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Governance Challenges and Relief Responses of Technology Embedding from the Perspective of Digital Governance

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Abstract **Original Research Article**

In the process of rapidly advancing modernization, the integration of digital technology into social governance is a key factor for China to achieve modernization success. However, when new technologies are embedded in the governance field, technical adaptability challenges also arise, bringing multiple challenges to digital governance. At the level of government affairs processing capabilities, digital technology has given rise to digital bureaucracy, the capabilities of digital push and digital product supply lag behind and digital technology tests the government's response to security crises. At the platform data management level, the ownership of government data is unclear, the threshold for data sharing and flow is relatively high, and interest-driven algorithms infringe upon data users. At the level of digital technology popularization, regional digital construction is unbalanced, the process of cultivating digital culture and qualities is slow, and insufficient capital investment hinders the operation speed of the digital economy. To alleviate the predicaments that the government encounters in the field of political and social governance after the introduction of digital technology, the government should start from top-level design and improve the new mechanism of digital governance. Increase digital investment and cultivate a new trend of digital civilization. Optimize the arrangement and layout to promote the coordinated development of digital regions. Promote innovation construction and empower the application of digital technology in the economy.

Keywords: Digital Governance, Technical Embedding Difficulties, Digital Transformation, Chinese-Style Modernization.

INTRODUCTION

Since the beginning of the new century, the digital information industry has developed rapidly, and artificial intelligence technology has been advancing rapidly. To adapt to the trend of information age, Chinese government has introduced digital technology into social governance, bringing many conveniences to people's lives. However, the embedding process of digital technology has triggered technical compatibility problems, posing challenges to the government's modern governance. The problems of social governance caused by digital technology keep emerging, and how the government, under the impetus of new quality productive forces, establishes a digital-friendly society has become a problem that must be considered in the new era. Against the backdrop of the unprecedented changes in the century, the competition among major countries has intensified, and digital technology, as a frontier technology, has become the pursuit of governments. How to reasonably manage advanced productive forces becomes the key to breaking the deadlock of competition. Therefore, the digital governance of the government is also a key way to win international competition. Facing the heavy responsibilities bestowed by the times, it is necessary to explore the difficulties faced by the government and society in the process of embedding digital technology, and propose corresponding countermeasures for the government's digital governance, so as to help China quickly establish a leading position in the world in terms of digitalization.

1. THE DEVELOPMENT OF DIGITAL GOVERNANCE THEORY AND CORE CONTENT INTERPRETATION

1.1 The Origin and Development of Digital Governance Theory

The traditional governance theory model can be classified into three types: the authoritative governance model represented by bureaucracy, the competitive governance model represented by new public management, and the cooperative

governance model represented by network governance. In the mid-1970s, to save government expenses and increase the efficiency of providing public goods, the new public management theory began to be popular. In the 1990s, due to the fragmentation, diversification, and complexity of urban governance, as well as the progress of electronic information technology, governance theories such as seamless governance, holistic governance, networked governance, and meta-governance began to be popular. With the widespread application of information technology, digital governance theory gradually formed (Shen et al., 2023). Digital governance theory is a product of the combination of governance theory and Internet information technology, and its main feature is the use of information technology to reshape the management process of the public sector (Han& Ma, 2016). Digital governance theory advocates using information technology to handle various complex and extensive changes (Zhu, 2015). In summary, digital governance theory is the guiding theory for the transformation of government behavior in the new era and is the manifestation of the improvement of government governance methods.

1.2 Interpretation of the Core Content of Digital Governance

Digital governance is a new governance model that integrates modern digital technology with governance theory (Huang & Chen, 2019). Digital governance can be understood as the synergy of "technology" as a way and "system" as a governance tool (Wang, 2020). When Zheng Lei talked about digital governance, he placed greater emphasis on its political attributes, believing that digital governance is not only a technical issue but also a governance issue. In the digital transformation, it requires innovation in concepts, institutional changes, organizational transformation, legal norms, and ethical concerns (Zheng, 2018). Zhang Xiaheng believes that the digital government, as a product of the digital revolution, is not intended to replace the traditional government or electronic government, but is a government form that emerges in the evolution from the traditional government in the industrial era to the Internet era. It is a re-innovation based on the original government form (Zhang, 2023). It can be seen that in digital governance, the weight of digital technology is less than that of politics. In the governance process, digital is more to serve politics rather than compete with politics. Therefore, digital governance should make political governance more perfect through digital technology ways. In this process, digital technology serves governance needs, enabling government governance to innovate and become more digital and modern.

2. GOVERNANCE DILEMMAS ARISING FROM THE EMBEDDING OF DIGITAL TECHNOLOGY IN CHINESE GOVERNMENT AND SOCIETY

During the digital governance of the government, the government will face multiple challenges brought by digital governance. The first challenge is that digital governance not only needs to deal with the discomfort and challenges brought by digital technologies embedded in government affairs, but also the government needs to confront the exclusion and new problems generated by society during the digital transformation process. During the digital transformation process, these two dual challenges will make the digital governance process extremely difficult.

2.1 Digital Embedding Challenge Government's Government Affairs Handling Capacity

Due to the fact that the government's motives were not purely altruistic when introducing digital technology, in the practice of digital governance, the initial motivation for the government to introduce new technologies was not necessarily "for service convenience", but "for management convenience" (Zheng & Zhu, 2021). The government's digital website construction became "everyone else has it, I must have it" copycat works, digital governance remained at the subconscious surface, "digital" became the slogan of bureaucratic governance, some unnecessary digital governance was placed on the digital altar. Formalism at the grassroots level is beginning to spread. Grassroots workers are busy submitting digital reports by logging in, taking photos, organizing data, and uploading it every day. Moreover, digital governance is not about building a government where there are only screens but no people (Zheng, 2021). Some government staff used the "digitalization" slogan to sort out the people. The unreasonable use of digital technology made the government's governance become a soulless technical machine.

Currently, the digital push of the Chinese government is mostly achieved through WeChat official accounts, and the writing norms of the government's WeChat official accounts are mostly conveyed in the form of notifications, compared with other interesting WeChat official accounts, the digital push of the government is strict in language and monotonous in content, and the reading interest it can arouse is relatively small. Secondly, in the WeChat official account, the relevant government official accounts do not have automatic top placement function, there is no upper limit for personal attention to the official account, how to achieve the purpose and effect of digital push in the fragmented information is another difficult problem for government digital construction. In addition, the government's digital services may also have situations where the government website does not update in a timely manner, the page content is outdated, and the information provided is not true, the government's digital supply does not match the society's needs. The emergence of these problems indicates that China's digital government sometimes has the problem of face-saving projects, it looks intact from the outside, but when reaching the core, the situation is constantly changing, digital government services have not yet reached the level of satisfying the people.

The development of AI is closely linked to the issue of world peace and security. UN Secretary-General António Guterres emphasized that UN member states must propose a legally binding treaty with constraints to prohibit the use of AI in automated warfare weapons by 2026. On the one hand, AI becomes an effective way to distinguish violent forms, monitor ceasefire status, promote peace mediation, and provide assistance for humanitarian aid. But on the other hand, AI-driven violent attacks target vulnerable infrastructure and cause

huge losses to peaceful actions and humanitarian assistance. More fatally, AI as a computing program, inevitably has temporary vulnerabilities. When AI is associated with nuclear weapons, biochemical weapons, etc., it is necessary to be cautious about the impact of algorithm errors on humans. In addition, the development of generative artificial intelligence poses a challenge to national security. Cyber warfare, information warfare have become new invasion methods and war states in the digital era. Generative artificial intelligence is easily trained to become a network hacker, constantly generating technical viruses for every operating system. Government networks are vulnerable and highly confidential, and are easily attacked by foreign hackers. Government network security in the digital era has become a new node of technical governance.

2.2 Unclear Platform Data Management Increases Governance Costs

In data governance, the government has two types of roles. The first type are data policy makers and regulators, while the second type are collectors, users, and custodians. When the government uses digital products, the data attributes generated need to be determined on a case-by-case basis. Li Haimin, based on the theory of state-owned property, proposed that government data is an important asset owned by the government. Different scenarios correspond to different legal attributes and apply different institutional norms. When used for internal official purposes, it belongs to "public goods"; when made public, it belongs to "public use goods"; when commercialized, it belongs to "state private property" (Li, 2020). However, legally, whether government data is state-owned property remains undetermined. According to the current accounting standards, it is impossible to record government data as a certain type of property. There are many legal gaps in the operation rights of government data (Zhang & Gu, 2022). Regarding the issue of the ownership of government data resources, relevant departments need to make detailed regulations to avoid situations where data rights are infringed upon.

At the data sharing level, due to different identities among different entities, data sharing in practical work often encounters the dilemma that different departments are unwilling to share. In today's era where data security and resource value are constantly rising, national ministries and provincial governments tend not to actively provide data. Municipal and county-level governments need to connect with their superiors to obtain data, which makes the horizontal and vertical flow of data extremely difficult and costly (Li & Huang, 2019). Data openness will encounter problems such as limited openness and an unformed open ecosystem. Additionally, due to the lack of unified digital management norms, local governments' data will adjust according to their own economic conditions and digital reserves, resulting in different data standards, measurement indicators, and focuses in each place. In the process of data openness, there will be problems such as data mismatch and data gaps. There is no common data policy among regions, and there is also a mismatch between data interconnection. Building a government data open sharing platform requires connecting the government office intranets, external government websites, internal government databases, and shared databases of government system construction and sharing of each local government (Zhao et al., 2018). At the data authorization level, there is also a problem of data ownership. In the era of artificial intelligence, the distribution of power presents a decentralized graph structure. The entities that hold data include not only government management institutions but also internet private enterprises and various social organizations (Liu, 2018). Whether certain data can be shared and when data openness will infringe upon privacy, whether data transmission needs to be agreed upon by citizens themselves, and other issues all require the government to issue policies for regulation.

Behind algorithms lies digital power. If digital rights are not regulated, they are prone to generating interest-driven digital power Leviathan. When enterprises that hold core technologies have the initiative in digital technology, there will be a risk that enterprises will pursue profits and weaken government power. In this situation, as the government is mostly a user of technology or digital tools rather than a designer or developer, it lacks initiative in policy foresight. At this time, the government is at a disadvantage in the game with digital groups, and intelligent algorithms will directly calculate the most "rational" answer, excluding humanistic data. Currently, many food delivery platforms use algorithm rights to set interest-driven food delivery time limits, and the exquisite food delivery routes are full of irrationality and lack humanistic care, causing great hardship for delivery workers. Additionally, algorithms will obtain personal preferences based on traffic direction. When algorithms discover the hidden user traffic destinations behind mobile phones, they will continuously push relevant content, unconsciously exposing personal information to the fullest extent. The subjective value of the human being, in the precise calculation of technology and algorithms, becomes a few bytes that can be utilized in the vast data space. The improper utilization of data information increases the governance cost of digital technology.

2.3 The limited adoption of digital technology has slowed down the effectiveness of governance

Due to historical reasons and objective conditions, the economic development in the eastern coastal regions of China has been significantly faster than that in the western inland areas. When the advantageous eastern regions began their new round of digital transformation, the digital construction in the western regions was still in a state of ignorance. After introducing digital governance, the economic development gap between the eastern and western regions will become even larger due to the arrival of new technologies, leading to a "Malthusian effect" in digital development. Secondly, the development of smart cities is generally faster than that of digital villages. Cities, due to their concentrated resources, numerous talents, and relatively complete infrastructure, have more convenient conditions for laying digital construction pipelines. Taking the national supercomputing center as an example, all of China's supercomputing centers are located in cities, such as Tianjin, Guangzhou, Shenzhen, Jinan, Zhengzhou, Xi'an and Chengdu. Taking Xi'an, the provincial capital, as an example, the Tencent Cloud data center built in Xi'an will radiate the entire Shaanxi Province. Due to the convenient conditions of the city, the

digital construction process of the city is self-enhanced. However, the countryside, both geographically and in terms of resources, is at a disadvantage and the construction will consume more digital construction costs. The in-depth promotion of digital governance in the countryside poses higher requirements for hardware infrastructure and soft environment guarantees. Currently, the digital infrastructure in rural areas of China is still relatively weak, and the integration, management, and development of data resources are insufficient (Zhao & Li, 2020). Therefore, in the process of digitalization, there will be a problem of lagging development in rural areas. Additionally, the overall digital literacy of farmers and their participation level in rural digital governance are relatively low. Under digital governance, the status of non-systemic elites has not strengthened the model of elite governance in villages. However, both the status within the system and the original status as rural elites have, to a certain extent, strengthened the model of elite governance in villages (Su & Peng, 2022). Compared to rural elites, ordinary villagers, due to limited digital literacy, are in a disadvantaged position in rural digital governance.

Due to historical reasons, China's scientific and technological development lags behind that of Western developed countries, and the soil for scientific culture is relatively thin. After the reform and opening up, the country's attention to science and technology has gradually deepened, and the trend of emphasizing science in the country has gradually become popular. However, the cultivation of citizen culture requires long-term investment and attention. Compared with Western developed countries, due to the reality of a low historical starting point, China's digital culture construction still needs to invest a long time to cultivate. Secondly, the training of digital talents also needs to change with the country's digital transformation. Currently, the education system in China emphasizes exam-oriented education, lacking innovative thinking and critical spirit, and young people face high life pressure, prominent mental exhaustion and ineffective internal competition. How to alleviate the pressure on talents and create a favorable innovative environment to focus young people on scientific and technological innovation and digital breakthroughs is a digital bottleneck problem that the government urgently needs to solve. Additionally, digital disadvantaged groups have become a new problem in the digital transformation. Among these digital disadvantaged groups, the elderly are the main group. Among the elderly population in China, the number of those who can use smart phones is relatively small, and those who mainly use the main functions of smart phones, such as making phone calls, are also not few. In daily life, the payment tools of the elderly are mostly cash and paper money, and the popularity of new payment methods such as Alipay and WeChat Pay is not high. On information acquisition apps such as Weibo, Zhihu, and Douban, it is rare to see the presence of the elderly. Currently, in the process of digital government governance, there is no digital remedial policy for digital disadvantaged groups. These series of problems that emerged in the process of digitalization require the government to provide corresponding solutions during the digital transformation process.

According to the rules of the market economy, when a commodity becomes profitable, corresponding capital will quickly flow in, and the rapid flow of production factors around this commodity accelerates the development of this commodity. Digital operations can be regarded as a large-scale commodity, whose digital economic effects will become increasingly significant, and its economic suction capacity will become stronger as the scale expands. However, the current capital investment volume has not yet met the market demand. The economic consumption of a digital product consists of three parts. The first part is the initial infrastructure construction consumption, including the construction of digital cables, broadband network speed, 5G base stations, software development and front-end, etc. The second part is the mid-stage operation consumption, including management and maintenance fees, daily operation fees. The third part is the external economic consumption at the back end, including network attacks, digital divide governance, innovation cultivation, etc (Wen et al., 2005). From this, it can be seen that the investment in digital capital is a long-cycle and multi-stage systematic project. If the capital investment is insufficient, the development of the digital economy will be restricted. Currently, China's digital economic consumption is mainly supported by national investment, with relatively little external capital involvement, and the capital flowing into the digital market has not yet reached the scale effect, so the entire construction cycle has been prolonged due to issues such as funds.Furthermore, the majority of digital capital investment is spent on the initial stage, while the economic investment in the middle and later stages is relatively less. This has also slowed down the circulation speed of the digital economy.

3. COUNTERMEASURES AND SOLUTIONS FOR IMPROVING THE CHALLENGES IN DIGITAL TECHNOLOGY GOVERNANCE

In response to the problems encountered in digital governance, the government needs to comprehensively and systematically, from the macro level to the micro level, from top to bottom, coordinate and promote the governance process, continuously improve the governance mechanism, and empower the development of digital technology.

3.1 Utilize top-level design to establish a new mechanism for digital governance

Deepen the advantages of the institutional system, and collaborate with multiple ministries and commissions to support the construction of digital government. In 2023, the Central Committee of the Communist Party of China and the State Council issued the “Overall Layout Plan for Digital China Construction”, emphasizing that under the centralized and unified leadership of the Party Central Committee, the Central Cyberspace Administration plays a coordinating role, and local Party Cyberspace Affairs Commissions implement the responsibilities stipulated in the document. Each ministry and commission has its own responsibilities, and they work together in a coordinated manner to promote the construction of Digital China. The legislative function of the People's Congress should be utilized to clarify the ownership of data rights, reasonably utilize digital resources, dismantle “data monopolies”, and prevent algorithms and big data from becoming a burden for digital development, adhering to the principle of serving the

people through digital technology.

Coordinate the integrated development path. Currently, each administrative department has its own online business platform, and online business development is fragmented. Digital governance should integrate digital platforms, establish a unified government service system, with closely connected processes and clear hierarchies among various departments, and consistent digital ports and program entrances at provincial and municipal levels, building a digital brain to achieve the goal of "one login, all processing". In response to the shortcomings of digital government, develop government service mini-programs, simplify the digital registration process, enrich the operation content of the official accounts, and embed digital governance in every corner of intelligent tools.

Actively promote technological ethics education to prevent electronic crimes. In 2022, the Central Committee of the Communist Party of China and the State Council issued the "Opinions on Strengthening the Governance of Technological Ethics", proposing that technological ethics is an important guarantee for the healthy development of technological enterprises, and it is necessary to strengthen bottom-line thinking and risk awareness, and strive to build a technological community of destiny. The Ministry of Industry and Information Technology has also issued the "Notice on Further Improving the Service Capacity of Mobile Internet Applications", strengthening the governance of apps throughout the process and chain. Currently, the theoretical research on technological ethics in China is relatively lagging, the level of legalization needs to be improved, the review and supervision systems are not yet perfect, and the norms and guidelines on technological ethics need to be strengthened. Relevant policies and regulations on technological ethics still need to be further improved to guide digital development towards a positive direction.

Strengthen safety responsibilities and enhance cyber security supervision. In the context of the rapid development of the Internet, China attaches great importance to cyber security. To fully implement the overall national security concept, China issued the "People's Republic of China Data Security Law" in 2021, requiring the establishment of a classification and grading management system, a data security risk monitoring mechanism, a data security emergency handling mechanism, as well as a data security review system and export control system. In the future, information security will become a core element of major power competition. China should follow the trend, plan and layout in advance, and make strategic preparations in advance.

3.2 Increase investment in digital technology and foster new trends of digital civilization

Ensure adequate funding and improve infrastructure. In early 2024, the Ministry of Industry and Information Technology launched the "Signal Upgrade" campaign to enhance the coverage of mobile networks. In border areas, the construction of "Broadband Border" has also been put on the agenda. The proportion of internet access on islands will reach 100% by 2025. In the future, the government will increasingly attach importance to the significance of digital technology in social development. Therefore, it is necessary to adjust the allocation of funds according to the needs of national development, so that the limited resources can exert maximum efficiency.

Encourage government-enterprise cooperation and promote the construction of cloud platforms at a high level. Shanghai has become a leading demonstration port for government-enterprise cooperation. The Shanghai government and Huawei Cloud have collaborated to build a cloud platform, creating a "1 + 16" two-level government cloud system. The municipal government cloud is centrally constructed, while 16 districts independently build their own government cloud platforms. This enables municipal departments to carry out applications, provide various services and resources through the e-government cloud, and the speed of new business launch by community offices has accelerated, with flexible deployment and an average processing time reduced from 40 days to 7 days, significantly improving the efficiency of handling affairs. Government information is shared through the cloud platform, and data openness becomes regulated.

Build digital barrier-free communities to enable more elderly people to participate in digital governance. According to the "Report on the Index of Cities' Capabilities for Actively Responding to Population Aging (2023)", the current population in China shows an aging trend, and meeting the needs of the elderly for a better life will bring new economic development opportunities. However, the current digital development structure, production supply, and service planning in China ignore the care for the elderly population. In the new era, it is necessary to increase investment in digital economy for the elderly, which can not only improve the living welfare of the elderly but also create new economic growth points.

Expand the supply of online cultural content, promoting the flourishing of digital culture. Stimulate the enthusiasm of digital creators and cultivate new-era cultural enterprises. Establish digital museums and smart libraries, allowing the people to be exposed to culture anytime and anywhere. Leverage the advantages of the fast development and low cost of the new media industry, hold various digital culture festivals, build world-class digital platforms, and promote international cultural dissemination and exchanges.

3.3 Optimize layout and promote coordinated development of digital regions

In response to the current situation of insufficient digital development and unbalanced regional development in China, we can combine regional advantages and rely on them to develop characteristic industries. In January 2022, the National Development and Reform Commission, in conjunction with the Cyberspace Administration of China, the Ministry of Industry and Information Technology, and the National Energy Administration, issued the "Implementation Plan for the Computing Power Hub of the National Integrated Big Data Center Collaborative Innovation System", requiring to accelerate the planning of "Data to the West, Computing Power to the East" layout. The "East Data West Computing" project can well coordinate the digital resources between the east and the west, solve the situation where there is an excess of computing power supply in the west but insufficient supply in the east, reduce power transportation costs, form a new

development pattern, and promote the transformation and development of the green economy.

The central region can introduce 5G technology in traditional industries to enable digital empowerment of industrial development. In 2021, the coal enterprise Yang Mei in Shanxi Province signed a "5G Strategic Cooperation Agreement" with China Mobile and built the first 5G smart coal mine in the country. Jingdezhen in Jiangxi Province developed "Animation Version" of the Blue Porcelain Factory Picture Porcelain Plate, making traditional craftsmanship come alive. The transportation department of Henan Province accelerated the construction of smart transportation, leveraging the function of the central transportation hub. The introduction of digital technology can enable digital empowerment of traditional industries, and the central region achieves digital rise.

Increase support for weak links to ensure balanced development of digital transformation. In rural areas, encourage the synchronous development of online and offline platforms to expand the sales channels of agricultural products. Digital e-commerce has been booming in recent years. Rural areas can sell agricultural products through online channels to all over the country through e-commerce platforms. In the production process, digital technologies are introduced to carry out the "Internet + Agriculture" upgrade, enabling digital supervision of all aspects of agricultural activities and achieving scientific production. In the field of rural governance, the leading role of rural digital elites is leveraged, digital knowledge is popularized, and villagers can enjoy the benefits of cloud village governance.

3.4 Promoting Innovation and Construction to Empower Digital Applications and the Economy

Cultivate talent in smart technologies. Encourage the enthusiasm of researchers and scientists for cutting-edge technologies, increase subsidies for high-tech industries and financial support for technology-oriented universities, optimize experimental environments, and establish smart industry incubation camps to leverage regional concentration advantages. Keep pace with global technological trends, explore disruptive technologies in the forefront, and make breakthroughs in theory, algorithms, programming, and generation. Accelerate the development of AI application products and achieve technological breakthroughs from zero to one in multiple fields.

Emphasize the development of interdisciplinary fields. Encourage the growth of emerging industries such as AI in medicine, education, and transportation, and seize the opportunities brought by knowledge updates and changes. Increase the development of embedded network technologies, accelerate the formation of interdisciplinary teams, actively invest in multi-functional smart applications, and increase the share of digital products in the international market.

Enhance independent research and development capabilities. Concentrate resources on strategic and global technological projects such as integrated electronic circuits, accelerate the transformation from a "chip big power" to a "chip strong power", and achieve chip independence. In key "bottleneck" technology areas, maintain an indomitable spirit and continuously strive for breakthroughs. Optimize the construction of scientific and technological teams, strengthen international academic exchanges, promptly grasp the latest technological information, and vigorously develop new productive forces.

In conclusion, the pace of the information revolution is rapid. The report of the 20th National Congress of the Communist Party of China points out that the next five years will be a crucial period for the opening and starting of the comprehensive construction of a modern socialist country, and it is necessary to accelerate the development of the digital economy, promote the deep integration of the digital economy and the real economy, and build a digital industrial cluster with international competitiveness. The competition in the future world is not only a contest of technology but also a competition of governance. The social crises brought about by the application of digital technology are manifested through digital governance. Digital construction not only requires long-term efforts in top-level design but also meticulous attention at different levels, reasonable regulation of development directions, and coordinated mobilization of the enthusiasm of various entities. It is a long-term process that cannot be achieved overnight. In the process of digital governance, it's necessary calmly face the challenges and difficulties brought by new productive forces, continuously optimize governance policies, and leverage the adaptability of digital technology in government and society to promote the leapfrog of modernization development.

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