 0.38, the highest of all configurations. When the formulation and implementation of digital policies lag, provinces with superior financial support and organizational structures can also improve the level of digital-government construction with the help of good information-infrastructure construction and high-quality digital-talent resources. As seen in Figure 4, the cases belonging to H2b are Zhejiang, Sichuan, and Jiangsu. Taking Sichuan Province as an example, as a vital computing-hub node in China, Sichuan Province has focused on many digital industries such as big data, artificial intelligence, a supercomputing center, and many digital-innovation talents. The continuous improvement of new infrastructure and the continued convergence of digital resources will further promote the development of the digital economy and the construction of digital government in Sichuan Province. Considering that the core conditions of configurations H2a and H2b are identical, this group of arrangements is known as the public demand–talent-support type.

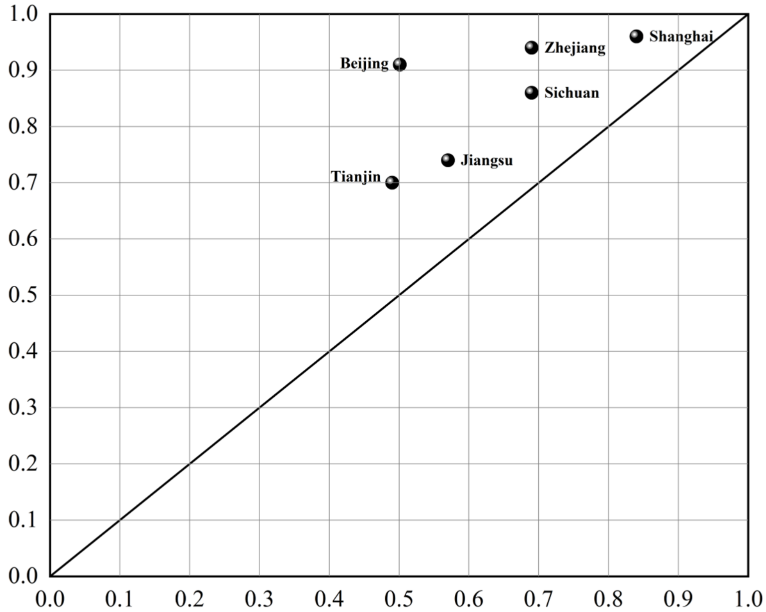

Figure 4. Explanation case of configuration H2.

For configuration H3, the core conditions are OC, DPS, PD, and DT, while the peripheral condition is FS. The consistency level and raw coverage of this configuration are 0.99 and 0.32. This path demonstrates that the government can promote a high level of digital-government construction by combining good institutional setup, policy direction, high public demand, and quality digital-talent resources without considering information-infrastructure construction. Zhejiang, Jiangsu, and Jiangxi are the cases that comprise configuration H3. Using Zhejiang Province and Jiangsu Province as an example, these two provinces are located in the Yangtze River Delta region, which is characterized by a high level of economic activity, an abundance of digital talent, and an ideal organizational structure. By promoting the development of various elements in a balanced manner, they will be able to construct a digital governance of the highest caliber. The configuration is known as a comprehensive development type based on its characteristics.

To realize the goal of research with "causal asymmetry", this paper further discusses the configurations for a non-high construction level of digital government. As shown in Table 3, the configuration that produces a non-high level of digital-government construction is N1. Since the core conditions of N1a, N1b, N1c, and N1d are the same, they constitute a second-order equivalent configuration. Configuration N1a shows that the lack of digital-policy support, digital talent, information-infrastructure construction, organizational construction, and financial support will lead to a low level of digital-government construction. The configuration N1b-N1c demonstrates that even when there is considerable public demand, the level of digital-government construction is low when digital-policy support, digital talent, information-infrastructure building, and organizational structure are lacking. Configuration N1d reflects that digital-government construction is still not high when digital-policy support, digital talent, organizational construction, and public demand are missing, even with proper information-infrastructure construction and financial aid. In conjunction with the preceding discussion, this paper concludes that insufficient policy support, untimely institutional settings, and a lack of digital talent will plague regions with low levels of digital-government construction.

5.3. Potential Substitution Relationships between Conditional Variables

After analyzing each configuration, we compare H1–H3 horizontally to further identify the potential substitution relationships between the Wuli–Shili–Renli conditions. Firstly, by comparing the composition of H1b and H2a, we find that organizational construction and public demand can replace each other to improve the level of digital-government construction (Figure 5a). Secondly, by comparing configurations H1b and H2b, it is found that for provinces with complete information-infrastructure construction, organizational construction, and good digital-talent reserves, digital-policy support can be replaced by a combination of financial support and public demand (Figure 5b). Thirdly, the analysis of H2a and H3 shows that the construction of information infrastructure can be replaced by a combination of financial support and organizational construction (Figure 5c). Finally, comparing configurations H2b and H3, it is discovered that digital-policy support can replace information-infrastructure construction (Figure 5d).

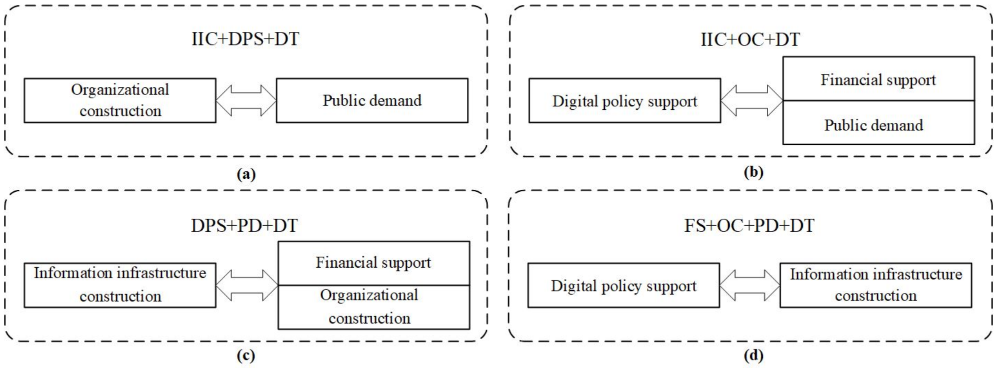

Figure 5. Substitution relationships between different conditions. (In the figure (**a**–**d**) represent four substitution relationships. For example, a represents that in the case of information infrastructure construction, public policy support and sufficient digital talents, organizational construction can be replaced by public demand).

The potential substitution relationships between various conditions in the WSR framework demonstrates that digital-policy support and information-infrastructure development play a more prominent role in digital-government construction. This is because, under objective endowment conditions, digital-policy support and information-infrastructure development can play the role that occurs when other conditions are combined (see Figure 5b,c). In addition, the substitution relationship between digital-policy support and information-infrastructure construction (Figure 5d) emphasizes digital-policy support's crucial role in enhancing digital-government construction. This is because information-infrastructure development is an objective endowment condition, and its status quo is difficult to alter in the short term. The digital policy is a controllable and subjective condition. By implementing digital approaches, the government can foster a digital-development environment, thereby increasing the level of digital-government construction.

5.4. Robustness Test

This paper evaluates the robustness of the configuration of a high-level digital-government construction. First, the PRI consistency threshold is increased to 0.75 and reanalyzed [88]. According to Table 4, the consequence is that the overall consistency level rises from 0.94 to 0.98, while the overall coverage falls from 0.65 to 0.58. After modifying the PRI value, the four configurations are nearly identical to the previous five. Second, the intersection is adjusted to the 55th percentile, and the other anchor points remain the same [19]. The resulting configuration after recalibration is the same as the existing configuration. The above robustness test shows that the results of this paper are robust.

Table 4. Robustness test.

Condition Variable	High CDG (PRI = 0.75)				High CDG (Threshold: 95%, 55%, 5%)				
	H1	**H2**	**H3**	**H4**	**H1a**	**H1b**	**H2**	**H3**	**H4**
IIC	⊗	●	●		⊗	⊗	●	●	
OC	●	●	⊗	●	●	●	⨂	●	●
FS	⊗			•	⊗	⊗		•	•
DPS	●	●	●	●	●	●	•	●	●
PD		⊗	●	●		⊗	●		●
DT	⊗	•	●	●	⊗	•	●	•	●
Consistency	0.9842	0.9834	0.9978	0.9979	0.9805	0.9696	0.9978	0.9766	0.9979
Raw coverage	0.2959	0.3595	0.3080	0.3287	0.3148	0.2873	0.3170	0.4364	0.3334
Unique coverage	0.0693	0.0622	0.0907	0.0347	0.0164	0.0137	0.0934	0.0673	0.0014
Overall consistency	0.9830				0.9711				
Overall coverage	0.5884				0.6293				

Note: ● (present) and ⨂ (absent) represent core conditions. • (present) and ⊗ (absent) represent peripheral conditions. Blank spaces indicate "not significant".

6. Discussion

According to the research carried out, this paper finds the following: First, fsQCA identifies five paths to enhance the quality of digital-government construction within the framework of WSR. This demonstrates the complexity and multiple driving mechanisms behind the development of digital governance [81]. Compared with the traditional analysis method, the QCA method allows us to explain the complex causal relationship. Second, by comparing the differences between different paths, it is found that information-infrastructure construction and digital-policy support play a prominent role in improving digital-government construction. The gradual improvement of information infrastructure will provide shared information and knowledge in various fields, make the cooperation of all parties easier and safer, and in this way, promote the development of digital government [58,89]. The digital policy is crucial in reducing organizational barriers, enabling information sharing, and building digital service platforms [90–92]. In addition, Nguyen et al. [93] believe that people with high confidence in government policies are more inclined to support and adhere to policy requirements. A good government policy will affect the degree of trust in the government, which in turn affects individual behavior, and helps to protect the community and strengthen national unity, all of which have a positive role in promoting the construction of digital government. Unfortunately, this study cannot accurately identify the depth of their impact on the level of digital-government construction. This inspires us to explore the QCA method in combination with other methods in the future. Third, in the "causal asymmetry" part, this paper finds that digital-policy support and the lack of digital talents are the core conditions leading to a non-high level of digital-government construction. This discovery again demonstrates the incentive and hindrance of digital policy for the structure of digital government [35]. The implementation of digital policy contributes positively to the construction of digital government and the improvement of the level of digital-government construction. In contrast, the absence of digital-policy support impedes the progress of digital-government construction [94]. In addition, a scarcity of digital talent significantly contributes to a low level of digital-government construction. The lack of digital talent and the uneven distribution of digital talent will harm enterprise performance and hinder the building of digital governance [95,96].

7. Conclusions

Based on the WSR framework and fuzzy-set qualitative comparative analysis (fsQCA), this paper profoundly analyzes the influencing factors and promotion paths of digital-government construction in 31 provinces in China from the configuration perspective. The conclusions are as follows: (1) This paper finds that five configurations can improve the level of digital-government construction, showing the characteristics of multi-path dependence in digital-government construction. The construction level of digital government is affected by six conditions: information-infrastructure construction, organizational construction, financial support, digital-policy support, public demand, and digital talents, and a single condition cannot promote the development of digital government. This phenomenon is similar to the conclusions of Li and Ma, and others [60,97]. In addition, we discovered that four configurations lead to a low level of digital-government construction. The lack of digital-policy support and digital talent are the main causes of a low level of digital-government construction. This conclusion is consistent with previous studies. The construction of a digital government still faces the challenge of digital policy and the shortage of digital talent [35,36]. (2) This paper matches the core conditions of each configuration and divides the five paths into three types: organization–policy-support type, public demand–talent-support type, and comprehensive development type. This provides a variety of options for digital-government construction in various environments. (3) By analyzing the potential substitution relationship between different conditions, this paper finds that under specific objective endowment conditions, the role of information-infrastructure construction and digital-policy support is more prominent than other variables. Due to information infrastructure, construction is difficult to change in the short term, and digital policy, in a subjective and controllable way, may have a more significant short-term effect on the development and construction of digital government. This conclusion emphasizes the vital role of policy support in constructing a digital government [36,98].

The theoretical significance of this study is as follows: (1) Based on WSR theory, we analyze the synergistic and concurrent effects of multiple conditions such as information-infrastructure construction, organizational construction, and policy support in improving the level of digital-government construction, and explain the complex causal mechanism that affects the level of digital-government construction. The construction of a digital government is highly complex and will face various difficulties and challenges [39,46]. Most existing studies analyze the construction of digital government from a single case or a particular element, so it is difficult to compare different instances horizontally and explain the complex causal relationship between different aspects. Through the WSR analysis framework, this paper obtains the research conclusion that various conditions drive the improvement of the level of digital-government construction by way of combinatorial configuration, which helps to strengthen the understanding of the complexity of digital-government construction and offers a variety of configuration options for digital-government construction. (2) This paper uses the QCA method to explore the impact of different conditions on the level of digital-government construction, which enriches the research tools in this field [73]. QCA provides a systematic perspective to explain the complex causal relationships and demonstrates the level of digital-government construction from different dimensions through the characteristics of causal asymmetry [60].

The practical significance of this study is as follows: (1) The construction of digital government is an essential part of the digital transformation in various countries, which is of great significance in improving government efficiency and the level of digital governance. The level of digital-government construction is an essential basis for measuring the degree of government digitalization and a crucial grasp of government-digitalization transformation. This paper's conclusions provide various options for constructing digital government in multiple environments and can provide a practical reference for policymakers. (2) This paper finds that information-infrastructure construction and digital-policy support play a significant role in increasing digital-government construction. This shows that when the government pays attention to the matching between diverse conditions, it should also pay special attention to the above two elements and make the best choice.

The following recommendations can be made for policymakers based on the findings of this study: (1) Government agencies should begin with a holistic perspective and enhance the interdependence of elements. A high level of digital-government construction results from the synergistic effect of multiple factors in the dimensions of Wuli, Shili, and Renli, as demonstrated by the conclusions of this paper. This implies that, in promoting the government's digital transformation, local governments must take a holistic approach, playing the central role of critical elements and enhancing the synergy between them. In configuration H1b, for instance, organizational construction and digital-policy support play a significant role; however, the synergistic effect of information-infrastructure construction and digital talents is still required to enhance digital-government construction. Therefore, local administrations should adopt a holistic approach, consider the synergies between various elements, and maximize the synergy between ingredients. (2) Information-infrastructure development is a crucial prerequisite for advancing the government's digital transformation and enhancing the level of digital-government construction. Consequently, we can consider strengthening infrastructure construction from the following two perspectives: on the one hand, we can elevate the construction of information infrastructure to a strategic level, accelerate the construction of communication-network infrastructure, emerging-technology infrastructure, and computing-power infrastructure, and improve the optical-fiber-communication-network and 5G-network coverage. Provinces should increase research and development for emerging technologies, such as artificial intelligence, cloud computing, and blockchain, and accelerate the establishment of various data centers and intelligent-computing centers to lay the groundwork for digital-technology applications; on the other hand, they should encourage governments at all levels to adopt digital technologies, to accelerate the construction of digital-government integration platforms, and to promote the deep integration of digital technologies into government operations. (3) Policymakers should pay close attention to the digital-policy support system and maximize the effect of combining digital policies. Using tax and subsidy policies, for instance, the government can support the development of emergent-technology enterprises, such as artificial intelligence and cloud computing, and help them innovate and fulfill their social responsibilities [99]. Simultaneously, all regions should enhance the digital-policy support system encompassing the three levels of supply, demand, and environment so that digital policy and practical needs are aligned, and so that the propelling force of digital policy is enhanced.

Finally, this paper still contains the following research flaws: (1) Due to the complexity of configuration and data limitations, this analysis framework selects only six conditional variables (information-infrastructure construction, financial support, organizational construction, digital-policy support, public demand, and digital talents). We encourage researchers to investigate additional factors in the future. (2) In this paper, only one year's data are selected for static research, and cross-year case data are not included in the analysis; consequently, it is impossible to observe the dynamic time change, which restricts the interpretation of the research conclusions in the time dimension. (3) The case study in this paper is limited to provincial government in China, and the analysis of regional heterogeneity may be inadequate. City-level case studies may be contemplated in the future.

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References

1. Matt, C.; Hess, T.; Benlian, A. Digital Transformation Strategies. *Bus. Inf. Syst. Eng.* **2015**, *57*, 339–343. [CrossRef]
2. Zaoui, F.; Souissi, N. Roadmap for Digital Transformation: A Literature Review. *Procedia Comput. Sci.* **2020**, *175*, 621–628. [CrossRef]
3. Janowski, T. Digital Government Evolution: From Transformation to Contextualization. *Gov. Inf. Q.* **2015**, *32*, 221–236. [CrossRef]
4. Khin, S.; Ho, T.C. Digital Technology, Digital Capability and Organizational Performance: A Mediating Role of Digital Innovation. *Int. J. Innov. Sci.* **2018**, *11*, 177–195. [CrossRef]
5. Usai, A.; Fiano, F.; Messeni Petruzzelli, A.; Paoloni, P.; Farina Briamonte, M.; Orlando, B. Unveiling the Impact of the Adoption of Digital Technologies on Firms' Innovation Performance. *J. Bus. Res.* **2021**, *133*, 327–336. [CrossRef]
6. Bertino, E. Data Security and Privacy: Concepts, Approaches, and Research Directions. In Proceedings of the 2016 IEEE 40th Annual Computer Software and Applications Conference (COMPSAC), Atlanta, GA, USA, 10–14 June 2016; Volume 1, pp. 400–407.
7. Henriette, E.; Feki, M.; Boughzala, I. Digital Transformation Challenges. 2016. Available online: https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1033&context=mcis2016 (accessed on 5 March 2023).
8. Benfeldt, O.; Persson, J.S.; Madsen, S. Data Governance as a Collective Action Problem. *Inf. Syst. Front.* **2020**, *22*, 299–313. [CrossRef]
9. Harrison, T.M.; Guerrero, S.; Burke, G.B.; Cook, M.; Cresswell, A.; Helbig, N.; Hrdinová, J.; Pardo, T. Open Government and E-Government: Democratic Challenges from a Public Value Perspective. In Proceedings of the 12th Annual International Digital Government Research Conference: Digital Government Innovation in Challenging Times, College Park, MD, USA, 12–15 June 2011; Association for Computing Machinery: New York, NY, USA, 2011; pp. 245–253.
10. Eom, S.-J.; Lee, J. Digital Government Transformation in Turbulent Times: Responses, Challenges, and Future Direction. *Gov. Inf. Q.* **2022**, *39*, 101690. [CrossRef]
11. Xiao, J.; Han, L.; Zhang, H. Exploring Driving Factors of Digital Transformation among Local Governments: Foundations for Smart City Construction in China. *Sustainability* **2022**, *14*, 14980. [CrossRef]
12. Ndou, V.D. E-Government for Developing Countries: Opportunities and Challenges. *Electron. J. Inf. Syst. Dev. Ctries.* **2004**, *18*, 1–24. [CrossRef]
13. Mergel, I.; Edelmann, N.; Haug, N. Defining Digital Transformation: Results from Expert Interviews. *Gov. Inf. Q.* **2019**, *36*, 101385. [CrossRef]
14. Gasco-Hernandez, M.; Nasi, G.; Cucciniello, M.; Hiedemann, A.M. The Role of Organizational Capacity to Foster Digital Transformation in Local Governments: The Case of Three European Smart Cities. *Urban Gov.* **2022**, *2*, 236–246. [CrossRef]
15. Moon, M.J.; Norris, D.F. Does Managerial Orientation Matter? The Adoption of Reinventing Government and e-Government at the Municipal Level. *Inf. Syst. J.* **2005**, *15*, 43–60. [CrossRef]
16. McNeal, R.S.; Tolbert, C.J.; Mossberger, K.; Dotterweich, L.J. Innovating in Digital Government in the American States. *Soc. Sci. Q.* **2003**, *84*, 52–70. [CrossRef]
17. Manoharan, A.P.; Ingrams, A. Conceptualizing E-Government from Local Government Perspectives. *State Local Gov. Rev.* **2018**, *50*, 56–66. [CrossRef]
18. Roundy, P.T.; Bradshaw, M.; Brockman, B.K. The Emergence of Entrepreneurial Ecosystems: A Complex Adaptive Systems Approach. *J. Bus. Res.* **2018**, *86*, 1–10. [CrossRef]
19. Xie, Z.; Wang, X.; Xie, L.; Duan, K. Entrepreneurial Ecosystem and the Quality and Quantity of Regional Entrepreneurship: A Configurational Approach. *J. Bus. Res.* **2021**, *128*, 499–509. [CrossRef]
20. Robertson, S.P.; Vatrapu, R.K. Digital Government. *Annu. Rev. Inf. Sci. Technol.* **2010**, *44*, 317–364. [CrossRef]
21. Gil-Garcia, J.R.; Martinez-Moyano, I.J. Understanding the Evolution of E-Government: The Influence of Systems of Rules on Public Sector Dynamics. *Gov. Inf. Q.* **2007**, *24*, 266–290. [CrossRef]
22. Chen, J.; Yan, Y.; Mingins, C. A Three-Dimensional Model for E-Government Development with Cases in China's Regional E-Government Practice and Experience. In Proceedings of the 2011 Fifth International Conference on Management of e-Commerce and e-Government, Wuhan, China, 5–6 November 2011; pp. 113–120.

23. Wong, M.S.; Hideki, N.; George, P. The Use of Importance-Performance Analysis (IPA) in Evaluating Japan's E-Government Services. *J. Theor. Appl. Electron. Commer. Res.* **2011**, *6*, 17–30. [CrossRef]
24. Alateyah, S.; Crowder, R.M.; Wills, G.B. An Exploratory Study of Proposed Factors to Adopt E-Government Services. *Int. J. Adv. Comput. Sci. Appl.* **2013**, *4*, 360248. [CrossRef]
25. Marchionini, G.; Samet, H.; Brandt, L. Digital Government. *Commun. ACM* **2003**, *46*, 25–27.
26. Katsonis, M.; Botros, A. Digital Government: A Primer and Professional Perspectives. *Aust. J. Public Adm.* **2015**, *74*, 42–52. [CrossRef]
27. Gil-Garcia, J.R.; Flores-Zúñiga, M.Á. Towards a Comprehensive Understanding of Digital Government Success: Integrating Implementation and Adoption Factors. *Gov. Inf. Q.* **2020**, *37*, 101518. [CrossRef]
28. Huang, H. Digital Government: Policy, Characteristics and Concept. *Gov. Stud.* **2020**, *36*, 6–15. (In Chinese)
29. Ziemba, E.; Papaj, T.; Żelazny, R.; Jadamus-Hacura, M. Factors Influencing the Success Of E-Government. *J. Comput. Inf. Syst.* **2016**, *56*, 156–167. [CrossRef]
30. Hu, S.; Yang, J. Practice and Experience of Digital Government Construction in Singapore. *Gov. Stud.* **2019**, *35*, 53–59. (In Chinese)
31. Pittaway, J.J.; Montazemi, A.R. Know-How to Lead Digital Transformation: The Case of Local Governments. *Gov. Inf. Q.* **2020**, *37*, 101474. [CrossRef]
32. Pardo, T.A.; Tayi, G.K. Interorganizational Information Integration: A Key Enabler for Digital Government. *Gov. Inf. Q.* **2007**, *24*, 691–715. [CrossRef]
33. Hong, S.; Kim, S.H. Political Polarization on Twitter: Implications for the Use of Social Media in Digital Governments. *Gov. Inf. Q.* **2016**, *33*, 777–782. [CrossRef]
34. Yuan, Y.-P.; Dwivedi, Y.K.; Tan, G.W.-H.; Cham, T.-H.; Ooi, K.-B.; Aw, E.C.-X.; Currie, W. Government Digital Transformation: Understanding the Role of Government Social Media. *Gov. Inf. Q.* **2023**, *40*, 101775. [CrossRef]
35. Safarov, I.; Meijer, A.; Grimmelikhuijsen, S. Utilization of Open Government Data: A Systematic Literature Review of Types, Conditions, Effects and Users. *Inf. Polity* **2017**, *22*, 1–24. [CrossRef]
36. Yang, T.-M.; Lo, J.; Shiang, J. To Open or Not to Open? Determinants of Open Government Data. *J. Inf. Sci.* **2015**, *41*, 596–612. [CrossRef]
37. Janssen, M.; Charalabidis, Y.; Zuiderwijk, A. Benefits, Adoption Barriers and Myths of Open Data and Open Government. *Inf. Syst. Manag.* **2012**, *29*, 258–268. [CrossRef]
38. Wilson, C.; Mergel, I. Overcoming Barriers to Digital Government: Mapping the Strategies of Digital Champions. *Gov. Inf. Q.* **2022**, *39*, 101681. [CrossRef]
39. Tangi, L.; Janssen, M.; Benedetti, M.; Noci, G. Digital Government Transformation: A Structural Equation Modelling Analysis of Driving and Impeding Factors. *Int. J. Inf. Manag.* **2021**, *60*, 102356. [CrossRef]
40. Zhao, Y.; Fan, B. Effect of an Agency's Resources on the Implementation of Open Government Data. *Inf. Manag.* **2021**, *58*, 103465. [CrossRef]
41. Weerakkody, V.; Omar, A.; El-Haddadeh, R.; Al-Busaidy, M. Digitally-Enabled Service Transformation in the Public Sector: The Lure of Institutional Pressure and Strategic Response towards Change. *Gov. Inf. Q.* **2016**, *33*, 658–668. [CrossRef]
42. Gong, Y.; Yang, J.; Shi, X. Towards a Comprehensive Understanding of Digital Transformation in Government: Analysis of Flexibility and Enterprise Architecture. *Gov. Inf. Q.* **2020**, *37*, 101487. [CrossRef]
43. Martin1, S. Risk Analysis to Overcome Barriers to Open Data. *Electron. J. E-Gov.* **2013**, *11*, 348–359.
44. van Donge, W.; Bharosa, N.; Janssen, M.F.W.H.A. Data-Driven Government: Cross-Case Comparison of Data Stewardship in Data Ecosystems. *Gov. Inf. Q.* **2022**, *39*, 101642. [CrossRef]
45. Hardy, K.; Maurushat, A. Opening up Government Data for Big Data Analysis and Public Benefit. *Comput. Law Secur. Rev.* **2017**, *33*, 30–37. [CrossRef]
46. Weerakkody, V.; Irani, Z.; Kapoor, K.; Sivarajah, U.; Dwivedi, Y.K. Open Data and Its Usability: An Empirical View from the Citizen's Perspective. *Inf. Syst. Front.* **2017**, *19*, 285–300. [CrossRef]
47. Anthopoulos, L.; Reddick, C.G.; Giannakidou, I.; Mavridis, N. Why E-Government Projects Fail? An Analysis of the Healthcare.Gov Website. *Gov. Inf. Q.* **2016**, *33*, 161–173. [CrossRef]
48. Gu, J.; Zhu, Z. Knowing Wuli, Sensing Shili, Caring for Renli: Methodology of the WSR Approach. *Syst. Pract. Action Res.* **2000**, *13*, 11–20. [CrossRef]
49. Zhu, Z. WSR: A Systems Approach for Information Systems Development. *Syst. Res. Behav. Sci.* **2000**, *17*, 183–203. [CrossRef]
50. Wang, Q.; Li, S. Shale Gas Industry Sustainability Assessment Based on WSR Methodology and Fuzzy Matter-Element Extension Model: The Case Study of China. *J. Clean. Prod.* **2019**, *226*, 336–348. [CrossRef]
51. Wang, T.; Zhong, D. Research on the Avionic Software Quality Evaluation Based on the WSR Methodology. In Proceedings of the 2008 IEEE/AIAA 27th Digital Avionics Systems Conference, St. Paul, MN, USA, 26–30 October 2008; pp. 5.B.6-1–5.B.6-11.
52. Zhou, Q.; Bao, Y.; Zhao, Y.; He, X.; Cui, C.; Liu, Y. Impacts of Government Credit on Government Performance of Public-Private Partnership Project in China: A WSR System Theory Perspective. *Sustainability* **2022**, *14*, 6886. [CrossRef]
53. Gao, S.; Jin, X. Analysis of the Influencing Mechanism of Solvers' Participation Behavior Based on the WSR System Approach. *Electron. Commer. Res.* **2022**, 1–29. [CrossRef]
54. Yang, K.; Zhu, J.; Yang, L.; Lin, Y.; Huang, X.; Li, Y. Analysis of Network Public Opinion on COVID-19 Epidemic Based on the WSR Theory. *Front. Public Health* **2023**, *10*, 1104031. [CrossRef] [PubMed]

55. Wan, X.; Cai, Y.; Zhang, C. Can digital construction improve the level of government governance? *Acad. Res.* **2021**, *443*, 94–99. (In Chinese)
56. Kassen, M. Open Data in Kazakhstan: Incentives, Implementation and Challenges. *Inf. Technol. People* **2017**, *30*, 301–323. [CrossRef]
57. Guo, L.; Huang, Z. An Empirical Study on the Influencing Factors of Digital Government Construction in China. *Soc. Sci. Hunan* **2021**, *208*, 64–75. (In Chinese)
58. Janssen, M.; Chun, S.A.; Gil-Garcia, J.R. Building the next Generation of Digital Government Infrastructures. *Gov. Inf. Q.* **2009**, *26*, 233–237. [CrossRef]
59. Luna-Reyes, L.F.; Gil-Garcia, J.R. Digital Government Transformation and Internet Portals: The Co-Evolution of Technology, Organizations, and Institutions. *Gov. Inf. Q.* **2014**, *31*, 545–555. [CrossRef]
60. Zhao, Y.; Fan, B. Understanding the Key Factors and Configurational Paths of the Open Government Data Performance: Based on Fuzzy-Set Qualitative Comparative Analysis. *Gov. Inf. Q.* **2021**, *38*, 101580. [CrossRef]
61. Bloch, C.; Bugge, M.M. Public Sector Innovation—From Theory to Measurement. *Struct. Change Econ. Dyn.* **2013**, *27*, 133–145. [CrossRef]
62. Cinar, E.; Trott, P.; Simms, C. A Systematic Review of Barriers to Public Sector Innovation Process. *Public Manag. Rev.* **2019**, *21*, 264–290. [CrossRef]
63. Bourgeois, L.J. On the Measurement of Organizational Slack. *Acad. Manag. Rev.* **1981**, *6*, 29–39. [CrossRef]
64. Levine, J.R.; Wilson, W.J. Poverty, Politics, and a "Circle of Promise": Holistic Education Policy in Boston and the Challenge of Institutional Entrenchment. *J. Urban Aff.* **2013**, *35*, 7–24. [CrossRef]
65. Tolbert, C.J.; Mossberger, K.; McNeal, R. Institutions, Policy Innovation, and E-Government in the American States. *Public Adm. Rev.* **2008**, *68*, 549–563. [CrossRef]
66. Ma, L. Factors Influencing the Development of E-government: An Empirical Study of Prefecture-level Cities in China. *E-Government* **2013**, *129*, 50–63. (In Chinese)
67. Rodríguez-Abitia, G.; Bribiesca-Correa, G. Assessing Digital Transformation in Universities. *Future Internet* **2021**, *13*, 52. [CrossRef]
68. Zhao, Y.; Liang, Y.; Yao, C.; Han, X. Key Factors and Generation Mechanisms of Open Government Data Performance: A Mixed Methods Study in the Case of China. *Gov. Inf. Q.* **2022**, *39*, 101717. [CrossRef]
69. Patanakul, P.; Pinto, J.K. Examining the Roles of Government Policy on Innovation. *J. High Technol. Manag. Res.* **2014**, *25*, 97–107. [CrossRef]
70. Ma, L.; Liu, Z.; Huang, X.; Li, T. The Impact of Local Government Policy on Innovation Ecosystem in Knowledge Resource Scarce Region: Case Study of Changzhou, China. *Sci. Technol. Soc.* **2019**, *24*, 29–52. [CrossRef]
71. Peng, Y.; Tao, C. Can Digital Transformation Promote Enterprise Performance? —From the Perspective of Public Policy and Innovation. *J. Innov. Knowl.* **2022**, *7*, 100198. [CrossRef]
72. Fan, B.; Zhao, Y. The Moderating Effect of External Pressure on the Relationship between Internal Organizational Factors and the Quality of Open Government Data. *Gov. Inf. Q.* **2017**, *34*, 396–405. [CrossRef]
73. Yifan, G.; Bei, L. Influencing Factors and Multiple Paths of Construction Ability of Digital Government: Qualitative Comparative Analysis Based on 31 Chinese Provinces. *Procedia Comput. Sci.* **2022**, *199*, 1213–1220. [CrossRef]
74. Gupta, A.K.; Singhal, A. Managing Human Resources for Innovation and Creativity. *Res-Technol. Manag.* **1993**, *36*, 41–48. [CrossRef]
75. Singh, S.K.; Giudice, M.D.; Chierici, R.; Graziano, D. Green Innovation and Environmental Performance: The Role of Green Transformational Leadership and Green Human Resource Management. *Technol. Forecast. Soc. Change* **2020**, *150*, 119762. [CrossRef]
76. Bason, C. *Leading Public Sector Innovation: Co-Creating for a Better Society*; Policy Press: Bristol, UK; Portland, OR, USA, 2010; ISBN 978-1-84742-633-8.
77. Kane, G. The Technology Fallacy: People Are the Real Key to Digital Transformation. *Res-Technol. Manag.* **2019**, *62*, 44–49. [CrossRef]
78. Karaboga, T.; Gurol, Y.D.; Binici, C.M.; Sarp, P. Sustainable Digital Talent Ecosystem in the New Era: Impacts on Businesses, Governments and Universities. *Istanb. Bus. Res.* **2020**, *49*, 360–379. [CrossRef]
79. Ragin, C.C. *The Comparative Method: Moving beyond Qualitative and Quantitative Strategies: With a New Introduction*; University of California Press: Berkeley, CA, USA, 1987.
80. Ragin, C.C. *Redesigning Social Inquiry: Fuzzy Sets and Beyond*; University of Chicago Press: Chicago, DC, USA, 2008; ISBN 978-0-226-70273-5.
81. Rihoux, B.; Ragin, C.C. *Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques*; SAGE Publications: Thousand Oaks, CA, USA, 2008; ISBN 978-1-4522-1031-5.
82. Schneider, C.Q.; Wagemann, C. *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis*; Strategies for Social Inquiry; Cambridge University Press: Cambridge, UK, 2012; ISBN 978-1-107-01352-0.
83. Andrews, R.; Beynon, M.J.; McDermott, A.M. Organizational Capability in the Public Sector: A Configurational Approach. *J. Public Adm. Res. Theory* **2016**, *26*, 239–258. [CrossRef]
84. Sun, H.; Fu, L.; Yang, S. What Contributes to the Government-Citizen Knowledge Sharing: Analysis of 293 Cities in China. *J. Innov. Knowl.* **2023**, *8*, 100362. [CrossRef]

85. Fiss, P.C. Building Better Causal Theories: A Fuzzy Set Approach to Typologies in Organization Research. *Acad. Manag. J.* **2011**, *54*, 393–420. [CrossRef]
86. Du, Y.; Kim, P.H. One Size Does Not Fit All: Strategy Configurations, Complex Environments, and New Venture Performance in Emerging Economies. *J. Bus. Res.* **2021**, *124*, 272–285. [CrossRef]
87. Balon, V.; Kottala, S.Y.; Reddy, K.S. Mandatory Corporate Social Responsibility and Firm Performance in Emerging Economies: An Institution-Based View. *Sustain. Technol. Entrep.* **2022**, *1*, 100023. [CrossRef]
88. Greckhamer, T. CEO Compensation in Relation to Worker Compensation across Countries: The Configurational Impact of Country-Level Institutions. *Strateg. Manag. J.* **2016**, *37*, 793–815. [CrossRef]
89. Tang, C.; Xu, Y.; Hao, Y.; Wu, H.; Xue, Y. What Is the Role of Telecommunications Infrastructure Construction in Green Technology Innovation? A Firm-Level Analysis for China. *Energy Econ.* **2021**, *103*, 105576. [CrossRef]
90. Chen, Y.-C.; Knepper, R. Digital Government Development Strategies: Lessons for Policy Makers from a Comparative Perspective. In *Electronic Government Strategies and Implementation*; IGI Global: Hershey, PA, USA, 2005; pp. 394–420, ISBN 978-1-59140-348-7.
91. Chung, C.-S.; Kim, S.-B. A Comparative Study of Digital Government Policies, Focusing on E-Government Acts in Korea and the United States. *Electronics* **2019**, *8*, 1362. [CrossRef]
92. Jiang, X. Digital Economy in the Post-Pandemic Era. *J. Chin. Econ. Bus. Stud.* **2020**, *18*, 333–339. [CrossRef]
93. Nguyen, H.M.; Phuc, H.N.; Tam, D.T. Travel Intention Determinants during COVID-19: The Role of Trust in Government Performance. *J. Innov. Knowl.* **2023**, *8*, 100341. [CrossRef]
94. Attard, J.; Orlandi, F.; Scerri, S.; Auer, S. A Systematic Review of Open Government Data Initiatives. *Gov. Inf. Q.* **2015**, *32*, 399–418. [CrossRef]
95. Spitzer, B.; Morel, V.; Buvat, J.; Kanakadandi, S. The digital talent gap. In Developing skills for today's digital organizations. In Proceedings of the ICERI2015, Seville, Spain, 18–20 November 2015; pp. 3488–3499. Available online: https://library.iated.org/view/SPITZER2015DIG (accessed on 5 March 2023).
96. Hao, X.; Wang, X.; Wu, H.; Hao, Y. Path to Sustainable Development: Does Digital Economy Matter in Manufacturing Green Total Factor Productivity? *Sustain. Dev.* **2023**, *31*, 360–378. [CrossRef]
97. Li, Y.; Ma, L. What Drives the Governance of Ridesharing? A Fuzzy-Set QCA of Local Regulations in China. *Policy Sci.* **2019**, *52*, 601–624. [CrossRef]
98. Zuiderwijk, A.; Janssen, M. Open Data Policies, Their Implementation and Impact: A Framework for Comparison. *Gov. Inf. Q.* **2014**, *31*, 17–29. [CrossRef]
99. Wenqi, D.; Khurshid, A.; Rauf, A.; Calin, A.C. Government Subsidies' Influence on Corporate Social Responsibility of Private Firms in a Competitive Environment. *J. Innov. Knowl.* **2022**, *7*, 100189. [CrossRef]