# A Study on the Adoption of Digital Technologies by Government Organizations in the Information Age

HU Ying

Business School University of Shanghai for Science and Technology, Shanghai, 200093 ;

**Abstract:** Digital technologies including cloud computing, big data, and AI are reshaping government governance. Based on the TOE framework, this paper explores the logic and pathways of government digital technology adoption, analyzing key factors in three dimensions: technological (maturity, security, interoperability), organizational (leadership, resources, culture), and environmental (policies, social demands). It identifies core challenges such as system integration barriers, security risks, organizational resistance, policy lag, and the digital divide, and constructs an integrated countermeasure system covering technology governance, organizational transformation, and inclusive ecosystem building. The findings confirm that government digital adoption is a multidimensional, systemic process governed by the "factor-challenge-countermeasure" logic, providing a practical roadmap for digital transformation and validating the TOE framework's effectiveness in this field.

**Keywords:** Technology Adoption; Digital Technology; Government Organizations; TOE Framework; Digital Transformation; Integrated Countermeasures

**DOI**:10.69979/3041-0843.25.01.064

## 1 Introduction

With the advancement of the information age, government adoption of digital technologies has become key to modern development.The widespread application of information technology can enhance government efficiency, strengthen service capabilities, and drive governance innovation, playing a vital role in achieving the goals of a digital and intelligent government[1] .However, the adoption of digital technologies involves issues across multiple dimensions — technical, organizational, and environmental—and its success is influenced by numerous factors[2] .Thus, in-depth research on its current status and influencing factors holds significant theoretical and practical value for advancing government modernization.

Government digital technology adoption is not a simple technology introduction, but a complex systems engineering project involving technology, organization, institutions, and environment. It faces challenges like technology integration, management adaptation, and cultural acceptance.Although discussions on enhancing government performance through information technology have garnered significant attention within the New Public Management movement since the 1970s, and both domestic and international academia have accumulated extensive research findings, existing literature predominantly focuses on the acceptance behaviors of external users such as the public and businesses toward government information technology[3] ,Systematic research on how government organizations make decisions, adopt, and manage digital technologies remains insufficient. Particularly driven by Web 2.0, social media, and next-generation mobile internet technologies, government agencies are increasingly active in adopting digital technologies. This topic should become a key research focus at the intersection of public administration and information science[4] .

Therefore, based on the information age context, this paper systematically explores the theoretical logic and practical pathways of government digital technology adoption. It reviews theoretical foundations and technology evolution, analyzes the application status of digital technologies in Chinese government organizations, dissects key influencing factors from three dimensions (technology, organization, environment), identifies core adoption challenges, and proposes targeted strategies — aiming to provide theoretical reference and practical guidance for government digital transformation and governance modernization.

# 2 Research Status and Theoretical Framework

## 2.1 Research on Government Information Technology Adoption

Government information technology adoption research is rooted in the literature on policy innovation and technological innovation, fundamentally addressing how governments make decisions and manage information technology. The adoption of new technologies involves deviating from organizational practices, expending organizational resources, and inducing significant behavioral changes[5] ,thus, it is not just a technical process but a multidimensional, complex social process.

Early studies predominantly followed a technical rationality approach, focusing on the characteristics of technology itself. For instance, Rogers' diffusion of innovations theory emphasized that perceived innovation attributes such as “relative advantage” and “compatibility” are key drivers of organizational adoption[6] .Subsequently, the research focus shifted from the technology itself to individual perceptions within organizations. Davis's Technology Acceptance Model (TAM) indicates that “perceived usefulness” and “perceived ease of use” are the decisive factors influencing users' acceptance of technology[7] .However, the aforementioned perspective fails to adequately incorporate the complex constraints at the organizational level and the influence of the external environment. In recent years, scholars have increasingly recognized that the adoption of government information technology is not a singular technological or individual act, but rather a strategic decision-making process embedded within specific organizational institutions and external environments[8] .

## 2.2 TOE Theoretical Framework and Its Applicability

To systematically analyze the complex process of government technology adoption, a comprehensive analytical framework capable of integrating technology, organizational factors, and the external environment is required.The TOE framework (Technology-Organization-Environment) was first proposed by Tornatzky, L.G. and Fleisher, M. in 1990. Initially emphasizing the impact of information technology itself on technology adoption, it subsequently evolved into a multidimensional analytical framework that comprehensively considers organizational and environmental factors[9] .Based on the widely used Technology-Organization-Environment (TOE) framework for explaining technology adoption, technological conditions, organizational conditions, and environmental conditions are the key factors influencing an organization's adoption of technology[10] .

Compared with innovation diffusion theory (focused on technology) or TAM (focused on individual cognition), TOE has unique explanatory power for government sectors (subject to strong institutional constraints) due to its comprehensiveness and context sensitivity. First, it integrates technological factors, internal organizational constraints (bureaucracy, culture, resources), and external environments (national policies, social demands) into a unified perspective, avoiding single-view limitations. Second, it aligns with government realities: government decisions balance technical feasibility, organizational adaptability, and political legitimacy, and TOE provides a structured path to analyze this interplay.

Given TOE’s systematicity and applicability, this paper uses it as the core analytical framework to deconstruct government digital technology adoption. Subsequent analysis will: 1) examine key factors (technology, organization, environment) driving/constraining adoption; 2) identify core challenges from factor interactions; 3) build integrated countermeasures based on "factor-challenge" logic.

# 3 Analysis of Key Factors Influencing Government Digital Technology Adoption Based on the TOE Framework

Based on the TOE framework in Chapter 2, this chapter analyzes key factors influencing government digital technology adoption from three dimensions, laying a foundation for understanding adoption logic and challenges.

## 3.1 Technological Dimension: Fundamental Constraints of Technical Characteristics

Under the TOE technological dimension, digital technology attributes are core to adoption decisions. First, technology maturity and stability determine reliability: governments prioritize verified core system solutions to balance operational

continuity and innovation benefits. Second, system interoperability is critical: legacy systems with divergent data formats/standards require new technologies to have standardized interfaces and flexibility for data and business integration. Third, technological security is mandatory: government data (privacy, national security) demands systems with encryption, access control, and zero-trust architecture. Finally, cost-effectiveness and user-friendliness are key: full-lifecycle cost-benefit analysis is required, and systems must adapt to staff with varied technical backgrounds to improve efficiency.

### 3.2 Organizational Dimension: Supporting Conditions of Internal Capacity

Under the TOE organizational dimension, internal characteristics shape adoption willingness and capacity. First, leadership support drives progress: senior leaders' focus on digital transformation shapes resource allocation and cross-departmental coordination, boosting initiative success. Second, organizational culture is critical: open, innovative cultures foster new technologies, while conservative ones hinder them—digital concepts must be embedded into organizational values. Third, employee capabilities and attitudes are foundational: hierarchical training (basic skills, digital thinking) and incentives reduce resistance for effective technology use. Fourth, structure and processes require adaptation: traditional bureaucratic models conflict with digital collaboration, needing boundary-breaking and workflow optimization.

### 3.3 Environmental Dimension: External Driving Forces

Under the TOE environmental dimension, external contexts guide adoption. First, policies and top-level design guide adoption: national digital government/economy policies and data security regulations form the compliance foundation. Second, market competition and tech ecosystem support adoption: competitive suppliers offer cost-effective options, and a healthy ecosystem (hardware/software providers) ensures stable technical support—scientific supplier evaluation is needed. Third, public demands drive urgency: digital lifestyles increase expectations for convenient, transparent services, prompting governments to accelerate adoption and optimize public interaction.

In summary, the three dimensions interact as a complex influencing system. Governments need systematic thinking to coordinate factors and develop targeted digital transformation strategies.

## 4 Adoption Challenges and Integrated Countermeasures Based on the TOE Framework

After clarifying key adoption factors, this chapter analyzes core challenges arising from their interplay in practice, categorized by the TOE framework's three dimensions and often intersecting to form constraints.

### 4.1 Core Challenges in the Digital Technology Adoption Process

In the process of promoting the implementation of digital technologies, the challenges faced by government organizations can be systematically attributed to the three dimensions of the TOE framework. These challenges not only exist independently but also often intersect with each other, forming a complex network of constraints.

4.1.1 Challenges in the Technological Dimension

Technological challenges restrict digital solution feasibility and effectiveness:

（1） System integration and data sharing complexity: Long-term informatization has left heterogeneous legacy systems, forming deep-rooted "information silos" and "data chimneys" that require high-cost integration (data cleansing, format conversion) to achieve cross-departmental collaboration.

（2） Security protection pressure: Cloud migration and system interoperability expand cybersecurity threats (data breaches, supply chain vulnerabilities, insider risks), making it difficult to build comprehensive, real-time defensive systems.

（3） Technology selection uncertainty: Rapid tech iteration conflicts with government projects' long-term nature, creating a dilemma between choosing mature (risk of obsolescence) and cutting-edge (immaturity risks) technologies.

4.1.2 Challenges in the Organizational Dimension

Internal barriers hinder digital technology absorption:

（1） Resource constraint contradictions: Sustained digital transformation input mismatches annual budget models, with shortages of professional talents (data analysis, AI) and difficulty competing with the private sector for high-end personnel.

（2）Cultural transformation resistance: Bureaucratic, risk-averse cultures conflict with the agile, innovative mindset needed for digitalization, leading to weak grassroots implementation despite strong top-level strategies.

（3）Inter-departmental collaboration obstacles: Traditional department-centric systems (responsibility division, performance evaluation) solidify boundaries, causing unclear powers, interest conflicts, and inconsistent data standards that block cross-departmental process reengineering.

4.1.3 Challenges in the Environmental Dimension

External dynamics introduce uncertainties:

（1）Policy and regulatory lag: Digital tech innovation outpaces supporting laws, regulations, and standards, with potential inter-departmental policy conflicts increasing project compliance risks.

（2）Digital divide risks: Disparities in digital access and literacy among social groups risk marginalizing vulnerable populations, undermining equitable public services.

（3）Technology market volatility: Frequent product/solution updates and supplier mergers/acquisitions create dilemmas in procurement decisions and threaten long-term project operation and maintenance stability.

## 4.2 Integrated Countermeasures Aligned with the TOE Framework

To address the above challenges, governments must coordinate efforts across TOE dimensions and develop integrated strategies focused on both immediate problem-solving and long-term mechanisms.

4.2.1 Countermeasures for the Technological Dimension

Build a robust, flexible technology governance system:

（1）Establish a unified technology governance system: Formulate unified technical, data, and interface standards; set up an inter-departmental committee to supervise implementation and prevent new "information silos".

（2）Construct an integrated security system: Adopt "defense-in-depth" thinking, embed security into the full system lifecycle, and build a centralized platform for shared services (unified authentication, data encryption, threat monitoring) to optimize protection and costs.

（3）Design a sustainable tech evolution path: Regularly evaluate technical assets and clear technical debt; use a technology watchlist and small-scale PoC testing to balance innovation and risk in adopting new technologies.

4.2.2 Countermeasures for the Organizational Dimension

Drive organizational transformation to ensure tech effectiveness:

（1）Innovate resource guarantees: Reform budget models (e.g., special funds for digital transformation, cross-year balancing); link digital project benefit evaluations to department performance to improve resource efficiency.

（2）Advance talent development: Build a hierarchical training system (leadership digital strategy, frontline skills); innovate recruitment (expert positions, project-based employment, university collaboration) to attract digital talents.

（3）Deepen organizational reform: Introduce roles like CDOs and Digital Transformation Offices; reengineer business processes (break departmental boundaries, adopt data-driven decision-making) and promote agile, collaborative work models.

4.2.3 Countermeasures for the Environmental Dimension

Enhance strategic foresight to adapt to external changes:

（1）Strengthen policy response: Build a team to track digital legislation and AI ethics; conduct policy impact assessments and participate in high-level standard-setting to ensure project compliance.

（2）Foster an open innovation ecosystem: Establish collaboration platforms for enterprises, universities, and research institutions; improve supplier management (scientific evaluation) to secure stable technical support.

（3）Promote inclusive services: Retain offline channels, develop age-friendly apps (large fonts, voice navigation), and integrate digital literacy education into public services to bridge the digital divide.

# 5 Conclusion

Based on the TOE (Technology-Organization-Environment) framework, this study explores the logic and pathways of government digital technology adoption in the information age. Key findings show that such adoption is a complex systems

engineering project shaped by technical feasibility (maturity, security, interoperability), organizational adaptability (leadership, resources, culture), and environmental legitimacy (policies, social demands, tech ecosystem). The TOE framework effectively deconstructs this multidimensional process—transcending "technological determinism" to clarify the "factors-challenges-countermeasures" logic, where challenges (e.g., system integration barriers, cultural resistance) stem from the superposition of TOE dimension factors and require coordinated rather than fragmented solutions. Practically, it provides a actionable "roadmap" for governments to diagnose adoption bottlenecks and optimize resource allocation.

This study has limitations: it focuses more on TOE-based theoretical analysis, with insufficient empirical support (such as large-sample data or cross-region case studies), fails to fully consider differences in adoption capabilities across regions and government levels, lacks discussion of international digital governance trends in environmental factor analysis, and pays little attention to post-adoption effect evaluation. Future research should strengthen empirical verification, explore adaptive adoption paths for grassroots governments, analyze how emerging technologies like generative AI reshape TOE dimensions, and incorporate international perspectives and digital equity issues while improving the post-adoption effect evaluation system.

## References

[1]Zhang Quan. Converging Paths: On the Promotion of Government Governance Innovation by Information Technology [J]. Studies in Science of Science, 2025, 43(11): 2362-2369+2400.
[2]Lai Xiyan, Zhou Xinmin. Exploring the Dynamic Process and Influencing Factors of Digital Technology Application in Grassroots Governments: A Longitudinal Case Study of Guangzhou's River Chief Management Information System [J]. Digital Governance Review, 2024, (00): 176-199+205-206.
[3]Zhu Xufeng, Lou Wenjia. Public Risk Perception and Acceptance of Emerging Technologies: An Experimental Study on Facial Recognition Technology[J]. Management World, 2024, 40(10): 118-132.
[4]Li Mei, Zhang Yi, Zhang Wei, et al. A Review of Research on Information Technology Adoption in Government Departments [J]. E-Government, 2016, (09): 70-79.
[5]Jun K-N, Weare C. Institutional Motivations in the Adoption of Innovations: The Case of E-Government[J]. Journal of Public Administration Research and Theory, 2011, 21(3):495-519.
[6]ROGERS E M. Diffusion of Innovations[M]. Fourth Edition. New York: The Free Press, 1995: 212-244.
[7]DAVIS F D. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology[J]. MIS Quarterly, 1989, 13(3): 319-340.
[8]Reddick C G. The Adoption of Centralized Customer Service Systems: A Survey of Local Governments[J]. Government Information Quarterly, 2009, 26(1): 219-226.
[9]Zhang Yuesheng, Jin Wenjun, Tan Yuxuan. Research on Pathways for Enhancing Local Governments' Digital Governance Capabilities: A Configuration Analysis Based on the TOE Framework [J]. Research on Economics and Management, 2024, 45(04): 93-111.
[10]Tan Haibo, Fan Ziting, Du Yunzhou. Technological Management Capability, Attention Allocation, and Local Government Website Development: A Configurational Analysis Based on the TOE Framework [J]. Management World, 2019, 35(09): 81-94.