

Article

What Drives Digital Governance Success? Configurational Evidence from Subnational China

Yun Wu ¹, Meihan Liu ¹, Bingyu Han ¹, Jialin Liu ¹, Ze Wang ^{1,2}  and Na Zhang ^{3,*} 

¹ School of Management, Capital Normal University, Beijing 100089, China; yunwu@mail.cnu.edu.cn (Y.W.); 1232901014@cnu.edu.cn (M.L.); 1232901009@cnu.edu.cn (B.H.); 1232901013@cnu.edu.cn (J.L.); zewang@cnu.edu.cn (Z.W.)

² Institute of Global and Area Studies, Capital Normal University, Beijing 100089, China

³ Earthquake Administration of Gansu Province (Lanzhou Institute of Seismology, China Earthquake Administration), Lanzhou 730000, China

* Correspondence: zhangna001128@163.com

Abstract

Digital transformation has become a central public-sector reform agenda, yet high digital governance performance remains uneven across subnational governments. Although digital governance is expected to strengthen administrative capacity and service delivery, less is known about the policy pathways through which such performance is achieved. Drawing on the Technology–Organization–Environment framework, this study examines six implementation conditions: technological management capability, digital infrastructure development level, organizational strategy, attention to digital governance, public demand, and intergovernmental competitive pressure. Applying fuzzy-set qualitative comparative analysis to 31 provincial-level cases in China, the study finds that organizational strategy is necessary but insufficient, and that no single condition alone explains high performance. Four sufficient policy pathways are identified and summarized into three implementation mechanisms: technology–organization synergy, competition–pressure reinforcement, and demand compensation. The findings show that high public-sector digital governance performance is shaped by aligned implementation conditions rather than isolated technological investment.

Keywords: digital governance; policy pathways; policy implementation; fsQCA; China

1. Introduction

Digital transformation has become a central policy agenda in public-sector reform, yet high digital governance performance remains uneven across subnational governments. Data-driven decision-making and platform-based service delivery are changing how governments deliver services, allocate public resources, and interact with citizens [1,2]. Governments have therefore expected digital transformation to strengthen administrative capacity and improve governance performance. Whereas prior QCA-based studies on digital governance and related public-sector digital transformation have mainly identified configurations associated with governance or service outcomes, this study differs by treating provincial digital governance performance as a policy implementation outcome and by further interpreting the identified pathways as TOE-based implementation mechanisms.

Existing studies have addressed this unevenness by examining the conditions that make digital governance more effective. Technical and service-oriented research emphasizes digital infrastructure, online service delivery, and platform capacity [3,4]. Other



Academic Editor: Jung-ho Baek

Received: 15 June 2026

Revised: 3 July 2026

Accepted: 6 July 2026

Published: 10 July 2026

Copyright: © 2026 by the authors.

Licensee MDPI, Basel, Switzerland.

This article is an open access article distributed under the terms and

conditions of the [Creative Commons Attribution \(CC BY\)](https://creativecommons.org/licenses/by/4.0/) license.

studies highlight public trust, government–citizen interaction, and organizational capability as important conditions for effective digital governance [5–7]. Together, this literature moves the debate beyond a narrow technology-adoption view and shows that digital governance performance depends on multiple governance conditions rather than technological investment alone. The remaining issue is how these conditions work together during implementation, rather than whether any single condition matters in isolation.

These strands can be brought together through the Technology–Organization–Environment (TOE) framework, which links technological resources, organizational arrangements, and environmental pressures within an implementation-oriented structure [8–10]. This framework matches the analytical problem addressed here: the unresolved issue is not whether these domains matter, but how specific conditions within them are aligned during local implementation. This issue is difficult to address through conventional regression-based approaches that estimate the average net association of individual variables. A configurational approach is better suited to examining how multiple conditions jointly form alternative pathways to the same outcome. Examining such alignment requires a method that moves beyond the net effects of isolated variables and captures conjunctural causation, equifinality, and causal asymmetry in a medium-N setting. This study therefore combines TOE with fuzzy-set qualitative comparative analysis (fsQCA). TOE organizes six implementation conditions, while fsQCA identifies the sufficient policy pathways through which these conditions jointly support high digital governance performance. These pathways are then summarized into broader implementation mechanisms underlying high performance. Whereas prior QCA-based studies on digital governance and related public-sector digital transformation have mainly identified configurations associated with governance or service outcomes, this study treats provincial digital governance performance as a policy implementation outcome and further interprets the identified pathways as TOE-based implementation mechanisms.

This analytical focus makes China a useful setting for examining how shared digital transformation agendas are translated into differentiated subnational implementation routes. Over the past decade, digital government construction has been incorporated into China's long-term public-sector digital transformation agenda, as reflected in national policy documents and performance-evaluation materials (Appendix A Table A1). Subnational governments, however, differ in technological capacity, organizational arrangements, public demand, and intergovernmental pressure, and digital governance performance also varies across provinces. This coexistence of a broadly shared national agenda and substantial subnational heterogeneity provides a strong empirical basis for examining how TOE-based implementation conditions combine into policy pathways to high public-sector digital governance performance. Accordingly, this study asks the following question: Through which configurations of technological, organizational, and environmental conditions do subnational governments achieve high public-sector digital governance performance? To answer this question, the study has three objectives. First, it identifies whether any single TOE-based condition is necessary for high performance. Second, it examines the sufficient policy pathways through which multiple conditions combine to support high performance. Third, it interprets these pathways as broader implementation mechanisms that explain differentiated routes to digital governance success.

Empirically, this study analyzes six TOE-based implementation conditions: technological management capability, digital infrastructure development level, organizational strategy, attention to digital governance, public demand, and intergovernmental competitive pressure. Applying fsQCA to 31 provincial-level cases in China, the study finds that organizational strategy is necessary but insufficient and that no single condition alone explains high performance. The study identifies four sufficient policy pathways to high

performance and summarizes them into three implementation mechanisms: technology–organization synergy, competition–pressure reinforcement, and demand compensation.

We make three contributions to digital governance and policy implementation research. First, we clarify the role of organizational strategy in digital governance implementation: organizational strategy is necessary for such performance, but it must be aligned with other implementation conditions to support high performance. Second, we use the TOE framework as a pathway-oriented implementation lens, showing how technological, organizational, and environmental conditions combine into different policy pathways. Third, we provide evidence for differentiated digital governance strategies: subnational governments can reach high performance through technology–organization synergy, competition–pressure reinforcement, or demand compensation.

2. Digital Governance Performance and Policy Implementation Conditions

2.1. Digital Governance Performance and the Policy Implementation Gap

Public-sector digital governance performance is often discussed as a technological or managerial outcome, but for subnational governments it is also a policy implementation outcome. Performance evaluation has long been central to administrative reform, especially at the local government level [11]. Digital governance has become an important lens for understanding government responsiveness and service delivery as information and communication technologies become embedded in public administration [12,13]. Public-sector performance is influenced by resource conditions, citizen-related factors, institutional arrangements, and spatial, infrastructural, and technological legacies [14]. These studies move the debate beyond a purely technical view of digital government. They also suggest that digital governance performance depends on how multiple governance conditions are translated into practice.

Technological explanations emphasize digital resources, platform capacity, data systems, and service technologies. Digital support and individual digital capability are associated with digital transformation performance [15,16]. Leadership and information technology quality are linked to e-government benefits in public-sector settings [17]. Web-based public service tools can improve government risk communication and information disclosure [18]. Web-based digital tools can strengthen online accountability and public reporting capacity [19]. Data systems and data-sharing mechanisms can improve public-sector data use and digital governance capacity [20,21]. Smart city technologies, data platforms, and digitally driven urban governance arrangements can support service innovation and local government performance outcomes [10,22–26]. These studies clarify the technological foundations of digital governance performance. Yet technological capacity alone cannot explain why regions with comparable infrastructure or platform resources may still produce different governance outcomes.

Organizational explanations highlight leadership, coordination, strategy, institutional design, and administrative arrangements. Organizational resources and coordination capacity affect local digital transformation and digital governance capacity [27]. Government digital support and leadership influence digital transformation performance [15–17]. Strategic planning, institutional design, and organizational support provide direction for digital governance [28–30]. Cross-departmental coordination, process reengineering, and organizational restructuring are required for digital transformation to change public-sector outcomes [31]. These studies show that digital technologies become performance-relevant only when they are supported by organizational direction and administrative capacity. However, organizational conditions are often examined as separate determinants, leaving their interaction with technological and environmental conditions insufficiently explained.

Contextual explanations extend the analysis to regional and environmental conditions. Regional economic development, technological level, population scale, fiscal resources, professional talent, and infrastructure conditions have been used to explain variation in digital governance or related performance outcomes [32–35]. Digital governance is linked to environmental governance and carbon-emission performance in urban contexts [36]. Local digital governance capacity and digital government construction have also been examined as part of regional sustainable development and common prosperity in China [37,38]. Public demand and citizen participation influence government responsiveness and digital government transformation [39–45]. Intergovernmental learning, peer innovation, and neighboring-region practices shape digital governance diffusion and local policy innovation [9,46,47]. These studies show that digital governance reforms are filtered through regional conditions, public needs, and intergovernmental incentives. They therefore help explain why similar reform agendas may generate uneven outcomes across places.

Taken together, existing research has identified technological, organizational, and environmental conditions associated with public-sector digital governance performance. The unresolved issue is not whether these conditions matter, but how subnational governments combine them during implementation. Much of the existing evidence still relies on single-factor explanations or net-effect estimates. Such approaches are less able to explain why provinces with different resource bases may reach high performance through different policy pathways. They are also less able to show why the conditions associated with high performance may not simply mirror those associated with non-high performance. A pathway-oriented analytical framework is therefore needed to examine how technological, organizational, and environmental conditions are aligned in practice to support high public-sector digital governance performance.

2.2. TOE Framework and Subnational Implementation Conditions

The TOE framework offers a policy implementation lens for examining how technological, organizational, and environmental conditions are combined to support high public-sector digital governance performance. Originally developed to explain technology adoption in organizations [8], TOE distinguishes three domains that correspond closely to digital governance reform. Technological conditions provide the operational base for platforms, data systems, and digital services. Organizational conditions give reform its strategic direction, administrative coordination, and institutional support. Environmental conditions capture the public demands and intergovernmental pressures that shape implementation choices.

For subnational policy analysis, this structure links digital reform to the uneven conditions under which provincial governments implement policy. Recent Sustainability research has used TOE–fsQCA to examine how technological, organizational, and environmental conditions combine into differentiated governance and service pathways in China [10,48]. Prior applications of TOE across information systems adoption, digital transformation, green innovation, and organizational performance demonstrate its value for organizing multi-domain conditions [9,10,24,48–58]. In the present analysis, the three TOE domains are treated as implementation arenas rather than as separate variable groups. The framework therefore helps explain how provincial governments translate a shared national digital reform agenda into different policy pathways to high digital governance performance.

2.2.1. Technological Conditions

Technological conditions provide the operational basis for digital governance. In this study, the technological dimension includes technological management capability and digital infrastructure development level. These two conditions capture analytically distinct but complementary aspects of the technological domain. Digital infrastructure

development level reflects the basic network and platform conditions that support digital service operation. Technological management capability reflects the government's capacity to manage digital platforms, data resources, online services, government–citizen interaction channels, and technical support arrangements.

Digital technologies can improve risk communication and emergency information disclosure [18]. Digital tools can also strengthen online accountability and public reporting capacity [19]. Broadband networks, sensors, the Internet of Things, and connected urban infrastructures provide technical support for smart city services and administrative operations [22,23,26]. Big data and public-sector data systems can improve data processing and administrative capacity [21]. Smart-city technologies are also associated with local government revenue and performance outcomes [25]. Data-sharing mechanisms can strengthen digital government construction and public-sector data governance [20]. Recent Sustainability research on mobile government services further shows that service levels depend on the alignment of technological, organizational, and environmental conditions rather than infrastructure alone [10]. These findings indicate that technological conditions function not only as technical assets but also as governance capacities within digital governance arrangements. They enable data processing, platform operation, and digital service delivery, thereby constituting the technological foundation of digital governance. For this reason, technological management capability and digital infrastructure development level are selected as the technological conditions in this study.

2.2.2. Organizational Conditions

Organizational conditions shape whether digital technologies can be institutionalized, coordinated, and translated into governance performance. In this study, the organizational dimension includes organizational strategy and attention to digital governance. These two conditions capture analytically distinct but complementary aspects of the organizational domain. Organizational strategy provides policy direction, institutional support, and implementation arrangements for digital transformation. Attention to digital governance reflects the extent to which digital governance is embedded in government organizational structures and administrative agendas.

Organizational resources and coordination capacity affect local digital transformation and digital governance capacity [27]. Government digital support and leadership influence digital transformation performance [15–17]. Governance mechanisms, organizational support, and strategic implementation arrangements affect the formation of local digital governance capacity [28–30]. Cross-departmental coordination, process reengineering, and organizational restructuring are required for digital transformation to change public-sector outcomes [31]. These studies indicate that organizational conditions are not passive background conditions. They provide internal enabling mechanisms through which technological capacity can be institutionalized, coordinated, and sustained within broader governance arrangements. For this reason, organizational strategy and attention to digital governance are selected as the organizational conditions in this study.

2.2.3. Environmental Conditions

Environmental conditions capture the external demands and competitive pressures that shape digital governance priorities. In this study, the environmental dimension includes public demand and intergovernmental competitive pressure. These two conditions capture analytically distinct but complementary aspects of the environmental domain. Public demand reflects citizens' demand for more convenient, responsive, and accessible digital government services. Intergovernmental competitive pressure reflects comparison, learning, and catch-up pressure generated by neighboring regions' digital government development.

Institutional and political contexts influence digital government transformation and public value creation [9,42–44]. Online public demand can shape government responsiveness and encourage governments to strengthen e-government channels and response capacity [40,45]. Citizen participation and public trust are associated with digital government performance and public value [39,41]. In China’s local governance context, higher-level requirements, peer innovation, and intergovernmental signal transmission affect digital governance innovation and diffusion [9,46,47]. These studies indicate that environmental conditions are not only external constraints. They also shape policy priorities, resource allocation, and service-response incentives during digital governance implementation. For this reason, public demand and intergovernmental competitive pressure are selected as the environmental conditions in this study.

2.2.4. TOE Alignment and Policy Pathway Framework

Together, the six TOE-based implementation conditions define the theoretical basis of the analytical framework. They are not treated as additive predictors, but as interdependent conditions whose alignment may vary across provincial cases. Within the TOE framework, high public-sector digital governance performance is expected to depend on alignment across technological, organizational, and environmental domains rather than on the isolated strength of any single condition.

The selection of the six conditions follows an implementation-centered reading of the TOE framework. Technological management capability and digital infrastructure development level capture the operational and infrastructural foundations of digital governance implementation. Organizational strategy and attention to digital governance capture the institutional direction and administrative priority that support implementation. Public demand and intergovernmental competitive pressure capture the demand-side and peer-pressure environments that shape implementation incentives. Other factors, such as regional economic development, fiscal resources, population structure, or general administrative capacity, may also influence digital governance performance, but they are treated as broader contextual conditions rather than as the core implementation conditions examined in this study. Policy implementation theory complements the TOE framework by shifting the analysis from classifying conditions to explaining how these conditions are translated into performance through aligned implementation pathways.

This pathway logic connects the selection of TOE-based implementation conditions with the fsQCA-based empirical strategy. The TOE framework specifies the technological, organizational, and environmental domains, while fsQCA is used to examine how conditions within and across these domains combine into policy pathways associated with high public-sector digital governance performance. This TOE-based policy pathway framework links theory-based condition selection with the empirical identification of alternative implementation routes to high performance. Figure 1 presents the analytical framework.

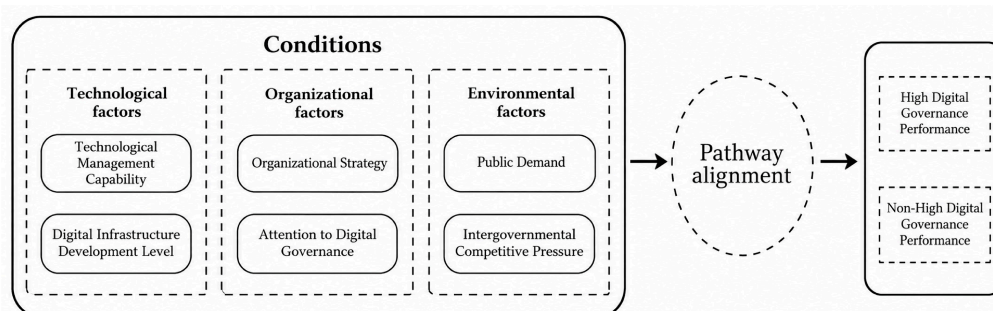


Figure 1. TOE-Based Policy Pathway Framework for Public-Sector Digital Governance Performance.

3. Materials and Methods

3.1. *fsQCA for Identifying Policy Pathways*

The fsQCA analysis was conducted using fsQCA 3.0 software. This study applies fsQCA to examine how technological, organizational, and environmental conditions combine into sufficient policy pathways to high public-sector digital governance performance. The research question concerns policy pathways: it focuses on how multiple interdependent conditions jointly form sufficient routes to the same outcome, rather than on the independent effect of any single condition.

Recent Sustainability research has used TOE–fsQCA to examine how multiple technological, organizational, and environmental conditions combine into governance or public-service pathways in China [10,24,48]. More generally, fsQCA is appropriate for this purpose because it analyzes set-theoretic relations, conjunctural causation, equifinality, and causal asymmetry [59–61]. By contrast, conventional regression methods model average net effects of individual variables, but they do not directly examine how conditions work together, how different routes may produce similar outcomes, or how high and non-high outcomes may follow different causal patterns. fsQCA therefore supports an explanation of how six TOE-based implementation conditions—technological management capability, digital infrastructure development level, organizational strategy, attention to digital governance, public demand, and intergovernmental competitive pressure—combine during subnational policy implementation to support high performance.

fsQCA also fits the data structure of this study. The outcome and condition variables are not binary; they represent degrees of membership in sets such as high public-sector digital governance performance, strong technological management capability, and strong organizational strategy. The sample of 31 provincial-level administrative units in China is appropriate for a medium-N design focused on policy pathways. fsQCA has also been widely applied in research on organizational strategy, technology adoption, innovation performance, and digital transformation [62–64].

3.2. *Data Collection*

The empirical analysis takes China's 31 provincial-level administrative units as cases, including provinces, autonomous regions, and centrally administered municipalities. This within-country design holds the national digital transformation agenda constant while preserving subnational variation in technological, organizational, and environmental conditions. These units provide standardized and comparable provincial-level digital governance indicators from official and statistical sources.

The data are drawn from three types of sources. First, official digital government reports provide standardized measures of digital governance performance and related institutional indicators. Second, statistical yearbooks provide demographic and infrastructure data. Third, institutional data on provincial digital governance agencies come from primary data collection, including official government websites, telephone consultations, and government information disclosure requests. Data collection was completed on 16 April 2023.

3.3. *Variable Measurement*

The study includes one outcome and six TOE-based implementation conditions, organized by the TOE framework. These six conditions were selected based on the digital governance literature reviewed in Section 2. The technological domain includes technological management capability and digital infrastructure development level. The organizational domain includes organizational strategy and attention to digital governance. The envi-

ronmental domain includes public demand and intergovernmental competitive pressure. Table 1 summarizes all measurement definitions and data sources.

Table 1. Variable Assignment, Measurement, and Data Sources.

Variable Type	Variables	Measurement Description	Data Sources
Condition variables	Technological Management Capability	Provincial governance capacity score	China Digital Government Development Research Report (2023)
Condition variables	Digital Infrastructure Development Level	Number of Internet broadband access ports per capita	2023 Statistical Yearbook of the National Bureau of Statistics of China
Condition variables	Organizational Strategy	Provincial institutional system score	China Digital Government Development Research Report (2023)
Condition variables	Attention to Digital Governance	Three-level coding based on provincial digital governance agency settings	Government websites, telephone consultations, and information disclosure requests
Condition variables	Public Demand	Ratio of mobile Internet users to permanent residents	2023 Statistical Yearbook of the National Bureau of Statistics of China
Condition variables	Intergovernmental Competitive Pressure	Average digital government development score of neighboring provinces	China Digital Government Development Research Report (2023)
Outcome variable	Public-Sector Digital Governance Performance	Provincial-level digital government development index	China Digital Government Construction Report (2023)

3.3.1. Outcome Variable

Public-sector digital governance performance is measured by the provincial digital government development index score from the China Digital Government Construction Report (2023). This indicator reflects the overall level of digital government development and digital governance capacity at the provincial level. Higher scores indicate stronger performance.

3.3.2. Condition Variables

Technological management capability is measured by the provincial governance capacity score from the China Digital Government Development Research Report (2023). This score captures the government's operational capacity to manage digital platforms, use data resources, deliver online services, maintain government–citizen interaction channels, and provide technological support for digital governance.

Digital infrastructure development level is measured by the number of Internet broadband access ports per capita. The data are sourced from the 2023 Statistical Yearbook of the National Bureau of Statistics of China and calculated as total broadband access ports divided by permanent resident population.

Organizational strategy is measured by the provincial institutional system score from the China Digital Government Development Research Report (2023). This indicator assesses policy documents and institutional arrangements related to digital government and the digital ecosystem, reflecting the strategic and institutional framework that guides provincial digital transformation. It is used to capture whether a province has established a relatively complete strategic and institutional arrangement for digital government implementation.

Attention to digital governance is coded according to the institutional standing of provincial digital governance agencies, capturing the formal organizational priority assigned to digital governance. A value of 3 is assigned when a specialized digital governance agency is directly under the provincial government or operates as a government department. A value of 2 is assigned when the relevant agency is managed by the government general office or by a functional department. A value of 1 is assigned when no specialized provincial digital governance agency exists. Data were obtained from official websites, telephone consultations, and information disclosure requests. This three-level coding reflects the degree to which digital governance is institutionally embedded in provincial administrative structures.

Public demand is measured by the ratio of mobile Internet users to permanent residents, using data from the 2023 Statistical Yearbook of the National Bureau of Statistics of China. This indicator is used as a proxy for potential public demand rather than direct service-use demand, given that it captures the population base and demand-side digital access conditions for mobile and online government services.

Intergovernmental competitive pressure is measured through geographic adjacency. For each province i , the set of neighboring provinces N_i is identified, and the arithmetic mean of their digital government development index scores is calculated as:

$$ICP_i = \frac{1}{n_i} \sum_{j \in N_i} DG_j \quad (1)$$

where ICP_i is the intergovernmental competitive pressure faced by province i , n_i is the number of neighboring provinces, N_i is the set of neighboring provinces, and DG_j is the digital government development index score of neighboring province j . This adjacency-based measure operationalizes the neighboring comparison and catch-up pressure emphasized in research on intergovernmental competition [9].

For Hainan, an island province without land-bordering neighboring provinces, this study follows the regional diffusion and policy-neighbor logic in policy diffusion research [65,66]. Guangdong, Guangxi, and Fujian are used as its southern coastal regional reference provinces, and the intergovernmental competitive pressure value is calculated using the arithmetic mean of the digital government development index scores of these three provinces.

4. Results

4.1. Data Calibration

Following standard QCA research practice, this study employs the direct calibration method. For continuous variables, the 95th, 50th, and 5th percentiles of each variable's empirical distribution are used as the qualitative anchors for full membership, crossover point, and full non-membership, respectively. This percentile-based strategy is appropriate for cross-provincial comparison, given the absence of externally established qualitative thresholds for most indicators and the need to preserve meaningful differences among the 31 provincial-level cases. For attention to digital governance, which is measured through a three-level institutional coding scheme, the values 3, 2, and 1 are used as the anchors for full membership, crossover point, and full non-membership, respectively. The possible influence of calibration choices on the stability of the configurations is further assessed through robustness checks. Table 2 reports the specific calibration anchors for all variables.

Table 2. Calibration Anchor Points of Variables.

Variable Type	Variables	Complete Non-Membership (5%)	Crossover Point (50%)	Complete Membership (95%)
Condition variables	Technological Management Capability	29.000	33.330	36.185
Condition variables	Digital Infrastructure Development Level	0.479	0.686	1.624
Condition variables	Organizational Strategy	9.065	13.000	14.690
Condition variables	Attention to Digital Governance	1.000	2.000	3.000
Condition variables	Public Demand	0.810	0.950	1.240
Condition variables	Intergovernmental Competitive Pressure	63.625	70.290	75.360
Outcome variable	Public-Sector Digital Governance Performance	65.010	70.890	84.550

4.2. Necessity Analysis

Necessity analysis examines whether any single condition is indispensable for high public-sector digital governance performance. In fsQCA research, a condition is conventionally considered necessary when its consistency exceeds 0.90. Applying this threshold, we evaluate whether any condition is consistently present among high-performing provinces.

As Table 3 shows, organizational strategy is the only condition that meets this threshold, with a consistency score of 0.955. This result indicates that high-performing units consistently exhibit a clear organizational strategy. By contrast, neither the other five conditions nor their negations reach the 0.90 consistency threshold. Accordingly, no other single technological, organizational, or environmental condition qualifies as necessary for high performance.

Table 3. Necessity Analysis of High and Non-High Public-Sector Digital Governance Performance.

Condition	High Public-Sector Digital Governance Performance: Consistency	High Public-Sector Digital Governance Performance: Coverage	Non-High Public-Sector Digital Governance Performance: Consistency	Non-High Public-Sector Digital Governance Performance: Coverage
Technological Management Capability	0.817	0.771	0.464	0.521
~Technological Management Capability	0.492	0.435	0.796	0.838
Digital Infrastructure Development Level	0.686	0.688	0.536	0.641
~Digital Infrastructure Development Level	0.642	0.538	0.739	0.737
Organizational Strategy	0.955	0.759	0.576	0.545
~Organizational Strategy	0.428	0.458	0.745	0.952
Attention to Digital Governance	0.848	0.614	0.726	0.626
~Attention to Digital Governance	0.483	0.597	0.552	0.812
Public Demand	0.674	0.672	0.589	0.699
~Public Demand	0.698	0.588	0.723	0.726
Intergovernmental Competitive Pressure	0.813	0.821	0.478	0.571
~Intergovernmental Competitive Pressure	0.575	0.482	0.850	0.843

Note: “~” indicates the absence of a condition. Consistency values greater than 0.900 are generally considered to indicate necessary conditions.

Crucially, necessity does not imply sufficiency. Although organizational strategy provides a common baseline across high-performing cases, it does not, by itself, account for high public-sector digital governance performance. This result shifts the interpretation from technological primacy to organizational anchoring: high performance first requires a strategic basis, but strategy alone does not complete the transition from digital transformation to effective governance. The absence of any individually decisive condition shifts the analysis toward policy pathways. The next section therefore examines how multiple TOE-based implementation conditions combine to support high performance across provincial governments.

4.3. Policy Pathways to High Digital Governance Performance

Sufficiency analysis examines whether specific combinations of technological, organizational, and environmental conditions are sufficient for high public-sector digital governance performance. For the truth-table analysis, this study uses a case frequency threshold of 1, a sufficiency consistency threshold of 0.80, and a proportional reduction in inconsistency (PRI) consistency threshold of 0.60. Following established QCA and configurational research practice [67–69], the frequency threshold is set at 1, given the medium-N design with 31 provincial-level cases and the need to retain empirically observed configurations. The sufficiency consistency threshold of 0.80 is used to identify configurations with sufficient set-theoretic consistency. The PRI consistency threshold of 0.60 is used to reduce contradictory configurations while preserving empirical diversity among the observed cases.

In fsQCA, complex, parsimonious, and intermediate solutions differ in their treatment of logical remainders during minimization. In this study, the three solution types are identical in both outcome analyses. This convergence indicates that logical remainders do not further simplify or change the minimized configurations under the specified frequency, raw consistency, and PRI consistency thresholds. Accordingly, the pathway tables report a single set of configurations, and core and peripheral conditions are not distinguished. Table 4 presents the resulting policy pathways to high public-sector digital governance performance.

The analysis reveals four pathways. The overall solution consistency is 0.893, and the overall solution coverage is 0.672. These values indicate that the reported pathways account for roughly two-thirds of the high-performance outcome-set membership, while the solution consistency remains well above the 0.80 sufficiency threshold.

The four pathways demonstrate that high performance does not depend on a single route; it emerges from multiple policy pathways. Organizational strategy, consistent with the necessity analysis, recurs across all four pathways. Technological management capability and attention to digital governance also recur across pathways, yet none of these conditions is independently sufficient. Their role is contingent on how they combine with digital infrastructure development level, public demand, and intergovernmental competitive pressure.

The other conditions—digital infrastructure development level, public demand, and intergovernmental competitive pressure—differentiate the pathways through their varying presence or absence across condition combinations. This pattern indicates equifinality: high performance can be reached through different condition combinations. Based on their condition structures, the four pathways can be classified into three implementation mechanisms: technology–organization synergy, competition–pressure reinforcement, and demand compensation. These mechanisms capture three implementation logics: internal capacity building, external pressure conversion, and demand-side compensation.

Table 4. Policy Pathways to High Public-Sector Digital Governance Performance.

Condition	Pathway 1	Pathway 2	Pathway 3	Pathway 4
Technological Management Capability	•	•	•	•
Digital Infrastructure Development Level	•		•	○
Organizational Strategy	•	•	•	•
Attention to Digital Governance	•	•	•	•
Public Demand	○	○		•
Intergovernmental Competitive Pressure		•	•	○
Raw Coverage	0.413	0.482	0.487	0.354
Unique Coverage	0.024	0.078	0.087	0.002
Consistency	0.889	0.940	0.914	0.918
Typical Case	Anhui (0.70, 0.75)	Shandong (0.57, 0.76)	Beijing (0.61, 0.98)	Guangxi (0.52, 0.50)
Mechanism	Technology–Organization Synergy	Competition–Pressure Reinforcement	Technology–Organization Synergy	Demand Compensation
Solution Consistency	0.893	0.893	0.893	0.893
Solution Coverage	0.672	0.672	0.672	0.672

Note: • = presence of a condition; ○ = absence of a condition; blank cells = condition not specified in the pathway. The complex, parsimonious, and intermediate solutions are identical; core and peripheral conditions are therefore not distinguished. Values in parentheses indicate pathway membership and outcome membership of the typical case, respectively.

The typical cases are used as illustrative evidence for the policy pathways; detailed official case materials for Anhui, Beijing, Shandong, and Guangxi are listed in Appendix A Table A2.

4.3.1. Technology–Organization Synergy Pathways

The technology–organization synergy mechanism, represented by Pathways 1 and 3, indicates that technological capacity supports high performance when embedded in a supportive organizational setting. Both pathways combine technological management capability, digital infrastructure development level, organizational strategy, and attention to digital governance.

Pathway 1 represents a foundational synergy pathway. It includes technological management capability, digital infrastructure development level, organizational strategy, and attention to digital governance, with public demand absent in the pathway. Anhui Province exemplifies this pathway. Its provincial digital government plan, data resource management institutions, and government service platform development reflect the joint presence of technological and organizational conditions. This case indicates that internal technological–organizational coordination can support high performance even when public demand is absent from the pathway. This indicates that technological and organizational conditions do not operate as independent drivers; their performance relevance emerges through coordinated implementation.

Pathway 3 represents a reinforced synergy pathway. It contains the same technological and organizational conditions as Pathway 1 and adds intergovernmental competitive pressure to the pathway. Beijing Municipality illustrates this pathway. Its digital government platforms, data governance capability, and government service reforms align with the combination of technological capacity and organizational support. Its capital-city function may

also intensify demonstration and comparison pressure. This pathway therefore indicates that competitive pressure can reinforce technology–organization synergy when the baseline technological and organizational conditions are already present.

4.3.2. Competition-Pressure Reinforcement Pathway

Pathway 2 constitutes the competition-pressure reinforcement mechanism. It combines technological management capability, organizational strategy, attention to digital governance, and intergovernmental competitive pressure. Digital infrastructure development level is not specified in the pathway, and public demand is absent.

This pathway indicates that intergovernmental competitive pressure does not operate independently. Its relevance to performance is contingent on the presence of technological management capability and organizational support. Competitive pressure may generate comparison, learning, and catch-up incentives, but these incentives are more likely to support high performance when public-sector organizations possess the capacity and strategic attention needed to translate pressure into action.

Shandong Province illustrates this pathway. Its digital government construction tasks, the “Ai Shandong” platform, and the “province without certificates” reform reflect the alignment of organizational strategy, platform-operation capability, and attention to digital governance. As a major eastern economic province, Shandong also faces intense regional competitive pressure. This case illustrates how intergovernmental competitive pressure can reinforce a high-performance policy pathway when coupled with internal technological and organizational conditions.

4.3.3. Demand-Compensation Pathway

Pathway 4 constitutes the demand-compensation mechanism. It includes technological management capability, organizational strategy, attention to digital governance, and public demand. Digital infrastructure development level and intergovernmental competitive pressure are absent in this pathway.

This pathway indicates that public demand can play a compensatory role when infrastructural or external-pressure conditions are weaker. Demand may heighten pressure for digital service improvement and strengthen responsiveness. However, public demand does not independently determine high performance; it appears in a high-performance pathway only when technological management capability, organizational strategy, and attention to digital governance are also present.

Given its low unique coverage, Pathway 4 remains theoretically meaningful but empirically limited: it shows that public demand may operate as a compensatory condition when infrastructural and external-pressure conditions are weaker. It is therefore treated as a supplementary policy pathway rather than a main explanation for high performance. The Guangxi Zhuang Autonomous Region offers an illustrative, though marginal, case: its enterprise- and citizen-oriented digital services, 12,345 government service hotline platform, and “Zhiguitong” platform are consistent with the demand-compensation logic. This case illustrates the boundary condition of the pathway: public demand may support digital governance performance when combined with organizational strategy and technological management capability, but the pathway has minimal independent coverage.

Overall, the sufficiency analysis shows that high public-sector digital governance performance is neither a technology-only outcome nor a result of organizational strategy or external pressure in isolation. It is supported by coherent policy pathways that combine technological, organizational, and environmental conditions. The four alternative pathways, organized into three implementation mechanisms, show how provincial-level digital governance reaches high performance through different forms of implementation alignment.

4.4. Non-High Performance Configurations and Causal Asymmetry

Table 5 reports the configurations associated with non-high public-sector digital governance performance. Four pathways are identified, with an overall solution coverage of 0.557 and an overall solution consistency of 0.989. A common feature across the four pathways is the absence of technological management capability, organizational strategy, and intergovernmental competitive pressure. This pattern suggests that non-high performance is closely associated with weak internal digital management capacity, limited strategic institutional support, and insufficient external competitive pressure.

Table 5. Policy Pathways to Non-High Public-Sector Digital Governance Performance.

Condition	Pathway N1	Pathway N2	Pathway N3	Pathway N4
Technological Management Capability	○	○	○	○
Digital Infrastructure Development Level	●	○		○
Organizational Strategy	○	○	○	○
Attention to Digital Governance	○	●	○	
Public Demand			○	○
Intergovernmental Competitive Pressure	○	○	○	○
Raw Coverage	0.271	0.413	0.331	0.476
Unique Coverage	0.015	0.043	0.009	0.000
Consistency	0.998	0.986	0.998	0.988
Typical Case	Ningxia (0.56, 0.88)	Xizang (0.77, 0.96)	Yunnan (0.74, 0.75)	Gansu (0.65, 0.90)
Solution Consistency	0.989	0.989	0.989	0.989
Solution Coverage	0.557	0.557	0.557	0.557

Note: ● = presence of a condition; ○ = absence of a condition; blank cells = condition not specified in the pathway. Values in parentheses indicate pathway membership and outcome membership of the typical case, respectively.

The four pathways also differ in their remaining conditions. Pathway N1 combines the absence of technological management capability, organizational strategy, attention to digital governance, and intergovernmental competitive pressure with the presence of digital infrastructure. Pathway N2 combines the absence of technological management capability, digital infrastructure, organizational strategy, and intergovernmental competitive pressure with the presence of attention to digital governance. Pathway N3 is characterized by the absence of technological management capability, organizational strategy, attention to digital governance, public demand, and intergovernmental competitive pressure. Pathway N4 combines the absence of technological management capability, digital infrastructure, organizational strategy, public demand, and intergovernmental competitive pressure.

The contrast between Tables 4 and 5 illustrates the causal asymmetry of digital governance performance. High-performance pathways are associated with different alignments of technological, organizational, and environmental conditions, while non-high performance pathways are concentrated around the joint absence of technological management capability, organizational strategy, and intergovernmental competitive pressure. Taken together, these results show that non-high performance is associated with a concentrated combination of weak technological capacity, limited organizational strategy, and insufficient competitive pressure.

4.5. Robustness Checks

We apply six robustness checks to evaluate the stability of the sufficiency results. First, the calibration anchors for continuous variables are adjusted from the 95th, 50th, and 5th percentiles to the 90th, 50th, and 10th percentiles. Second, the sufficiency consistency threshold is raised from 0.80 to 0.85, and the analysis of high public-sector digital governance performance is repeated. Third, selected regional cases are excluded, including Guangdong from the eastern region, Anhui from the central region, and Gansu from the western region, to test sensitivity to case composition. Fourth, the PRI consistency threshold is raised from 0.60 to 0.65 to further screen configurations that may simultaneously point to the outcome and its absence. Fifth, the public demand condition is replaced by province-level mobile Internet users, which captures the absolute scale of demand-side digital access. The alternative condition is recalibrated using the same direct calibration procedure. Sixth, as an additional common-source check, technological management capability and organizational strategy are removed from the configurational analysis given that both indicators are derived from the same specialized digital government report. The reduced model retains digital infrastructure development level, attention to digital governance, public demand, and intergovernmental competitive pressure.

The first robustness check directly examines whether the results are sensitive to calibration-anchor selection. After the calibration anchors are changed to the 90th, 50th, and 10th percentiles, the high-performance solution retains the same four configurational pathways as the main analysis, with a solution coverage of 0.642 and a solution consistency of 0.896. The non-high performance solution also retains four pathways, with a solution coverage of 0.536 and a solution consistency of 0.985. These results indicate that the main configurational logic remains stable under alternative calibration anchors.

The second, third, and fourth checks indicate that the main findings are not driven by a particular threshold setting or by selected regional cases. Raising the sufficiency consistency threshold to 0.85 retains the same four high-performance pathways as the main analysis. Removing selected regional cases produces a more conservative high-performance solution, with three retained pathways, a solution coverage of 0.652, and a solution consistency of 0.909. Applying stricter PRI screening also produces a more conservative high-performance solution, with three retained pathways, a solution coverage of 0.670, and a solution consistency of 0.910. These results do not overturn the core interpretation, given that the retained pathways continue to center on technological management capability, organizational strategy, attention to digital governance, and related technological or competitive conditions. They also show that more condition-dependent pathways, especially the demand-compensation pathway, are more sensitive to stricter screening and selected case composition. Taken together, these checks suggest that the technology–organization core remains the most stable component of high performance, while intergovernmental competitive pressure and demand compensation operate more conditionally.

The fifth robustness check shows that the main configurational logic remains stable after the measurement of public demand is replaced. The alternative-measurement check produces two high-performance pathways, with a solution coverage of 0.682 and a solution consistency of 0.898. Although the number of pathways is reduced compared with the main analysis, technological management capability, organizational strategy, and attention to digital governance remain central to high-performance configurations. The non-high performance solution has a coverage of 0.521 and a consistency of 0.999. These results indicate that the main findings are not sensitive to the specific measurement of public demand.

The sixth robustness check further reduces concerns about common-source measurement overlap. After technological management capability and organizational strategy are removed, the high-performance solution identifies two reduced pathways. The first

combines attention to digital governance, the absence of strong public demand, and inter-governmental competitive pressure. The second combines digital infrastructure development, attention to digital governance, and intergovernmental competitive pressure. The solution coverage is 0.706, and the solution consistency is 0.923. The non-high performance solution has a coverage of 0.721 and a consistency of 0.870. These results indicate that the main configurational interpretation remains substantively stable after the two report-based indicators are excluded.

Overall, the robustness checks support a bounded but stable interpretation of the main findings. The results indicate that the core conclusions are not materially sensitive to calibration-anchor selection, threshold settings, selected case composition, the measurement of public demand, or the inclusion of two report-based indicators. High performance remains associated with the alignment of technological, organizational, and environmental conditions, while non-high performance remains associated with the absence or weakness of key supporting conditions.

5. Discussion

5.1. Theoretical Contributions

The findings of this study advance digital governance research in three main ways.

First, the findings support a policy-pathway understanding of public-sector digital governance performance. Existing research has identified multiple factors associated with digital governance performance, including technological resources, organizational capacity, public participation, and environmental conditions. The results show that these conditions do not operate through simple addition. High performance is associated with coherent policy pathways formed by multiple conditions. This shifts the explanation from the net effects of individual variables to the implementation alignment of technological, organizational, and environmental conditions.

Second, this study formulates an organizational anchoring argument for digital governance. Organizational strategy is the only condition that reaches the conventional necessity threshold, which indicates its common role in high-performance cases. At the same time, it is not sufficient on its own. Strategy anchors digital transformation, but it must be connected with technological management capability and attention to digital governance to support high performance. Organizational strategy is therefore a necessary foundation, not a stand-alone route to high performance.

Third, this study unpacks three implementation mechanisms that explain how TOE-based implementation conditions combine to support high performance. The technology–organization synergy mechanism shows how technological foundations become performance-relevant when embedded in organizational arrangements. The competition-pressure reinforcement mechanism shows how external pressure can support high performance when translated through internal technological and organizational capacity. The demand-compensation mechanism shows how public demand may play a supplementary role when infrastructural or external-pressure conditions are weaker. These mechanisms also highlight the alternative and asymmetric nature of digital governance performance: the same high-performance outcome can be reached through different condition combinations, and non-high performance should not be treated as a simple mirror image of high performance.

These mechanisms can be placed within broader debates on digital governance and policy implementation. Existing studies have shown that digital government performance is shaped by technological capacity, organizational support, external pressure, and citizen demand [10,27,31,39–47,70–73]. The configurational results extend this line of research by showing how these conditions work together in different implementation contexts.

Technology and organization reinforce each other when infrastructure and management capacity are supported by clear strategy and administrative attention [10,27–31,70,71]. Competitive pressure becomes more relevant when governments have the internal capacity to absorb external comparison and translate it into implementation efforts [46,47,65,66]. Public demand, meanwhile, can help sustain performance under weaker infrastructural or competitive conditions when it is combined with organizational strategy and governmental attention [39–45]. In this way, the three mechanisms show that digital governance performance depends on the alignment of conditions within specific implementation pathways, not on isolated conditions alone. This finding extends the TOE framework by linking condition domains with pathway-based implementation explanations and contributes to digital governance research by clarifying why different provinces can achieve similar performance through different combinations of technological, organizational, and environmental conditions.

5.2. Practical Implications

The findings of this study provide practical guidance for decision makers by linking each implementation mechanism with a specific policy diagnosis. Instead of adopting a uniform digital governance reform package, provincial governments should first identify which conditions constrain their current performance. The identified pathways can help determine whether reform priorities should focus on technological capacity, organizational support, competitive pressure, or demand-side responsiveness.

For the technology–organization synergy mechanism, the main recommendation is to connect technological investment with organizational embedding. This approach is most relevant for provinces with relatively strong digital infrastructure and technological management capability. For these governments, the key task is to align platforms, data systems, and service redesign with strategic planning, institutional responsibility, data governance rules, and cross-departmental coordination.

For the competition–pressure reinforcement mechanism, the main recommendation is to convert external comparison into internal learning and implementation improvement. This approach is most relevant for provinces exposed to strong intergovernmental competition, benchmarking, rankings, or pilot evaluations. Competitive pressure becomes useful when governments have the technological and organizational capacity to absorb comparison, identify gaps, and improve service delivery.

For the demand–compensation mechanism, the main recommendation is to use public demand to guide targeted service improvement. This approach is especially relevant for provinces where infrastructure or competitive pressure is weaker but citizen demand remains strong. Governments should prioritize high-frequency public services, simplify service access, improve mobile service usability, and strengthen feedback channels. In such contexts, public demand can become a practical source of performance improvement when it is supported by organizational strategy and sustained governmental attention.

Together, the pathway interpretations and mechanism-based recommendations show how configurational results can inform differentiated governance strategies, not only describe formal set-theoretic patterns. These implications are also relevant beyond China, especially for countries with national digital government agendas but uneven local implementation capacity. In federal, decentralized, or multilevel governance systems, local governments often differ in technological resources, organizational commitment, citizen demand, and exposure to benchmarking or national evaluation. The findings suggest that decision makers in these contexts should match reform priorities with local institutional and regional conditions. Regions with stronger technological foundations may prioritize organizational coordination, regions under stronger external comparison may focus on

learning and implementation adjustment, and resource-constrained regions may use citizen demand to guide more targeted and incremental service improvement.

6. Conclusions

This study explains how technological, organizational, and environmental implementation conditions combine into policy pathways to high public-sector digital governance performance. Drawing on the TOE framework, this study specifies six TOE-based implementation conditions: technological management capability, digital infrastructure development level, organizational strategy, attention to digital governance, public demand, and intergovernmental competitive pressure. The empirical analysis applies fsQCA to 31 provincial-level administrative units in China to assess necessary conditions and identify sufficient policy pathways associated with high performance.

The results reveal that organizational strategy is a necessary but insufficient organizational anchor for high public-sector digital governance performance. No single condition supports high performance on its own. Rather, high performance is achieved through multiple policy pathways, which are summarized into three implementation mechanisms: technology–organization synergy, competition–pressure reinforcement, and demand compensation. These results support an implementation alignment principle: digital governance performance improvement requires the alignment of technological foundations, organizational arrangements, and environmental pressures rather than isolated investment expansion or uniform template replication.

This study has three analytical boundaries. First, the use of aggregated provincial-level data may conceal variation across cities, counties, departments, or digital service platforms within provinces. Second, the cross-sectional design captures configurational patterns in one period, but cannot explain how digital governance pathways change over time. Third, the analysis focuses on condition combinations associated with performance, rather than the internal administrative processes through which these conditions are implemented. Future research could use longitudinal or dynamic QCA, extend the analysis to lower administrative levels, and develop multilevel designs that connect provincial strategies with local implementation processes.

Author Contributions: Conceptualization, Y.W., M.L. and N.Z.; methodology, Y.W., M.L. and N.Z.; software, J.L.; validation, M.L., B.H. and Z.W.; formal analysis, M.L. and J.L.; investigation, M.L., B.H. and J.L.; resources, Y.W. and N.Z.; data curation, M.L. and J.L.; writing—original draft preparation, M.L.; writing—review and editing, M.L. and N.Z.; visualization, M.L. and J.L.; supervision, Y.W. and N.Z.; project administration, N.Z.; funding acquisition, Y.W. and N.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This study was funded by the National Natural Science Foundation of China (Grant No. 72504190) and the Humanities and Social Sciences Project of the Ministry of Education of China (Grant No. 24YJC630236).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

Acknowledgments: The authors gratefully acknowledge the institutional support provided during the preparation of this manuscript.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

This appendix lists supplementary policy, evaluation, report, and case materials used as contextual or illustrative source materials rather than formal literature references.

Table A1. National Policy Documents, Evaluation Materials, and Contextual Reports.

Source Code	Source and Issuer	Year/Type	Use in This Study and URL
A1	The 14th Five-Year Plan for National Informatization; Central Cyberspace Affairs Commission	2021; national policy plan	Supports the inclusion of digital government construction in the national informatization agenda and Digital China strategy. URL: https://www.cac.gov.cn/2021-12/27/c_1642205312337636.htm (accessed on 22 May 2026).
A2	The 14th Five-Year Plan for Advancing National Government Informatization; National Development and Reform Commission	2021/2022; national government-informatization plan	Shows that government informatization and digital government construction were treated as national-level administrative modernization tasks. URL: https://www.ndrc.gov.cn/xxgk/zcfb/ghwb/202201/t20220106_1311499.html (accessed on 22 May 2026).
A3	Guiding Opinions on Strengthening Digital Government Construction; State Council/official government source	2022; national policy document	Shows direct national-level policy attention to strengthening digital government construction and improving government digital capacity. URL: https://www.nia.gov.cn/n741440/n741547/c1562629/content.html (accessed on 22 May 2026).
A4	Overall Layout Plan for Digital China Construction; CPC Central Committee and State Council	2023; national strategic plan	Shows the top-level strategic positioning of Digital China and the role of digital government within the national digital transformation agenda. URL: https://www.gov.cn/zhengce/2023-02/27/content_5743484.htm (accessed on 22 May 2026).
A5	Digital government performance evaluation in China: Theory and practice; Wang W. L., E-Government	2022; performance-evaluation source	Describes China's digital government performance evaluation practices.
A6	China City Digital Governance Report (2023) released: Shanghai and Beijing lead in digital governance level; China Economic Information Service/Xinhua Finance	2023; online report/contextual data source	Documents regional variation in digital governance performance and supports the background statement on uneven digital governance development. URL: https://www.cnfin.com/cy-lb/detail/20231111/3963344_1.html (accessed on 22 May 2026).

Table A2. Official Case Materials for the Configurational Pathways.

Case	Pathway	Evidence Type	Source Title	Issuing Body/Year	URL
Anhui	Pathway 1	Policy plan	Notice of the Anhui Provincial People's Government on Issuing the Anhui Digital Government Construction Plan (2020–2025)	Anhui Provincial People's Government, 2020	https://www.ah.gov.cn/public/1681/553919201.html (accessed on 22 May 2026).
Anhui	Pathway 1	Policy plan	Notice on Issuing the Overall Plan for the Construction of “Digital Jianghuai” (2020–2025)	Anhui Provincial Data Resources Administration, 2020	https://sjzy.ah.gov.cn/public/7061/39986325.html (accessed on 22 May 2026).
Anhui	Pathway 1	Government service material	Policy Subsidy Funds Are Delivered with “No Application Required”	Anhui Provincial People's Government, 2024	https://www.ah.gov.cn/zwyw/jryw/565446851.html (accessed on 22 May 2026)
Beijing	Pathway 3	Work plan	2022 Work Summary and 2023 Work Plan of Beijing Municipal Government Service Administration	Beijing Municipal Government Service Administration, 2023	https://zwfwj.beijing.gov.cn/zwgk/zfxgk/fdzdgnr/gkghjh/202303/t20230316_2937745.html (accessed on 22 May 2026).
Beijing	Pathway 3	Government reply	Reply to Proposal No. 0290 of the Second Session of the 16th Beijing Municipal People's Congress	Beijing Municipal Government Service and Data Management Bureau, 2024	https://zwfwj.beijing.gov.cn/zwgk/jyta/202408/t20240829_3784510.html (accessed on 22 May 2026).
Beijing	Pathway 3	Government report	Government Work Report 2023	Beijing Municipal People's Government, 2023	https://www.beijing.gov.cn/gongkai/jihua/zfgzbg/202301/t20230128_2907344.html (accessed on 22 May 2026).
Shandong	Pathway 2	Policy document	Notice on Issuing the Implementation Plan for Digital Government Construction in Shandong Province	Shandong Provincial People's Government, 2023	http://gb.shandong.gov.cn/art/2023/3/13/art_100623_42282.html (accessed on 22 May 2026).
Shandong	Pathway 2	Platform material	“Ai Shandong” Government Service Platform: Big Data Helps Efficiently Complete One Thing	Science Popularization China, 2024	https://www.kepuchina.cn/article/articleinfo?business_type=100&ar_id=514444 (accessed on 22 May 2026).
Shandong	Pathway 2	Policy material	Policy Documents on the Construction of a “No-Certificate City”	Shouguang Municipal People's Government, 2023	https://www.shouguang.gov.cn/zt/wzmcsjs/zcwj/202308/t20230808_6231221.html (accessed on 22 May 2026).
Guangxi	Pathway 4	Government service material	By 2025, the Framework of a Digital Government System Will Be Basically Formed	Guangxi Daily, 2022	https://epaper.gxrb.com.cn/gxrb2/html/2022-12/19/content_1896279.htm (accessed on 22 May 2026).

References

1. Feng, Y.; Liu, G.; Meng, X.; Jiang, K.; Huang, R.; Zhang, C.; Shi, J.; Pan, Y. How does digital government affect carbon intensity at the global level? New perspective of resource allocation optimization. *Resour. Policy* **2024**, *94*, 105108. [[CrossRef](#)]
2. Latupeirissa, J.J.P.; Dewi, N.L.Y.; Prayana, I.K.R.; Srikandi, M.B.; Ramadiansyah, S.A.; Pramana, I.B.G.A.Y. Transforming public service delivery: A comprehensive review of digitization initiatives. *Sustainability* **2024**, *16*, 2818. [[CrossRef](#)]
3. Morgeson, F.V., III; VanAmburg, D.; Mithas, S. Misplaced trust? Exploring the structure of the e-government-citizen trust relationship. *J. Public Adm. Res. Theory* **2011**, *21*, 257–283. [[CrossRef](#)]

4. Nicholls, T. Local government performance, cost-effectiveness, and use of the web: An empirical analysis. *Policy Internet* **2019**, *11*, 480–507. [[CrossRef](#)]
5. Shin, B.; Floch, J.; Rask, M.; Bæck, P.; Edgar, C.; Berdichevskaia, A.; Mesure, P.; Branlat, M. A systematic analysis of digital tools for citizen participation. *Gov. Inf. Q.* **2024**, *41*, 101954. [[CrossRef](#)]
6. Tolbert, C.J.; Mossberger, K. The effects of e-government on trust and confidence in government. *Public Adm. Rev.* **2006**, *66*, 354–369. [[CrossRef](#)]
7. Welch, E.W.; Hinnant, C.C.; Moon, M.J. Linking citizen satisfaction with e-government and trust in government. *J. Public Adm. Res. Theory* **2005**, *15*, 371–391. [[CrossRef](#)]
8. Tornatzky, L.G.; Fleischer, M.; Chakrabarti, A.K. *Processes of Technological Innovation*; Lexington Books: Lexington, MA, USA, 1990.
9. Wang, Y.; Ran, B.; Ma, L. Decoding paradoxes in digital government: Strategies for the pursuit of public value. *Public Adm.* **2026**, *104*, 188–201. [[CrossRef](#)]
10. Zhang, H.; Zhu, Z. Mobile government service promotion strategies: Exploring sustainable development pathways based on provincial government practices in China. *Sustainability* **2024**, *16*, 7191. [[CrossRef](#)]
11. Moynihan, D.P.; Pandey, S.K. The big question for performance management: Why do managers use performance information? *J. Public Adm. Res. Theory* **2010**, *20*, 849–866. [[CrossRef](#)]
12. Andersen, K.N.; Medaglia, R.; Vatrapu, R.; Henriksen, H.Z.; Gauld, R. The forgotten promise of e-government maturity: Assessing responsiveness in the digital public sector. *Gov. Inf. Q.* **2011**, *28*, 439–445. [[CrossRef](#)]
13. Mergel, I.; Edelman, N.; Haug, N. Defining digital transformation: Results from expert interviews. *Gov. Inf. Q.* **2019**, *36*, 101385. [[CrossRef](#)]
14. Da Cruz, N.F.; Marques, R.C. Revisiting the determinants of local government performance. *Omega* **2014**, *44*, 91–103. [[CrossRef](#)]
15. Sousa-Zomer, T.T.; Neely, A.; Martinez, V. Digital transforming capability and performance: A microfoundational perspective. *Int. J. Oper. Prod. Manag.* **2020**, *40*, 1095–1128. [[CrossRef](#)]
16. Zhang, L.; Zhang, X. Impact of digital government construction on the intelligent transformation of enterprises: Evidence from China. *Technol. Forecast. Soc. Change* **2025**, *210*, 123787. [[CrossRef](#)]
17. Prybutok, V.R.; Zhang, X.; Ryan, S.D. Evaluating leadership, IT quality, and net benefits in an e-government environment. *Inf. Manag.* **2008**, *45*, 143–152. [[CrossRef](#)]
18. Benavides, A.D.; Nukpezah, J.; Keyes, L.M.; Soujaa, I. Adoption of multilingual state emergency management websites: Responsiveness to the risk communication needs of a multilingual society. *Int. J. Public Adm.* **2021**, *44*, 409–419. [[CrossRef](#)]
19. Sillah, A.; Nukpezah, J.A.; Kamau, F. Web-based accountability among united way of Texas chapters. *Public Organ. Rev.* **2020**, *20*, 771–787. [[CrossRef](#)]
20. Dong, C.; Zhang, Y.; Zheng, L. How to enhance data sharing in digital government construction: A tripartite stochastic evolutionary game approach. *Systems* **2023**, *11*, 212. [[CrossRef](#)]
21. Maciejewski, M. To do more, better, faster and more cheaply: Using big data in public administration. *Int. Rev. Adm. Sci.* **2017**, *83*, 120–135. [[CrossRef](#)]
22. Angelidou, M. Smart city policies: A spatial approach. *Cities* **2014**, *41*, S3–S11. [[CrossRef](#)]
23. Li, W.; Zhang, J.; Guo, X.; Zhou, Y.; Yang, F.; Li, R. Digitally driven urban governance: Framework and evaluation in China. *Sustainability* **2024**, *16*, 9673. [[CrossRef](#)]
24. Liu, J.; Liu, X.; Yang, J. TOE configuration analysis of smart city construction in China under the concept of sustainable development. *Sustainability* **2024**, *16*, 10708. [[CrossRef](#)]
25. Nukpezah, J.; Abutabenjeh, S.; Azhar, A. Do smart cities technologies contribute to revenue performance? Evidence from U.S. local governments. *Public Perform. Manag. Rev.* **2022**, *45*, 1155–1180. [[CrossRef](#)]
26. Tang, T.; Ho, A.T.-K. A path-dependence perspective on the adoption of Internet of things: Evidence from early adopters of smart and connected sensors in the United States. *Gov. Inf. Q.* **2019**, *36*, 321–332. [[CrossRef](#)]
27. Zhou, W.; Lyu, Z.; Chen, S. Mechanisms influencing the digital transformation performance of local governments: Evidence from China. *Systems* **2024**, *12*, 30. [[CrossRef](#)]
28. 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](#)]
29. Wilson, C.; Mergel, I. Overcoming barriers to digital government: Mapping the strategies of digital champions. *Gov. Inf. Q.* **2022**, *39*, 101681. [[CrossRef](#)]
30. Yu, J.; Dai, P. Opening the “Black-Box” of Digital Governance Capabilities Formation across Chinese Local Governments—A Comparative Case Study. *Chin. Public Adm.* **2021**, *1*, 36–41 + 78. (In Chinese) [[CrossRef](#)]
31. Marienfeldt, J.; Wehmeier, L.M.; Kuhlmann, S. Top-down or bottom-up digital transformation? A comparison of institutional changes and outcomes. *Public Money Manag.* **2025**, *45*, 456–465. [[CrossRef](#)]
32. Das, A.; Singh, H.; Joseph, D. A longitudinal study of e-government maturity. *Inf. Manag.* **2017**, *54*, 415–426. [[CrossRef](#)]

33. Ingrams, A.; Manoharan, A.; Schmidhuber, L.; Holzer, M. Stages and determinants of e-government development: A twelve-year longitudinal study of global cities. *Int. Public Manag. J.* **2020**, *23*, 731–769. [\[CrossRef\]](#)
34. Singh, H.; Das, A.; Joseph, D. Country-level determinants of e-government maturity. *Commun. Assoc. Inf. Syst.* **2007**, *20*, 632–648. [\[CrossRef\]](#)
35. Wu, Y.H.; Bauer, J.M. E-government in China: Deployment and driving forces of provincial government portals. *Chin. J. Commun.* **2010**, *3*, 290–310. [\[CrossRef\]](#)
36. Wang, Y.; Zhang, X.; Lin, F.; Peng, M. The role of digital governance on carbon emission performance: Evidence from the cities in Yangtze River Delta, China. *Environ. Res. Commun.* **2023**, *5*, 085013. [\[CrossRef\]](#)
37. Xu, X.; Dai, M. Evaluation of local government digital governance ability and sustainable development: A case study of Hunan Province. *Sustainability* **2024**, *16*, 6084. [\[CrossRef\]](#)
38. Xiong, B.; Yu, B.; Tang, Y. Digital government construction and common prosperity in China: Effect and transmission channel. *Sustainability* **2025**, *17*, 9047. [\[CrossRef\]](#)
39. Bright, J.; Margetts, H. Big data and public policy: Can it succeed where e-participation has failed? *Policy Internet* **2016**, *8*, 218–224. [\[CrossRef\]](#)
40. Chen, J.; Pan, J.; Xu, Y. Sources of authoritarian responsiveness: A field experiment in China. *Am. J. Political Sci.* **2016**, *60*, 383–400. [\[CrossRef\]](#)
41. Kim, S.; Lee, J. E-participation, transparency, and trust in local government. *Public Adm. Rev.* **2012**, *72*, 819–828. [\[CrossRef\]](#)
42. Lindquist, E.A.; Huse, I. Accountability and monitoring government in the digital era: Promise, realism and research for digital-era governance. *Can. Public Adm.* **2017**, *60*, 627–656. [\[CrossRef\]](#)
43. 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. [\[CrossRef\]](#)
44. Margetts, H.; Dunleavy, P. The second wave of digital-era governance: A quasi-paradigm for government on the web. *Philos. Trans. R. Soc. A Math. Phys. Eng. Sci.* **2013**, *371*, 20120382. [\[CrossRef\]](#) [\[PubMed\]](#)
45. Su, Z.; Meng, T. Selective responsiveness: Online public demands and government responsiveness in authoritarian China. *Soc. Sci. Res.* **2016**, *59*, 52–67. [\[CrossRef\]](#) [\[PubMed\]](#)
46. Liu, Z.; Jiang, C.; Jin, H.; Zhang, W. Digital innovation diffusion of local government under public crisis: An event history analysis based on the City Brain. *Cities* **2025**, *160*, 105811. [\[CrossRef\]](#)
47. Ye, M.; Hao, W.; Meng, X. Intergovernmental policy signal transmission and open government data platform pilot diffusion in China. *Asian Surv.* **2024**, *64*, 79–115. [\[CrossRef\]](#)
48. Li, Y.-D.; Yan, C.-L.; Zhao, Y.-H.; Bai, J.-Q. Analysing multiple paths of urban low-carbon governance: A fuzzy-set qualitative comparative analysis method based on 35 key cities in China. *Sustainability* **2023**, *15*, 7613. [\[CrossRef\]](#)
49. He, X.; Chen, W. Digital transformation and environmental, social, and governance performance from a human capital perspective. *Sustainability* **2024**, *16*, 4737. [\[CrossRef\]](#)
50. Jing, L.; Li, Q.; Chen, Y.; An, Q. How digital transformation facilitates ESG performance in heavy-polluting enterprises: A panel fsQCA based on national big data comprehensive pilot zones. *Technol. Forecast. Soc. Change* **2025**, *221*, 124366. [\[CrossRef\]](#)
51. Kuan, K.K.; Chau, P.Y. A perception-based model for EDI adoption in small businesses using a Technology-Organization-Environment framework. *Inf. Manag.* **2001**, *38*, 507–521. [\[CrossRef\]](#)
52. Lian, J.-W.; Yen, D.C.; Wang, Y.-T. An exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital. *Int. J. Inf. Manag.* **2014**, *34*, 28–36. [\[CrossRef\]](#)
53. Mishra, A.N.; Konana, P.; Barua, A. Antecedents and consequences of Internet use in procurement: An empirical investigation of U.S. manufacturing firms. *Inf. Syst. Res.* **2007**, *18*, 103–120. [\[CrossRef\]](#)
54. Pinto, A.S.; Abreu, A.; Pérez Cota, M.; Paiva, J. A meta-analysis of TOE factors driving organizational adoption of artificial intelligence across industries. *Discov. Artif. Intell.* **2025**. [\[CrossRef\]](#)
55. Thong, J.Y. An integrated model of information systems adoption in small businesses. *J. Manag. Inf. Syst.* **1999**, *15*, 187–214. [\[CrossRef\]](#)
56. Yin, W. Does digital transformation matter to green innovation: Based on TOE framework and configuration perspective. *Environ. Sci. Pollut. Res.* **2023**, *30*, 100046–100057. [\[CrossRef\]](#) [\[PubMed\]](#)
57. Zhu, K.; Kraemer, K.L. Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. *Inf. Syst. Res.* **2005**, *16*, 61–84. [\[CrossRef\]](#)
58. Zhu, K.; Kraemer, K.; Xu, S. Electronic business adoption by European firms: A cross-country assessment of the facilitators and inhibitors. *Eur. J. Inf. Syst.* **2003**, *12*, 251–268. [\[CrossRef\]](#)
59. Ketchen, D.J., Jr.; Thomas, J.B.; Snow, C.C. Organizational configurations and performance: A comparison of theoretical approaches. *Acad. Manag. J.* **1993**, *36*, 1278–1313. [\[CrossRef\]](#)
60. Misangyi, V.F.; Greckhamer, T.; Furnari, S.; Fiss, P.C.; Crilly, D.; Aguilera, R. Embracing causal complexity: The emergence of a neo-configurational perspective. *J. Manag.* **2017**, *43*, 255–282. [\[CrossRef\]](#)

61. Ragin, C.C. *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies*; University of California Press: Berkeley, CA, USA, 1987.
62. Shang, M.; Jia, C.; Zhong, L.; Cao, J. What determines the performance of digital transformation in manufacturing enterprises? A study on the linkage effects based on fsQCA method. *J. Clean. Prod.* **2024**, *450*, 141856. [[CrossRef](#)]
63. Tóth, Z.; Henneberg, S.C.; Naudé, P. Addressing the ‘qualitative’ in fuzzy set qualitative comparative analysis: The generic membership evaluation template. *Ind. Mark. Manag.* **2017**, *63*, 192–204. [[CrossRef](#)]
64. Zhang, M.; Li, B.; Yin, S. Configurational paths to regional innovation performance: The interplay of innovation elements based on a fuzzy-set qualitative comparative analysis approach. *Technol. Anal. Strateg. Manag.* **2020**, *32*, 1422–1435. [[CrossRef](#)]
65. Berry, F.S.; Berry, W.D. State lottery adoptions as policy innovations: An event history analysis. *Am. Political Sci. Rev.* **1990**, *84*, 395–415. [[CrossRef](#)]
66. Mallinson, D.J. Who are your neighbors? The role of ideology and decline of geographic proximity in the diffusion of policy innovations. *Policy Stud. J.* **2021**, *49*, 67–88. [[CrossRef](#)]
67. Ragin, C.C. *Redesigning Social Inquiry: Fuzzy Sets and Beyond*; University of Chicago Press: Chicago, IL, USA, 2008.
68. Schneider, C.Q.; Wagemann, C. *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis*; Cambridge University Press: Cambridge, UK, 2012. [[CrossRef](#)]
69. Fiss, P.C. Building better causal theories: A fuzzy set approach to typologies in organization research. *Acad. Manag. J.* **2011**, *54*, 393–420. [[CrossRef](#)]
70. Haug, N.; Dan, S.; Mergel, I. Digitally-induced change in the public sector: A systematic review and research agenda. *Public Manag. Rev.* **2024**, *26*, 1963–1987. [[CrossRef](#)]
71. Mikalef, P.; Lemmer, K.; Schaefer, C.; Ylinen, M.; Fjærtøft, S.O.; Torvatn, H.Y.; Gupta, M.; Niehaves, B. Examining how AI capabilities can foster organizational performance in public organizations. *Gov. Inf. Q.* **2023**, *40*, 101797. [[CrossRef](#)]
72. Zyzak, B.; Sienkiewicz-Małyjurek, K.; Jensen, M.R. Public value management in digital transformation: A scoping review. *Int. J. Public Sect. Manag.* **2024**, *37*, 845–863. [[CrossRef](#)]
73. OECD. *Government at a Glance 2025*; OECD Publishing: Paris, France, 2025. [[CrossRef](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.