The Pathway for Modernization Transformation in Government Governance —— Construction of Digital Intelligent Government

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Abstract

Government governance is a complex and systematic endeavor. The governance model has transformed from traditional to digital governance. However, digital governance has struggled to meet current needs with the evolution of public issues and the diversification of civic demands, particularly with the rapid advancement of technology, represented by artificial intelligence. Driven by realistic demand and technological innovation, the modernization transformation of government governance is bound to become a global trend. This article proposes a conceptualization for transforming government governance, namely constructing the digital intelligent government. The logic behind constructing the digital intelligent government involves the government formulating strategies, mobilizing technological talent and material resources, and embedding artificial intelligence technology into digital governance. The digital Intelligent government has the potential to overturn the shortcomings of digital governance models and achieve the goal of effective government. However, the construction of the digital intelligent government will face challenges and risks from ethical, governmental, talent, and societal aspects, necessitating early measures by the government.

Keywords

government governance, digital government, artificial intelligence, digital intelligent government, governance modernization

1. Introduction

The state of nature is one of disorder, bringing disruption and inconvenience to people's lives, and even sparking wars[1]. The establishment of government is a human endeavor aimed at seeking benefits, avoiding harm, pursuing development, and restraining the process of development. It marks the transition of human development from the "state of nature" to the "era of contract," and is also an expression of human civilization and cultural progress. The earliest forms of government can be traced back to tribes in primitive societies, where the government structure was relatively simple, typically consisting of tribal elders, chieftains, or other leaders. Power was based on prestige within kinship relations and individual capabilities, with the purpose of safeguarding the safety of tribal members and coordinating the supply of resources[2]. As human society developed and progressed, the forms and functions of government continued to evolve. In particular, during the 18th and 19th centuries, with events such as the Enlightenment and the French Revolution, the concepts of

democracy, freedom, and equality gained popularity and rapidly spread worldwide. This challenged traditional monarchies and feudal hierarchies, calling for a more just and democratic political order[3]. Democratic movements and revolutions swept across the world, leading to the emergence of modern democratic governments. Especially with the rise of policy science, new public management, new public services, and theories of new public governance, modern democratic governments have been continuously reformed and innovated. The functions of government have further expanded to include upholding the basic rights of the people, promoting social progress, and safeguarding the welfare of civics. The government's presence is ubiquitous, encompassing almost all aspects of human life[4].

After the Third Industrial Revolution, humanity entered the technological age, leading to significant innovations in government governance. The widespread application of information technologies such as big data has reshaped the modes and methods of government governance, resulting in the development of governance concepts and the enhancement of governance efficiency. However, contemporary government governance faces multifaceted challenges. First, the complexity of the international situation. Against the backdrop of globalization and interconnection, global instability poses new challenges to government governance, with transnational issues such as climate change, trade disputes, terrorism, and resource conflicts requiring attention. Second, prominent social issues. Inequality in public services caused by urbanization, personalized demands arising from the emergence of new social groups, environmental pollution induced by technological and industrial development, population growth, and structural transformations leading to resource pressures and social issues, all present additional demands on government governance. Third, the shortcomings of digital government governance. Government reliance on digital technologies has led to digital formalism, with frequent occurrences of issues such as digital divide, digital security, and digital ethics, posing multiple challenges to government governance[5].

The need for further reform and innovation in government governance has become an urgent issue. Coincidentally, amidst the efforts of numerous researchers, Artificial Intelligence Technology (AIT) has made significant advancements. At the end of 2022, the American Artificial Intelligence (AI) company, Open AI pioneered the release of ChatGPT, a natural language processing tool driven by AI. This advancement in AIT has sparked a wave of enthusiasm and provided support for the reform of government governance. Realistic demands and technological innovations have provided driving forces and opportunities for the reform and innovation of government governance.

This paper outlines a pathway for the modernization and transformation of government governance. It suggests the introduction of advanced AIT upon the existing framework of digital government to construct the Digital Intelligent Government (DIG). This initiative aims to facilitate the evolution of government governance models and methodologies. Such a transformation is expected to enhance the government's governance capacity and effectiveness, enabling it to more effectively address international challenges and fulfil national development objectives.

2. Components, Construction Logic, and Function Ways of DIG

The construction of DIG entails more than simply applying information technology, it involves a profound

integration of new governance concepts, models, and methodologies. Driven by the waves of digitalization and intelligence, constructing DIG emerges as an inevitable pathway for government governance transformation and represents a new frontier in the global arena of governance. However, the creation of DIG doesn't occur in isolation but is built upon several crucial components. These elements collaborate and converge through specific logic to form the framework of DIG construction. Subsequently, employing various methods, they serve as new governance models and methodologies.

2.1 Components

The technical rationality within the organization emphasizes prioritizing instrumental issues in planning[6]. Various elements are crucial for the construction of DIG and can also be understood as tools for the construction of such a government.

Firstly, the digital government serves as a fundamental prerequisite for the construction of a data-intelligent government. The term "digital government" implies that the government has reached a certain level of maturity in its informatization efforts, encompassing both software and hardware dimensions. On the software front, the government possesses sophisticated digital systems, including internal management systems, public service platforms, and e-government systems. Regarding hardware, the government has sufficient equipment, such as computers, servers, networks, and data storage devices. The seamless compatibility between software and hardware components forms the basic framework of the digital government, providing a solid foundation for the development of DIG.

Secondly, actors serve as the key driving forces behind the construction of DIG. The primary actors involved in the construction of DIG are government entities and technical experts in relevant fields. Government departments play a pivotal role in planning and leadership throughout this process, responsible for overall planning, scheme formulation, supervision and evaluation, and decision execution. They determine the direction, methods, standards, and efficiency of constructing DIG. Technical experts constitute the core force in realizing technological innovations and applications within DIG. They can provide essential technical support and address practical issues in the construction of a data-intelligent government, including the development of new software, manufacturing of new equipment, and maintenance of the entire intelligent system.

Thirdly, AIT constitutes the core technology in the construction of DIG. The essence of such a government lies in its wisdom, and AIT is pivotal in realizing this attribute. AI is an interdisciplinary nexus encompassing computer science, psychology, logic, mathematics, and philosophy[7]. It employs technologies such as machine learning, intelligent recognition, data mining, information analysis, and natural language processing to uncover underlying patterns and trends in phenomena, thereby enabling the most insightful decision-making, forecasting, and services[8]. This intelligent technology can address the shortcomings of digital governance, enhancing the accuracy and efficiency of government decision-making, optimizing resource allocation, and improving the level of public services.

Fourth, institutional frameworks are crucial in constructing DIG. These frameworks ensure the security and legality of governmental data. Given the vast and sensitive nature of data managed by governments, institutional safeguards regulate the processes of data collection, storage, processing, and sharing, ensuring compliance and privacy protection, and preventing data breaches and misuse. Moreover, institutional safe-

guards facilitate information sharing and interoperability. DIG requires interdepartmental information sharing and connectivity. Institutional frameworks can standardize information-sharing protocols and data interfaces, breaking down information silos, enhancing data utilization efficiency, and fostering cross-departmental collaboration and integrated intelligent governance[9]. Additionally, such frameworks can enhance resource utilization efficiency and eliminate human interference, ensuring the effectiveness and quality of DIG construction.

These components interact and support each other, forming the foundational framework for the construction of DIG, thereby providing robust support for the realization of digitalized and intelligent governance.

2.2 Construction Logic

The construction logic of DIG is essentially the organic integration of various critical elements. The central logic is that the government recognizes real-world issues and is willing to take action, engaging both internal and external technological expertise for assistance. This involves the amalgamation of material resources, AIT, and digital government infrastructure (Figure 1).

Firstly, the decision to undertake governance reform and construct DIG hinges on governmental willingness, prevailing challenges, and technological advancements. A defining characteristic of modern democratic governments is their legitimacy and authority, derived from democratic elections[10]. Therefore, governments are accountable to their electorate. Consequently, the myriad real-world issues relevant to voters are imperative concerns that governments must address, compelling them to enhance governance capabilities and standards. However, such advancements require a specific catalyst. In the era of technology, technological progress offers governments opportunities to drive governance reforms and innovations. The intersection of real-world challenges with AIT provides a pivotal opportunity for the construction of DIG.

Secondly, pivotal actors, namely the government, take action by formulating a series of plans and regulatory frameworks for the construction of DIG. The government invites technology experts to participate, providing ample material resources, and integrates AIT into the existing digital government infrastructure, thereby propelling the governance model of the government towards a new phase characterized by a high level of integration between digitization and intelligence. However, the construction of DIG is highly complex, fraught with uncertainties and risks, necessitating close collaboration between the government and technology experts. While the government aims to construct DIG, technology experts seek to obtain sufficient benefits. This requires the government to demonstrate adequate sincerity and offer appropriate incentives to attract and enlist the cooperation of technology experts in governmental actions. Additionally, effective communication and mutual understanding between the government and technology experts are essential, requiring timely adjustments to the construction plans to ensure the smooth progression of DIG development.

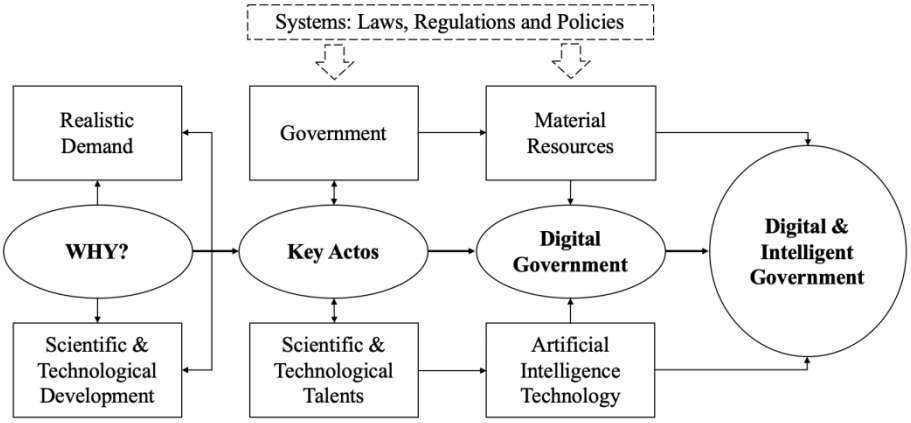

Figure 1 The Construction Logic of DIG

2.3 Function Ways

Government governance is the process by which the government addresses national public issues, fundamentally involving the alignment between the government and specific public matters. However, public issues are inherently complex, characterized by the interconnection of various intertwined issues and the involvement of multiple stakeholders. Moreover, in the process of addressing public issues, governments must contend with challenges such as information asymmetry, dynamic changes in issues, uncertainty risks, resource allocation and supply, and balancing the demands of relevant stakeholders, rendering the governance process similarly intricate. The dual complexity exacerbates the difficulty and risks of government governance. Digital government emerges precisely to streamline this complexity and enhance governance capabilities. Its fundamental logic is guided by principles of overall coordination and systemic integration, leveraging modern digital technology innovation to drive government governance—a model characterized by intensification, systematization, and efficiency[11]. Intensification is demonstrated as the government integrates resources from various departments and stakeholders through digital technology, facilitating efficient resource utilization and sharing while avoiding redundancy and waste. Simultaneously, digital government simplifies internal government information flows and decision-making processes by establishing unified digital platforms and information systems, thereby enhancing internal operational efficiency and coordination capabilities. Systematization is evident as digital government integrates and optimizes various governance tools and resources, establishing a systematic governance framework and processes, and fostering coordination and information sharing among departments and stakeholders. Efficiency is demonstrated as digital government leverages modern technological means to enhance the accuracy and timeliness of government decision-making, achieving precision and intelligence in government governance. In summary, the features of intensification, systematization, and efficiency make digital government an effective tool for addressing complex governance environments. Essentially, digital government remains the alignment between the government and specific public issues, albeit with a more effective alignment process.

DIG represents the direction of digital government reform, adhering to the fundamental governance essence of government alignment with specific public issues. The function way of DIG comprises two main components (Figure 2). Firstly, the overall role of function way, when public issues arise and are transmitted to DIG,

DIG, guided by its intelligent integration system, provides the optimal strategy, which the government then employs to address the public issue, while civics fulfil their needs based on the optimal strategy provided by DIG. Secondly, the intelligent integration function way of DIG encompasses information gathering, data analysis, problem analysis, solution strategies, strategy comparison, strategy advantages, risk and uncertainty assessment, and resource coordination. These steps are interconnected progressively. The objective of the intelligent integration system of DIG is to provide the optimal strategy for resolving public issues.

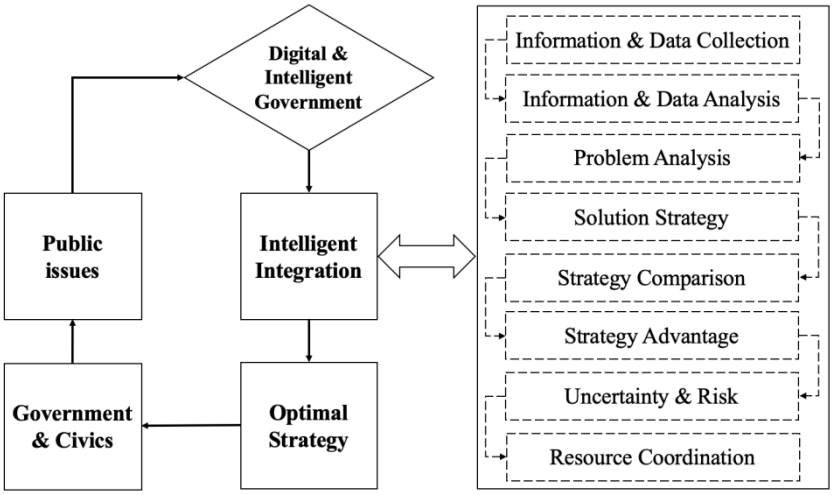

Figure 2 Function Ways of DIG

3. The Practical Value of DIG

Currently, government governance is facing an increasing number of challenges, with effectively addressing public issues and promptly responding to public needs becoming paramount. The primary practical value of DIG is its ability to enhance government governance capabilities and standards, enabling more effective responses to societal needs and public issues, ultimately achieving the goal of good governance.

3.1 Eliminate the Boundaries of Governance

Public issues occur in different domains and involve various stakeholders, with clear boundaries between domains and stakeholders[12]. Each government department carries different responsibilities, typically focusing on specific domain-specific public issues. When public issues span multiple departments, collaboration between departments is necessary for resolution. Despite the existence of various coordination mechanisms and communication platforms within the government, boundary issues between departments persist, significantly impacting the resolution of public affairs. However, DIG can transcend governance boundaries by conducting comprehensive analyses of public issues and stakeholders across different domains, identifying relevant departments for addressing public issues, and promptly issuing instructions to these departments. This breaks down departmental boundaries and information silos, promoting a model of collaborative governance among government departments. This enhances the overall efficiency of government operations and better enables the government to address public issues and meet the needs of stakeholders. For example, in the event of a natural disaster, DIG can swiftly analyze the situation, promptly provide information to departments such as civil affairs, health, transportation, and public security, and coordinate their efforts for rapid and effective

rescue and post-disaster reconstruction work.

3.2 Eliminate Governance Lag

Public issues often arise before governmental intervention, leading to a reactive governance approach[13]. DIG can significantly alleviate this lag in governance, shifting governmental practices from reactive to proactive, and enabling anticipatory measures. DIG is characterized by foresight and proactivity. The intelligent integration system of DIG can detect emerging patterns and trends within data, utilizing machine learning algorithms for early prediction and real-time monitoring of public issues. For instance, in domains such as traffic management, epidemic prevention, and public safety, the government can promptly identify potential issues and take preemptive actions to prevent or mitigate their impact through predictive analytics. Moreover, the intelligent integration system of DIG can continuously monitor and re-evaluate changes in public issues during the governance process, offering insights for governmental decision-making and facilitating adaptive responses to diverse risks and uncertainties. Leveraging a wealth of cases and data, the intelligent integration system provides evidence-based decision support and strategy formulation, enabling the government to address complex social, economic, and environmental challenges with greater agility.

3.3 Enhance Government Governance and Service Efficiency

While a digital government provides support for data acquisition and analysis, it is incumbent upon the government to utilize the results of data analysis for decision-making and formulate specific strategies to address public issues. Furthermore, the information collected and analyzed by a digital government is limited to text and numerical data, thereby lacking the capability to gather and analyze diverse forms of information such as audio, video, and images. This limited scope hampers the government's comprehensive understanding of public issues and results in measures that may not be sufficiently comprehensive, thereby failing to achieve optimal governance outcomes[14]. Conversely, DIG can collect and analyze a wide range of information and provide the government with optimal strategies to address public issues, thereby avoiding redundant resource allocation and waste, and achieving refinement, efficiency, and intelligence in governance. Civics, whose needs are diverse, can directly interact with DIG when they need to handle relevant affairs. Through intelligent customer service consultations, civics can learn about transaction processes and required documents, or utilize self-service platforms to complete their transactional needs. DIG enables comprehensive monitoring, management, and handling of civic demands, thereby enhancing the responsiveness and quality of services and meeting the diverse needs of the public.

3.4 Enhance Civics' Trust in Government

Government trust refers to the relationship between the public and the government in which, when faced with uncertainty, the public generally perceives the government's intentions and actions as predictable and reliable. They choose to trust the government and hold sufficient positive expectations, believing that the government can effectively address public issues and serve the civics[15]. Civics trust in the government is the primary reason for the government's existence. The government, in turn, aims to enhance civic trust through effective operation and fulfilling its role in addressing public issues and meeting civic needs, thereby achieving the goal of strengthening its position in the eyes of the public. Under both traditional government gover-

nance models and digital government governance models, the strategies and decisions of the government in addressing public issues and meeting civic needs are relatively closed. The public often harbors doubts about government information disclosure, decision transparency, and service efficiency, leading to a potential crisis of trust[16]. When civics no longer trust the government, it not only risks dissolution but also holds top officials accountable under the law[17]. DIG enables civics to participate in public affairs governance anytime and anywhere, allowing them to understand the government's strategic and decision-making basis, as well as the status of public affairs resolution, thereby enhancing public understanding and acceptance of government decisions. Moreover, civics can provide feedback and suggestions to DIG, promoting a more democratic and scientific approach to government governance This form of communication governance facilitated by DIG can greatly enhance civic trust in the government, thereby helping the government maintain its credibility.

3.5 Reduce the Costs of Government Governance

DIG can significantly reduce the operational costs associated with governance. Via leveraging DIG, governments can achieve extensive automation and intelligence, thereby diminishing the utilization of human resources and lowering administrative and operational expenses. For instance, intelligent online service platforms can substitute traditional offline service windows, leading to decreased manpower requirements and office space demands. DIG can enhance information processing efficiency and decrease data management and storage costs. Constructing DIG can foster collaboration between governments and enterprises, facilitating resource sharing and mutual benefits, thereby further reducing governance costs. Moreover, DIG can optimize processes and resource allocations, mitigating wastage and consequent cost escalation commonly observed in traditional governance models due to redundant processes and inefficient resource allocations. Through data analysis and intelligent decision support systems, DIG can identify bottlenecks and inefficiencies in processes and resource allocations, providing optimization recommendations. By optimizing processes and resource allocations, governments can maximize resource utilization and reduce costs[18]. Additionally, DIG can enable intelligent supervision, facilitating real-time monitoring and analysis of various behaviors, allowing for the timely identification and mitigation of issues, thus lowering governance risks and associated costs.

4. Challenges for the Construction of DIG

The construction of DIG is pivotal in advancing the modernization of governmental governance, aiming to align with technological development trends, fully unleash the potential of spatial development, and forge a new frontier in the modernization of government management. However, this process is fraught with numerous challenges that will significantly impede both the construction of DIG and the transformative modernization of governmental governance.

4.1 Ethical Challenges

The construction of DIG entails the government's comprehensive collection of all possible data and information. Addressing the legality, legitimacy, and necessity of data and information collection and usage, as well as finding a balance between enhancing service efficiency and protecting individual privacy, are the primary challenges that DIG must confront. The intelligent integration systems of DIG are predicated on specific algorithms to provide optimal strategies for addressing public issues. Ensuring that technological ap-

plications do not exacerbate social inequality or discriminate against specific groups is a crucial consideration in the construction of digital intelligent governments[19]. As technology continues to advance and new technologies emerge, ensuring that technological applications adhere to ethical norms and societal values presents significant ethical challenges to the construction of DIG.

4.2 Challenges of Technology Update and Government Adoption

Throughout history, humanity has witnessed two scientific revolutions and three industrial revolutions, giving rise to various new technologies that have had a profound impact on societal practices. The onset of the Fourth Industrial Revolution is already underway, marked by the rapid development and iteration of new technologies. However, the adoption of technology by governments often requires a structured process, which can be time-consuming. Government departments may face limitations in budget and resource allocation, insufficient to support the rapid adoption and deployment of the latest technologies. Government entities typically approach the adoption of new technologies with caution, apprehensive of the risks and unknown consequences associated with them[20]. These factors contribute to the difficulty of governments keeping pace with the speed of technological development, resulting in lag. This lag not only affects the efficiency and effectiveness of government services but also risks the government falling behind in terms of information security and technological competitiveness.

4.3 Challenges of Talent Demand and Supply

The primary actor in the construction of DIG is the government entities themselves, however, this construction demands a high level of expertise, particularly relying on technological talent. Technological professionals constitute a small proportion of government personnel, the majority of whom possess a relatively simplistic knowledge structure and lack the interdisciplinary knowledge necessary to support the construction of DIG[21]. Furthermore, training technological talent requires time and resources, yet the pace of technological development often exceeds the rate of talent cultivation, leading to a supply-demand disparity. Additionally, the range of expertise required for DIG spans multiple domain, including data science, AI, and cybersecurity, where professionals are relatively scarce. The salary and benefits offered by government sectors, constrained by institutional limits, generally cannot compete with private enterprises, making it challenging to attract and retain high-caliber technological talent. Consequently, in order to achieve the objectives of constructing DIG, it is imperative for governments to address the challenges related to the supply of technological talent.

4.4 Challenges of Social Acceptance and participation

The participation of diverse stakeholders is essential for the successful implementation of DIG. However, DIG encompasses complex technical and policy issues, and the general civic often lacks sufficient understanding of its operational mechanisms and impacts. Typically, civics are more concerned with their immediate life and issues directly impacting their interests, which hinders effective participation. The broader participation often includes a specialized elite composed of engineers, tech entrepreneurs, and researchers. Their engagement in DIG projects aligns with their vested interests. This elite group controls significant resources and sometimes uses these advantages and their social status to negotiate with the government for substantial benefits[22]. This can suppress the interests of other civics, leading to dissatisfaction with the DIG initiative.

Additionally, while DIG aims to enhance the efficiency and quality of government services, some civics may be unable to access the benefits due to a lack of digital skills or necessary devices. This reduces their acceptance of DIG and can also provoke skepticism and resistance towards the initiative among certain segments of the population[23].

4.5 Challenges of International Science and Technology Competition

Science knows no borders, but technology does. Technological innovation serves as a driving force for national economic development, giving rise to advancements in various sectors such as politics, military, and society, thereby competing for international interests. This competition influences the global landscape significantly. Driven by interests, nations engage in fierce competition surrounding technological innovation. Similarly, DIG initiatives encompass various scientific technologies, with different countries holding distinct expertise. Nations possessing core DIG construction technologies prioritize their domestic utilization, facilitating the transformation of their governmental governance, improving socio-economic development environments, and enhancing overall national strength. Moreover, science and technologies associated with DIG initiatives can yield substantial economic benefits for owning nations. For instance, patenting various technologies can form DIG technological barriers in the form of intellectual property, making it challenging for other countries to enter or obtain them without compensation[24]. Additionally, DIG initiatives are often influenced by national politics and geopolitics. Some countries may exploit technological advantages to achieve political objectives and expand their influence on the international stage, potentially exacerbating tensions in international relations.

4.6 Challenges of International Collaboration and Standardization

During the process of constructing DIG, international collaboration and standardization pose significant challenges. With the acceleration of globalization and the widespread adoption of information technology, the practices of digitization and intelligent governance are attracting increasing attention from the international community. However, differences in understanding, needs, and practices regarding digitization and intelligent governance among different countries, regions, and organizations give rise to challenges in international collaboration and standardization. Variances in laws, regulations, and policies among different countries and regions, particularly concerning data security, privacy protection, and information sharing, present a significant challenge. The technological standards and data interoperability involved in digitization and intelligent governance also pose a challenge. Different countries and regions may adopt different technological platforms and system architectures, leading to interoperability issues among digitization and intelligent governance systems. Furthermore, international collaboration needs to address security and risk management issues in digitization and intelligent governance. As digitization and intelligent governance systems continue to evolve and proliferate, information security and cybersecurity face increasingly severe challenges[25].

5. Conclusion and Recommendations

Given the current developments in technology, the status of government governance, the complexity of public issues, the diversity of citizen needs, and the challenges faced by digital government governance, this paper proposes a path for the modernization of government governance through the construction of DIG. The

logic behind DIG involves the government formulating plans, organizing technological talent and material resources, and integrating AIT into the digital government framework. We firmly believe that in an era dominated by technology, DIG will revolutionize traditional and digital government governance models. It will eliminate the boundaries and delays inherent in government governance, improve the efficacy of public services, and enhance civics' trust in the government.

However, the construction of DIG may face ethical, governmental, talent-related, and societal challenges, necessitating certain measures to mitigate associated risks and challenges. Firstly, governments should proactively recognize the disruptive changes that technology, represented by AIT, brings to governance. Appropriate strategies, laws, regulations, and ethical standards for DIG should be established to ensure that data collection, processing, and usage occur within a transparent and lawful framework. Secondly, there is a need to strengthen the cultivation and recruitment of technological talent, particularly in critical areas such as data science, AI, and cybersecurity. The attractiveness of government positions should be enhanced by offering competitive salaries, career development opportunities, and conducive work environments to retain exceptional technology experts. Thirdly, governments should keep abreast of technological advancements relevant to the modernization of governance. This involves establishing mechanisms for technology identification and adoption to minimize the delay between governance reforms and technological developments, ensuring that technology effectively serves governance reform and enhances public service quality. Fourthly, citizen participation and feedback should be encouraged by creating open channels of communication and feedback mechanisms, enabling public involvement in the construction and oversight of DIG. The government should leverage DIG to gather public opinions, respond promptly to public concerns, increase transparency, and enhance public satisfaction. Investments in infrastructure and the promotion of DIG skills education and training should be pursued to enable more citizens to effectively utilize DIG. Fifth, governments should actively engage in international dialogues and collaborations, mutually learning from successful experiences and methodologies in DIG construction. By incorporating advanced international technologies and management expertise, they can ensure the forward-thinking and high adaptability of domestic DIG development. This endeavor not only significantly enhances governmental governance capabilities but also fosters the construction of a more open and interconnected global DIG governance framework.

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