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The Integration of Digital-Intelligent Technology with Government Governance: Modes, Constraints and Optimisation

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Abstract

Such emerging digital-intelligent technologies as big data, cloud computing, blockchain and artificial intelligence provide technical support for the digital transformation of government governance. As digital-intelligent technology becomes embedded in government governance ever more deeply and widely, how to advance further the integrated development of that technology and government governance has become the key to realising the digital transformation of government. At present the integrative practice by which digital-intelligent technology is embedded in government governance displays a continuing tendency towards integration in its target concepts, governing subjects, decision-making and execution, and application scenarios, while at the same time facing the practical constraints of an imbalance between instrumental and value rationality, conflict between new powers and responsibilities and traditional regulation, blind spots in technology together with administrative-ethical risk, and barriers in organisational management and data support. To optimise further the integrative practice of embedding digital-intelligent technology in government governance, work should begin from the mutual integration of value and technical rationality, the regulation of public- and private-sphere powers and responsibilities, agile human-machine coordination, and the intensive sharing of virtual-real mapping, so as to achieve a deep integration of digital-intelligent technology and government governance.

Keywords: digital-intelligent technology; government governance; instrumental rationality; value rationality

1 The modes in which digital-intelligent technology and government governance are integrated

The digital transformation of government carries a double dimension, that of governance logic and that of technology logic. On the one hand, the logic of government governance is a technical route grounded in the traditional bureaucratic system for solving complex and intractable public problems: it takes the realisation of governance goals as its starting point and stresses the exercise of human agency and adaptability. On the other hand, the logic of digital-intelligent technology stresses the importance of choosing the means and instruments of governance: it is oriented towards improving governance performance and pursues the empowering effect of technological renewal. The process by which digital-intelligent technology is embedded in government governance is therefore in substance a process of deep integration of governance logic and technology logic, that is, of clarifying the points of integration and the internal connections between governance structure and technical support so as to maximise the effectiveness of that embedding. Practice at the present stage shows that the embedding of digital-intelligent technology in government governance displays a continuing tendency towards integration in target concepts, governing subjects, decision-making and execution, and application scenarios, manifesting itself concretely as the integration of reason and feeling, of public and private, of human and machine, and of virtual and real.

1.1 The integration of reason and feeling in target concepts

The integration of reason and feeling means the deep integration of the "emotional" orientation of value rationality with the "technical" orientation of instrumental rationality, so that humanistic care and technological advantage illuminate one another. It is a full response to the complexity of modern governance problems and to the pluralism of value pursuits. On the one hand, the rapid development of modern society confronts government governance with unprecedented uncertainty, risk and fragility, most conspicuously in public problems that grow ever more complex and intractable; the government must continually renew its technology to escape the difficulty of efficiency, and its governance goals necessarily carry the instrumental rationality of technical performance. On the other hand, modern public problems involve such subjects as

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government, enterprises and the public, and these have different value goals and display different logics of action[4]. This requires the government, while pursuing technical performance, still to take "people" as its starting point; its governance goals necessarily carry such value rationality with a public character as the public interest and public needs. Although scholarship remains divided over the distinction and the mutual integration of value and instrumental rationality, the target concept that fuses a people-centred spiritual core with pragmatic means of pursuing performance has already been embodied in the practice of government digital transformation. The *Guiding Opinions of the State Council on Strengthening the Construction of Digital Government* proposes "applying digital technology widely to government management and services" while also stressing that "satisfying the people's yearning for a better life must always be the starting point and the end point of digital government construction"[1]. This fully affirms the empowering advantage of digital-intelligent technology and at the same time stresses the value concept of putting the people at the centre. Local levels have also actively implemented this requirement: Shanghai's "One Network for Unified Management", for example, listens to citizens' demands by building a "Voice of the City" module, which draws on the "Suishenban" app, the 12345 citizen hotline, people's suggestions and trending online topics as its source channels and proactively discovers the high-frequency needs and shared aspirations of citizens, embodying the idea that urban governance should combine "precision" with "warmth" and fuse "feeling" with "technology"[5].

1.2 The integration of public and private in governing subjects

The integration of public and private means that digital-intelligent technology empowers private-sphere subjects to take part in the governance of public affairs, forming a new digital governance configuration of plural co-governance and cooperative symbiosis between the public and private spheres. Market forces, social organisations and individual citizens, as subjects of public-affairs governance, take part jointly in the governing process by giving play to their respective strengths, forming new cooperative relations and a new configuration of power.

First, a public-private partnership is formed. Government governance needs to rest on big data, and the development and use of data give plural subjects an important field in which to play their part, taking the strengths of others to make up for the weaknesses of governance. In the course of governance the government can obtain large quantities of data of potential value, but is constrained by its management system and budget from doing everything itself. Compared with government, enterprises excel at data mining and technological research and development and have a strong internal drive to achieve data integration and technological iteration, which helps to remedy the inadequacy of government as a single subject in developing and using data. At present, joint public-private development of data is already widely used in practice and has begun to take shape: the "Chuxing Cloud" launched by the Ministry of Transport in 2016, for instance, is a platform on which government opens data, enterprises develop and use it, and decision support is provided to government; through dynamic data monitoring it supplies traffic-management departments with real-time information on passenger flows, road congestion and emergencies, thereby improving traffic emergency management capacity and decision support for road planning. The public is at once the user who obtains data from enterprise products and services, the supplier who feeds back user experience and creates user data, and the cooperator in government crowdsourcing and crowdfunding of public services. Some local traffic-management departments, for example, have launched a "Snap and Report" app: citizens who spot a traffic violation can record it at any time and upload it to the app, which helps to discover problems that the traffic-management department cannot see or reach, greatly promoting the participation of the whole population in traffic governance.

Second, new governing powers are derived. The traditional structure of governing power is characterised by government leadership and upward concentration, the government managing market and society in a one-way fashion. Digital-intelligent technology, however, continually generates such new forms as the digital economy and digital society, breaking the passive position of market and society in management activity and extending governing power from government to market and society: market enterprises, social organisations and individual citizens gradually take part in the governance of public affairs and exert influence on the governing process on the basis of their respective strengths. Large platforms operated mainly by enterprises have gradually evolved into a kind of quasi-public good and have progressively taken on the responsibilities and obligations of government[6]: platforms such as Alipay and WeChat, for example, not only perform financial and social functions but have also progressively established integrated links and access interfaces for such matters as residents' utility payments, social-security enquiries and payment of traffic fines. These platforms can not only assist government in optimising digital services but can also, on the strength of such latent advantages as technology and information, constitute a de facto governing power that goes beyond the instrumental category.

1.3 The integration of human and machine in decision-making and execution

The integration of human and machine means the deep integration of human and machine so as to adapt decision-making and execution and to achieve efficient coordination between human and artificial intelligence. According to the autonomy

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of the machine, human-machine relations may be grouped into three types: semi-autonomous, supervised autonomy and full autonomy[7]. The semi-autonomous relation stresses that decision-making power rests in human hands, the machine playing an executive role while humans intervene in and control its operation; the supervised-autonomous relation means that the machine completes decision-making and execution on its own without waiting for human instruction, but remains subject to the necessary human intervention; the fully autonomous relation is wholly free of human influence, perceiving, deciding and acting autonomously, with humans unable to intervene even when problems arise. For practical reasons, the semi-autonomous and supervised-autonomous relations are the types that can presently be generally accepted and put into practice. Facial recognition, digital identity authentication and automated capture of traffic violations, for example, are all semi-autonomous modes of human-machine integration supported by algorithms, big data and related technologies. Artificial intelligence is moreover gradually entering administrative decision-making: deeply simulating the human brain's mode of thought on the basis of big data and cloud computing and other emerging technologies, it achieves auxiliary decision-making and predictive assessment for artificial intelligence through continuous training of large models. Shanghai's Pudong district, for example, has launched "Xiaopu", a digital human for intelligent government services, resting on a large model intensively trained on more than 100,000 items of real voice-handled business and vast quantities of government information; this realises automated decision-making and execution by the digital human and represents an attempt at supervised-autonomous human-machine integration. In auxiliary decision-making it can use big data to build "profiles" of market subjects, analyse their behaviour and development trends, predict and evaluate risk levels, and have the system apply risk intervention automatically. It is thus clear that fusing the dual intelligence of human and machine has opened a wholly new "era of human-machine integrated intelligence", which aims through human-machine interaction and coordination to extend the performance of artificial intelligence systems, making artificial intelligence a natural extension of human intelligence and solving complex problems more efficiently[8].

1.4 The integration of virtual and real in application scenarios

The integration of virtual and real means using digital-intelligent technology to construct a virtual digital space corresponding to real physical space, so that the virtual and the concrete map onto one another and act together upon complex and changeable problem scenarios. Constructing a virtual mapping is not virtuality for its own sake: the point is to present the living concrete world within virtual space and to optimise the concrete world on the basis of that space. The integration of virtual and real in application scenarios shows itself both in the tendency of organisational structures towards flattening and virtualisation and in the joint virtual-real management of such objects as problems and things. First, as to organisational structure, there is a shift from the functional type towards flattening, compressing vertical transmission levels and horizontally partitioned space, and taking matters as the core to combine virtually the functional departments involved in the operation of business processes, using networked parallel working to restore the integrity of processes that had been fragmented among different functional departments. This resembles the "process team" of the seamless organisation, which places "people in 'process teams', and these process teams perform most of the key functions from production to delivery"[9]. Zhejiang province's "at most one visit" reform, for example, has government service items concentrated in administrative service centres, adopts a "parallel windows" mode of service according to the matter to be handled, and thereby achieves a flattened reshaping of organisation in physical space; it moreover advances the full connection of each business system with the "one-window acceptance" platform, further compressing the gaps in the linkage of "parallel windows" and achieving the virtualised integration of different functional departments around a matter. Second, as to object management, the integration of virtual and real provides an experimental scenario of "trial and error" for solutions to complex problems and moreover makes possible the empowerment of smart regulation by digital twins. The traditional governance environment makes it difficult to carry out trial and error and computation on different governance options, whereas the simulation channels provided by virtual space help to find a relatively optimal solution, which can then be applied to management in the concrete world. Furthermore, using digital technology to treat management objects as intelligent living beings and organisms, reproducing and shaping their "vital signs" on the basis of massive multidimensional data and perceiving them in real time, allows explicit problems and latent risks to be discovered intuitively and promptly and joint virtual-real response to be achieved. Shanghai, for example, uses a digital twin system to present in virtual-image form the physical features of the Nanjing Building — its structure, facilities, people and environment — and uses static data and IoT sensing data to form risk warnings and emergency responses, fully demonstrating the empowering advantage of virtual-real integration in object management.

2 The practical constraints on integrating digital-intelligent technology and government governance

As the depth, breadth and frequency of interaction between digital-intelligent technology and government governance increase, a series of interwoven, superimposed and mutually affecting negative phenomena of technological embedding put

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the integration of the two to the test and constrain the practical process of embedding digital-intelligent technology in government governance.

2.1 The imbalance between instrumental and value rationality

Although the integration of reason and feeling is already deeply rooted in the concepts and target requirements of government governance, the problem of an imbalance between instrumental and value rationality persists, and governance faces the predicament of retreating so far from value rationality as to fall into "instrumental rationalism". Concretely, this shows itself mainly in the tension between the governance perspective and the user perspective, and in the gap between finger-tip administration and the needs of the masses.

First, the tension between the digital-first governance perspective and the service-satisfaction user perspective becomes prominent. From the governance perspective, continually using advanced means to improve performance is the main criterion by which the embedding of digital-intelligent technology in government governance is measured; from the user perspective, satisfying service demands and providing a good experience is that criterion. The different perspectives yield different criteria for measuring technological embedding, filling that embedding with tension. On the one hand, the comprehensive generalisation of digital-intelligent technology causes the value of human subjectivity to be neglected. Functions of automatic review in government service systems such as "instant approval" and "smart approval", for example, can complete approval automatically and issue the review result on the spot, with no human intervention throughout. Although the approval process is accelerated, such functions suit only cases where the materials are complete and standard in format, and they weaken the capacity to recognise and respond to a user's special case. On the other hand, objective gaps exist between different social groups in access to information and use of technology, and the embedding of digital-intelligent technology objectively accelerates the polarisation between strong and weak groups. Strong groups, on the strength of good digital literacy, can enjoy the technological dividend fully and become the mainstream voice in expressing demands, whereas weak groups, hampered by their resource endowment and limited capacities, are easily separated and marginalised by digital-intelligent technology. One-size-fits-all services such as "non-face-to-face service" and "online appointment", for example, seriously neglect the sense of gain and equality of opportunity of weak groups, and may even bring about resource crowding-out and systemic exclusion of those groups.

Second, finger-tip administration that struggles to keep up cannot effectively solve the urgent difficulties and anxieties of the masses. On the one hand, the embedding of digital-intelligent technology in government governance needs the support of powerful databases, so the collection, acquisition and organising of data become the foundational work to be completed in the early stage of government digital transformation; yet data-building tasks are pushed down to the grassroots separately under the system of vertical and horizontal segmentation, causing the grassroots workload to surge. The many kinds of government apps, WeChat work groups and government websites, with differing statistical bases and standard formats, effectively require the grassroots to carry out data building repeatedly, which not only lowers grassroots efficiency but leaves staff no time for field investigation and visiting the masses. On the other hand, although finger-tip administration helps to strengthen the convenience and effectiveness of government services, in practice it suffers from the problem of stressing form over substance. Some local governments use such indicators as the registration rate, login rate and "check-in" rate of government apps as the measure of online service construction; these indicators satisfy formal requirements only, are divorced from the actual substance of serving the masses, and so leave digital construction "suspended" above the needs of the masses. Once technological embedding fails to bring about an improvement in government governance performance and the realisation of public wellbeing, then however splendid the digital governance process, its result is ultimately ineffective[10].

2.2 The conflict between new governing powers and responsibilities and traditional regulation

While helping private-sphere subjects to improve their governing capacity and obtain more space for participation, digital-intelligent technology has also promoted the formation of public-private partnerships and the evolution of new governing powers and responsibilities. The new relation of powers and responsibilities breaks the existing public-private boundary and at the same time comes into conflict with traditional modes of regulation.

First, the boundary of the new governing powers and responsibilities tends to blur. Compared with the clear demarcation of public and private spheres in the traditional relation, the relation of powers and responsibilities under the new governance configuration covers both public and private spheres, so that the boundary between them tends to blur. On the one hand, the expansion of digital power continually breaks through the boundary between public and private power. Digital platforms resting on such technical support as big data, algorithms and large models continually extend into the governance of public affairs while redefining people's physical space and modes of interaction, which to some degree dilutes the exclusivity of government power. Digital power, with large platforms as its medium, continually breaks through the original category of power on the basis of the principal-agent relation and the antecedent legitimacy of public power, and makes the

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public-private boundary blurred. On the other hand, responsibility boundaries are difficult to clarify within a complex chain of title. The flow of government data involves the definition and change of data title. Government, enterprises and citizens all take part in the data flow process, and data continually change their title in the course of generation, transmission and use; once a problem arises with data at any one link, the attribution of responsibility across plural subjects is difficult to trace. In the same way, although an algorithm is in essence a series of coded programs, it can automatically determine the order and rules of cyberspace that are executed, so how to define the subjectivity of the algorithm is also a difficulty in the practice of allocating liability. To attribute responsibility to the algorithm's user or designer seems unfair, while to attribute the corresponding responsibility to the algorithm itself seems impossible[11].

Second, traditional regulation fails when confronted with new powers and responsibilities. Traditional regulation takes government as the regulating subject and uses such means as legal norms and policy control to achieve its regulatory purpose; it is the foundation for ensuring the orderly operation of power, but it remains limited in dealing with new powers and responsibilities. First, the hard constraint of legal norms lags behind. China's regulation of digital power rests on the hard constraint of legal norms, providing supervisory departments with an enforcement basis by enacting the relevant legal norms. But artificial intelligence is at present developing at great speed: ChatGPT-1 to ChatGPT-4 took five years in all, and the cycle for launching a new generation of technology has shortened from "years" to "months", with ever faster renewal. Compared with this technological metamorphosis, the gestation period of legal norms is longer: often the old categories of powers and responsibilities have not yet been clearly defined when new problems have already appeared, so that the regulatory effect of legal norms lags seriously. Second, the conservative embedding strategy of ex ante prevention has its limits. Although the embedding of digital-intelligent technology has a markedly positive effect in improving government governance performance, promoting the participation of plural subjects and realising government-citizen interaction, government tends rather to pursue stability. The embedding of such technologies as generative artificial intelligence and government large models is still, in the government's eyes, an option of high uncertainty and risk. The most direct way of eliminating unclear responsibility is therefore to restrict strictly or suspend the embedding of digital-intelligent technology, adopting a conservative strategy in advance to prevent problems from arising. At present very few local governments have introduced generative artificial intelligence or government large models into government services; where used, they are mostly concentrated in such modules as entry retrieval or official-document drafting and are less involved in front-office services. This conservative mode of embedding can avoid unclear responsibility to some degree, but it is not conducive to improving the quality of government service. Third, the government's role positioning as regulating subject faces a challenge. As the subject of public power and the maker of rules, government regulates and controls the digital conduct of private-power subjects, yet government is likewise one of the users of data and algorithms and ought itself to be an object of rule constraint. Where the dual identity conflicts, the paradoxical role of "referee and player" easily arises.

2.3 The risk of technological blind spots and administrative ethics

As the degree of human-machine integration in adapting decision-making and execution deepens, phenomena contrary to administrative ethics — information leakage, disclosure of privacy and algorithmic discrimination among them — continually emerge. Ethics concerns the moral logic of conduct, values, beliefs and principles, and is a consideration of the meaning of such things as justice, honesty or the public interest[12]; administrative ethics is accordingly a moral requirement by which the administrative process is measured. The ethical risk of human-machine integration is a manifestation of the disharmony between artificial and human intelligence, and reflects moreover an absence of the moral dimension in the use of technology; concretely it includes the disharmony between protection and use, and the crisis of human trust in machines.

First, the disharmony between protection and use. Artificial intelligence's entry into government governance needs large quantities of information, data and algorithms to support the orderly computation of government large models, and information, data and algorithms rest mainly on supply by such subjects as government, enterprises and users. Government holds large quantities of government information and makes the rules; enterprises hold industry data and algorithmic technology and convert those rules into algorithms for execution; users receive services and open up their personal information and need profiles. Under the traditional governance model the use of information, data and algorithms was strongly monopolistic and closed: government held information and data on its own and could effectively avoid ethical problems through internal control. Big-data technology, however, can continually expand the scope and volume of public information collected, and data mining makes it more possible for private information to become public information. This means that in the new technological environment the production and possession of data and information are no longer wholly monopolised by government but are widely distributed among technology companies, social organisations and individual subjects[13]. Such information, data and algorithms have enormous potential value and room for profit, and combined with complex chains of title and the technological black box, information security and privacy protection are difficult to achieve through government internal control. The practice of new fields of digital-intelligent technology

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therefore often exceeds the scope of the existing government management system and policy, the supply of legal norms often lags, and the balance between security and use faces a prominent challenge[14].

Second, the crisis of human trust in machines. An important topic in human-machine integration is how to solve the problem of balance between humans and automation, and the problem of trust between humans and machines[15]. First, human and artificial intelligence differ in the logic of the human brain and the logic of the algorithm, which means that humans and machines may differ in decision-making and execution. When humans and machines produce different results, whether to trust the "optimal solution" computed by the machine or the "satisfactory solution" of human wisdom is a problem that human-machine integration must solve. Road surveillance, for example, still captures violations and generates records in extreme weather or when the road is out of order; this may be the "optimal solution" conforming to the machine algorithm, but it is not necessarily a "satisfactory solution" consonant with reason, and a second round of human screening is therefore needed beyond automatic capture. Second, human-machine integration requires the existence of a shared consciousness between human and machine, that is, humans can understand how the machine sees the world and the machine adapts to human individual habits and preferences, achieving human-machine tacit understanding. Such understanding in substance embodies human trust in the machine, that is, the belief that the machine can make the correct judgement and execute it accurately in a way most favourable to humans. But the machine itself has congenital defects — system failure, absence of emotion, transplantation of the designer's will — which put human-machine understanding to the test and further affect the credibility of the government as principal. Once the credible commitment between human and machine fails, rebuilding trust becomes much more difficult. During the COVID-19 pandemic, for example, system misjudgement caused the travel codes of a few individuals to be assigned "red", which at one point provoked public reaction. Third, the use of automated decision-making and execution appears to help eliminate the influence of human background characteristics and subjectivity, but the algorithm itself is not wholly neutral and may even carry the designer's bias and discrimination. Ordinary people do not think deeply about the algorithm itself but equate its automated decisions with "neutral decisions"[16], which makes algorithmic discrimination the more covert and damages human trust in machines.

2.4 The barriers of organisational management and data support

Giving full play to the integration advantages of virtual and physical space has become the mainstream tendency in embedding digital-intelligent technology in government governance, but the relation between organisational management and data support has not yet been properly ordered, and the problems of organisational fragmentation and data isolation are prominent.

First, fragmented organisation in which each acts on its own. Traditional government organisation has a pyramid structure characterised by "vertical stripes and horizontal blocks": the "stripes" and "blocks" of each level and each department constitute the intersecting matrix of organisational management, and this has continued in the construction of digital government. On the one hand, in practice the portals, government app platforms and government social-media accounts of each level and each department are mostly built separately and operated in a dispersed manner. Even functional departments at the same level differ in platform maintenance and service-port management, which aggravates the segmentation of digital government construction and leads to a state of organisational fragmentation. On the other hand, although "parallel windows" and "one-window acceptance" help to simplify the organisational management structure to some degree, this is mostly evident at the front office, while the back office, for matters involving approval by multiple departments and prerequisite requirements, still needs each department to complete its part separately before the results are combined into a final outcome. Departments long focus on the system design and application operation of their own business functions and have gradually formed independent closed systems, with weak horizontal linkage of business applications[17] and with each acting on its own in management.

Second, data isolation brought about by a forest of data chimneys. The virtual world resting on the internet, algorithms and big data is better suited to a multi-point organisational network with decentralised and flattened features, and this requires as its precondition that the interior of the organisation remain open, shared, interactive and coordinated. However, the informatisation of government services has in the past mostly followed an investment-and-construction model that "takes the department as the subject and the project as the centre": departments hold huge quantities of data internally, and government services are divided into a number of independent and fragmented systems by department, producing the phenomenon of "data chimneys". Because information and data are closed within the "grids" built by each department — regarded as a departmental resource and therefore "unwilling" to be shared, or "afraid" to share for reasons of security and confidentiality, or "unable" to share because of data incompatibility left over from dispersed construction — each department can only eliminate the barrier by continually creating new databases, which further aggravates duplicated data construction and the "data chimney" phenomenon. The "Cloud Guizhou" government data platform, for example, had two systems, "mother" and "son", at the initial stage of construction; this was in effect a remedy of "setting up a separate

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kitchen" forced by data incompatibility. The "mother" system maintained administrative work within departments while the "son" system provided such government services as public enquiry, browsing and downloading, seriously increasing system operating costs and creating an obstacle to data sharing.

3 Optimising the integration of digital-intelligent technology with government governance

Digital-intelligent technology is an important support for improving government governance performance, and continually expanding the space for technological empowerment accords with the requirements of the digital wave and of governance modernisation; achieving the integration of digital-intelligent technology and government governance is therefore the general tendency. Grounded in the co-construction and mutual integration of governance logic and technology logic, and focused on the practical constraints currently facing digital-intelligent technology and government governance, it is necessary to propose an optimisation scheme for their integration.

3.1 Seeking the mutual integration of value rationality and technical rationality

The integration of reason and feeling is a process of balancing technology and humanity, that is, of breaking the "purely instrumental rationality" orientation that gives priority to governance performance and, on the premise of manifesting public value, injecting warm humanistic care, so as to promote the mutual integration of instrumental and value rationality.

First, establish a people-centred value consensus. Balancing instrumental and value rationality encompasses such important propositions as efficiency and fairness, technology and ethics, innovation and security, and vitality and order; the core of handling these propositions properly lies in upholding the people-centred target concept and forming a value consensus. On the one hand, the most advanced technology is not equivalent to the most suitable technology; we should return to human subjectivity and value needs and take these as the fundamental criterion for judging whether a technology is suitable. Public wishes and choices should be fully respected, the cold "technological determinism" discarded, and more value care given to people. While fully rolling out such digital services as "non-face-to-face approval", electronic certificates and online appointments, for example, government should also retain offline counters, paper certificates and other means to meet the service needs of different groups. On the other hand, the most complete statistics are not equivalent to the fullest understanding: "filling in forms", "checking in" and "leaving traces" mostly cater to the requirements of digital indicators and give no substantive help in grasping grassroots problems. It is therefore urgently necessary to return from "the paperwork" to "the real", and to descend from "before the screen" to "among the masses", so that grassroots work is freed from formalistic busywork and responds better to livelihood problems and the needs of the masses.

Second, strengthen the construction of digital inclusion mechanisms. A digital inclusion mechanism is a mechanism design covering the expression of demands, the supply of services and distributive compensation, safeguarding equal rights and interests for all groups. As to the expression of demands, dialogue and exchange with different groups should be strengthened, plural value demands brought into the vision of government governance to the greatest extent, and channels for the expression of demands by different groups kept open. As to the supply of services, with an eye to the digital divide between town and country, between regions and between rich and poor, weak-group-friendly digital platforms and operating procedures should be built, adding such features as enlarged type for older users and physical accessibility functions for people with disabilities, so as to improve the mode of service provision. As to distributive compensation, on the basis of the ideas of social fairness and distributive justice, full account should be taken of the disadvantaged position of weak groups in sharing the digital dividend, and equal distribution achieved through tax relief, policy compensation and technical support.

Third, improve citizens' digital literacy and application skills. The digital transformation of government is the tendency of the age, and the promotion of digitalisation requires the whole population to keep pace and take part. In 2021 the Cyberspace Administration of China issued the *Outline of the Action Plan for Improving Digital Literacy and Skills for All*, which states that improving digital literacy and skills for all is a strategic task conforming to the requirements of the age and a key measure for bridging the digital divide and promoting common prosperity[18]. Digital knowledge and consultation channels may be provided to citizens through publicity and explanation, intergenerational mutual aid and community assistance, with special programmes drawn up in particular for such weak groups as older people, people with disabilities, the poor and people in remote areas, so as gradually to eliminate the negative effects of digital inequality and the digital divide.

3.2 Establishing regulation of public- and private-sphere powers and responsibilities

The integration of public and private accelerates the transformation of the relation between the public and private spheres and reshapes the configuration of power. Faced with the expansion of digital power and the predicament of attributing responsibility, government needs to clarify the boundary of public and private powers and responsibilities and to strengthen

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the regulation of platform power, the supervision of subject responsibility and the tracing of data title.

First, regulate platform power on the principle of stakeholders. Government cannot achieve all-round regulation of platform power because of regulatory costs, technological monopoly and hierarchical authority, and platform self-regulation has limited effect; a cooperative mode of regulation should therefore be an effective way of constraining platform power. Cooperative regulation rests on the stakeholder principle of sharing responsibilities and tasks jointly, and on joint governance by such plural subjects interested in the platform as government, platform enterprises, users, judicial organs and public opinion; this not only helps to form a joint force for regulating platform power but can also remedy the lag of legal norms.

Second, improve the supervision of powers and responsibilities on the principle of inclusive prudential regulation. As to regulating the risk of expanding platform power, excessive intervention would inhibit technological innovation and platform autonomy, while inadequate regulation would further encourage a "technological Leviathan" and damage social fairness. In 2021 the State Council issued the *Outline for Implementing the Construction of a Law-Based Government (2021–2025)*, which explicitly proposes "improving inclusive and prudential modes of regulation suited to innovation and creation"[19]. We should therefore grasp the dynamic balance between technological innovation and the regulation of power, promoting development through inclusiveness and establishing regulation through prudence. A list of inclusive and prudential regulation should be issued, the circumstances exempting platforms from liability refined, unlawful and non-compliant conduct specified and standardised, and the bottom-line principle upheld, creating an environment for platform development that tempers severity with leniency. In addition, as to internal regulation, government must establish operating norms for the collection and use of information and the protection of privacy and a mechanism for early warning of information-security risk, strengthening ex ante prevention of digital anomie in the exercise of public power. Self-examination and self-correction should be carried out regularly, problems such as information leakage, system vulnerabilities and non-compliant operation investigated and corrected in good time, and ex post supervision and correction strengthened.

Third, clarify data title on the basis of sovereign blockchain instruments. Complex data chains give rise to regulatory difficulty and obstacles to sharing, and are the pain point and difficulty in attributing responsibility to subjects in the course of public-private integration. What sovereign blockchain is meant to solve is the question of title as between state, organisation and individual; it is a governance-system innovation that evolves from a consensus structure into a co-governance structure and thence into a shared structure[20]. A digital control platform can achieve full-trace electronic tracking, full-process information investigation, and anti-counterfeiting and anti-tampering functions, improving the traceability, reliability and security of the determination of subject responsibility.

3.3 Strengthening the agile response and coordinated extension of human and machine intelligence

The rapid iteration of artificial intelligence and its continuing integration with human intelligence have changed the underlying logic of the traditional governance paradigm; with the emergence of generative artificial intelligence in particular, there is an urgent need to establish a new governance system responding to technological risk and to governance needs. The human-machine integration discussed here therefore does not mean a decision-making and execution mode in which human and technology are mutually exclusive, but rather one that breaks through the limitations of both, responding agilely and extending in coordination.

First, strengthen agile governance of the risks of technological embedding. Compared with traditional governance, agile governance is a dynamic governance paradigm that adapts quickly to changing circumstances and can effectively bridge the contradiction between the rapid change of digital society and the relative lag of government regulation[21]; it is a mode that pays closer attention to the whole process of the development of the object of governance, adapts quickly to changing circumstances and continually expands new governance instruments and methods[22]. The *Principles for the Governance of Next-Generation Artificial Intelligence: Developing Responsible Artificial Intelligence* adopts agile governance as one of its governance principles, proposing to "respect the laws of artificial intelligence development and, while promoting the innovative and orderly development of artificial intelligence, discover and resolve the risks that may arise in good time"[23]. The potential risks in human-machine integration should therefore be grasped accurately on the basis of the principle of agile governance, and responded to and handled quickly with highly adaptive and flexible modes of governance.

Second, promote the coordinated extension of human and machine intelligence. Human-machine coordination means the deep combination and coordinated cooperation of machine algorithms and human thought in completing decision-making tasks. It manifests itself as an operating process at three levels: system, organisation and individual. The process of interaction between human and machine constitutes the large system of human-machine coordination; governments at each level and their departments constitute the subsystems within that large system; each subsystem is composed of organisations; and the personnel concerned are the basic units of the organisation. At the individual level, therefore, a decision-maker's individual algorithmic cognition mechanism and capacity to use digital-intelligent technology should be

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established; at the organisational level, such technologies as virtual space and the metaverse should be used to integrate and reorganise so as to break organisational fragmentation; at the system level, data-driven and interactive response mechanisms should be deepened so as to maintain a harmonious system of real-time human-machine communication.

Third, establish a self-correction mechanism. Human experiential decision-making is easily fettered by subjective feeling, while machine algorithmic decision-making is also swept along by design bias. Technology comes from human design, and systemic exclusion caused by program code carrying the designer's bias is the more covert. A corresponding correction mechanism should therefore be established alongside system development, using risk warnings and correction models to discover and handle problems in good time during human-machine interactive decision-making.

3.4 Advancing the intensive sharing of virtual-real mapping

The integration of physical and virtual space cannot be achieved without the two-wheel drive of organisational management and data elements. It is therefore necessary to shape not only the transformative direction of public information sharing but also the coordinated mode of organisational management and the functional form of data elements, so as continually to improve the fit and match between "virtual" and "real".

First, strengthen the integration and sharing of information resources. In practice digital governance manifests itself mainly as using information as a basic instrument to assist the decision process or as a core instrument to solve real problems[24]. Reshaping public information resources therefore constitutes an important foundation for dealing with the "inability" to share caused by data incompatibility. On the one hand, an information exchange and sharing centre should be built, extracting each department's business database as a departmental source database, gathering and cleaning these, and integrating them into an information-sharing application database. On the other hand, an information classification manual and a list of sharing permissions should be improved. According to the public-good attributes of information and the degree of restriction on its disclosure, information should be divided into four types — "public good, openly accessible" (such as government information made public), "public good, restricted access" (such as national security information), "paid product, openly accessible" (such as personal credit certification) and "paid product, restricted access" (such as patent research information) — and access permissions and use rules specified for each type.

Second, deepen the coordination and transformation of government departments. The key to solving organisational fragmentation and the "unwillingness" to share lies in the efficient coordination of government departments. In January 2024 the *Guiding Opinions of the State Council on Further Optimising Government Services, Improving Administrative Efficiency and Promoting "Efficient Completion of One Matter at a Time"* proposed "clarifying the lead department and the cooperating departments for each 'one matter', together with their respective duties, and strengthening cross-departmental coordination of policy, business and systems, and data sharing"[25]. To deepen departmental coordination, the processes by which government information and public demands are collected, allocated, handled and used should be further improved, shifting from the departmental big data of the past to business big data, and from a departmental-management orientation to a public-service orientation, ensuring that "one matter" can be traced precisely to the specific departments handling it jointly and to their duties, and avoiding departmental buck-passing and idle platforms.

Third, advance the blockchain-based construction of data. In response to the numerous government platforms, overlapping functions and incompatible data, blockchain technology can be used to strengthen block-based construction and thereby achieve the interconnection of government service information and data at provincial and municipal level. Data blockchain technology should be used to strengthen the intensive management of government platforms: focusing on the main line of government services and business work, efforts should be concentrated on building government platforms of high integration, strong user stickiness and user-friendly interfaces, and platforms and applications that overlap in function or are highly homogeneous should be cleaned up and merged. Moreover, as to the "fear" of sharing arising from security and confidentiality considerations, the technical binding force of blockchain — traceable, title-confirming, priceable and tradable — should be brought into play to strengthen the security of data flow and so break through the problem of data fragmentation.

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