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Abstract

The scientific governance is the most important to S&T because of its dual nature for societies. Currently, disruptive technology is the focus attention of national strategic scientific and technological innovation force. To promote the sustainable and healthy development of disruptive technological innovation, we must take measures to prevent and resolve major scientific and technological risks, prudently handle ethics challenges. Take Beijing's disruptive technology governance as a model, this paper studies the path of disruptive technology governance from the perspective of multiple subject participation, and explores the framework of disruptive technology collaborative governance, which is of great significance to the development of innovation governance.

1 Disruptive technology innovation and governance

Disruptive technology is an alternative technology proposed by American scholar Christensen in the 1990s to produce disruptive effects on existing traditional or mainstream technologies. Emergence of major disruptive technologies including artificial intelligence, blockchain and biotechnology which are forward-looking, cross-border, and transcendent have exerted a huge impact on accelerating the iteration of new industries and new business forms, profoundly affecting and changing the balance of national power, and reshaping the world economic structure and international competition landscape.

Disruptive technology is not only a great material practice, but also a pioneering social ethics experiment. Since the 21st century, the dispersion, accumulation, uncertainty, autonomy of the "scientific community" and the freedom of scientists to explore the boundaries of the scientific and technological risks in the knowledge production model have brought many risks to the society and have posed severe challenges to existing sci-technological ethics and public interests.

As these issues expand from the scope of science- technology to the fields of economy, politics and society, the contradiction between the public's increasing demands for multiple interests in security, democracy, and the rule of law and the imbalanced and inadequate development of modern science-technology will become more prominent, which may trigger social conflicts and affect social stability and even national security.

2 Challenges and Dilemma of Disruptive Technology Governance in Beijing

Recent years have seen Beijing grow into a region in China with the strongest scientific and technological foundation, the most concentrated innovation resources and the most active innovation subjects in China. It is home to more than 90 universities, more than 1,000 scientific research institutes and nearly 30,000 national high-tech enterprises. According to the China Urban Science and Technology Innovation Development Report 2020, Beijing ranks first in Science and Technology Innovation Development Index in China. In the 11th sample survey of Chinese citizens' scientific literacy in 2020, Beijing's citizens scientific literacy ranks second in China, second only to Shanghai. The development of disruptive technologies is one of Beijing's important measures in building itself into an international science and technology innovation center.

As a hub of disruptive technologies such as artificial intelligence and biotechnology, Beijing is facing some challenges in the practice of disruptive technologies:

Personal privacy leakage in face of recognition technology; abuse of data and algorithms in artificial intelligence technology that tells the "vacuum" of ethical principles and policies and laws; The identification of ethical responsibility in the application of unmanned driving technology; possible violation of scientific research ethics and absence of regulatory agencies by the subjects of disruptive technological innovation; issues concerning public health, ecological safety, distribution of risks & 利益成本，and international responses to ethical problems.

At the same time, Beijing is faced with problems in exercising disruptive technology governance, unbalanced technological development; differentiation of stakeholders and diverse needs; lack of a clear governance body; overlapping functions of departments and lack of overall planning leading to insufficient governance, fragmentation of authority and information island effects; incomplete government system; insufficient experience in decision-making and governance, a lacks of unified mechanism for coordinating and promoting technology governance, 政策正当性消解 as a result of lacking forward-looking transformation of ethical principles and full-process ethical review, normalized supervision and accountability, and public democratic participation; lack of succession the connection between old and new ethics, and of open absorption and innovative development of international principles; imperfect legal system; lack of policy guidance and regulation which may bring in anomie and chaos of technology governance and the crisis of legalization of governance; scientific and technological innovation on global issues such as climate, energy and public health urgently calling for international governance to be improved; performance of ethical responsibilities relaying only on subject self-discipline; insufficient popularization of scientific and technological

ethics education; the public's scientific literacy and awareness of democratic participation to be improved; technology governance lacking a systematic analysis of ethical, legal and social issues caused by scientific and technological development from the strategic level and multidisciplinary perspective; technology governance response strategy at the institutional level yet to be formed.

The above problems have to some extent restricted Beijing's technological innovation and social development.

3 Participation of multiple subjects in the top-level design of disruptive technology governance

Judging from the historical changes in governance practices, technology governance has undergone a historical change from passive reaction to active participation in the entire process of technological development and construction. From the perspective of theoretical research, under the influence of social governance theory and risk society theory, international technology governance has shown a shift from focusing on scientists' micro-ethical behavior norms to macro-responsibility for scientific and technological activities, and from professional ethics norms to broader social responsibilities. Based on the criticism of technological determinism, technological expert governance and unexpected outcome theory, the ethical issues and challenges of disruptive technology are brought into the perspective of governance, and the goal of multi-agent governance and technology governance is consistent.

A disruptive technology governance system for co-construction, co-governance and sharing needs to be built. In the top-level design, we should give full play to the institutional advantages of China's national system and the participation of multiple entities shall be given full play, These entail promoting responsible innovation in science and technology to achieve the governance goal of a better life for the people; build a multiple subject responsibility system with vertical power and responsibility operation and horizontal collaboration structure around responsibilities and relationships, establishing technological governance policy based on ethics and law, realizing four-dimensional governance concepts of co-construction, co-governance & sharing, and forming four-dimensional governance concepts tailored to value orientation of the needs of people, relationship dimension synergy, legitimacy of power essence and democratic participation and consultation, and. The five governance principles of openness, participation, accountability, effectiveness and coherence. These elements form an organic unity of structure and function and frame the top-level design of the governance system.

4 Path to Participatory Technology Governance by Multiple Subjects

At present, taking disruptive technology governance as an entry point, Beijing is actively exploring the path for multiple subjects to participate in disruptive technology governance, Enabling co-construction, co-governance and sharing to be cohesive, integrated, and responsible will be

significant for Beijing to prevent and resolve major scientific and technological risks, prudently handle ethics challenges and also comprehensively promote technology governance.

4.1 Empowerment. Establish a multi-subject governance system with clear rights and responsibilities and overall coordination

Clarifying the responsibilities of each subject is the core issue of technology governance. Therefore, we should build corresponding supporting systems shall be built so that the rights and responsibilities of related subjects will restrict and cooperate with each other, hierarchical barriers will be broken through and achieve horizontal coordination realized. At the same time, the system corresponding to rights and responsibilities will realize vertical continuity in terms of stage and continuity according to the structure of co-construction, co-governance and sharing. Such horizontal and vertical combination will produce strong resultant force.

Beijing must deepen institutional reform. It should coordinate the technical governance functions of the departments of science and technology, education and health to establish a government-led main body participation system. It is necessary to ensure that science and technology ethics committees at all levels have the functions of territorial review, supervision, rejection, consultation, guidance and evaluation of sub-committees by means of empowerment. Research institutes, universities, high-tech companies and institutional ethics committees shall have internal review and supervision functions. Third-party social organizations composed of experts in the fields of technology and humanities shall be endowed with certification, supervision, and judgment functions. It is also necessary to grant scientific and technological workers the rights to foresee, announce, and suggest. The public should have the rights to understand, participate and supervise. And the media should have the rights to supervise, disseminate and educate. With all these measures, a multi-subject structure with clear rights and responsibilities and with an overall coordination structure can be formed, that is able to avoid overlapping functions and fragmentation of authority.

4.2 Digital and smart governance. Build a legal co governance platform of scientific and technological information based on big data

The interaction between multiple subjects, whether restriction or cooperation, must be based on information exchange. The open, transparent and timely sharing of information is an effective means to prevent scientific and technological workers from violating scientific and technological ethics.

Scientific and technological workers must register the basic information of themselves and their team on the designated platform, and record the relevant information of scientific research projects as well as accept the review and supervision of the scientific and technological ethics committees. The public shall be able to exercise their right to know through the information sharing mechanism.

At the same time, relevant information from the public can also be fed back to government departments and scientific and technological workers through the information sharing platform.Timely and effective communication of information will break the information barrier between multiple subjects and ensures information equality. At the same time, it is also the basis for ensuring the coordination of relationship dimensions among subjects.

At present, data technology is in the stage of technology explosion to the stage of diffusion and application. Beijing should showcase the innovative role of data technology and smart governance on people’s quality of life and resource elements, give full play to the governance advantages of big data, the Internet of Things, artificial intelligence, and blockchain, accelerate the construction of information sharing and co-governance platforms, and establish a smart city support system. While providing the

basic guarantee for technological innovation, it also needs to create a vibrant data ecosystem and realizes data integration.

Scientific and technological ethics regulations, policies, ethical norms and relevant knowledge shall be popularized, full cycle mandatory and general information disclosure for important ethical considerations and major scientific and technological projects shall be made to effectively eliminate the information island effect and lay a foundation for promoting the standardization of multiple subjects and orderly participation in governance. With the gradual popularization and application of blockchain technology, information sharing will become more efficient and secure, and the synergy of rights and responsibilities supported by information sharing mechanism stronger and stronger.

4.3 Inclusive and consultation. Form a communication mechanism for democratic participation of multiple subjects and reaching consensus

Beijing Science and technology ethics committees at all levels can create opportunities and platforms for democratic participation and consultation. They can encourage and guide relevant subjects, third-party social organizations, public representatives, social media and other diverse subjects to engage in intelligent and normalized democratic participation and common consultation online and offline, such as holding scientific and technological ethics conferences, citizen consultation forums etc.

Negative impact caused by the imbalance of the strategy of a few subjects in public and long-term interests, key areas, key technologies and the implementation of complex projects shall be guard against. Beijing municipal government shall pay attention to social inclusion in the formulation and management of public science and technology policies, promote the cross sectoral and interdisciplinary cooperation of interested parties to participate in technology governance through direct, effective and legitimate ways, and realize the constructive transformation from the leadership of scientific and technological elites to the democratic participation of multiple subjects. All these measures are conducive to expressing opinions, resolving contradictions, eliminating differences and reaching consensus.

4.4 Try first. Improve the experimental governance model of disruptive technology

For disruptive innovative technologies such as artificial intelligence, Beijing must give full play to its policy advantages such as the Zhongguancun National Independent Innovation Demonstration Zone and the China (Beijing) Free Trade Pilot Zone, introduce major mission-oriented management methods in important plans and systems such as the outline of the medium and long-term science and technology development plan, adopt governance models and mechanisms that are in line with the state, encourage technological innovation, actively respond to important economic and social challenges, and prevent and control major scientific and technological ethical risks, such as the implementation of “regulatory sandboxes” and pilot projects in experimental models such as blockchain and other financial technology and autonomous driving. Under the premise of being conducive to technological innovation, appropriate boundaries are set to reduce the scope of damage, reduce social risks, and create Better scientific research ecology and technology ecology.

4.5 Collaborative governance. Improve Beijing’s local science and technology ethics regulations, policies and ethical norms

Beijing shall press ahead to solving the existing governance problem that involves all-round innovation in laws, policies, and ethics. Beijing should take the Constitution as the fundamental law,

the civil law and the science and technology promotion law as the guidance, and reasonably learn from international treaties and agreements.

Legal governance around the recognition of the rights and responsibilities of multiple governance entities, norms of behavior, participation procedures, realization of responsibilities, regulatory review and risk relief etc.

Adopt the principle shall be adopted to promote the policy of ethical norms. Policy guidance in scientific research planning, research funding and achievement management to prevent and respond to potential risks shall be strengthened, so will be the effective connection between traditional and modern ethical norms under the guidance of socialist core values to eliminate the normative vacuum. Beijing shall actively integrate into the global innovation network, participate in the implementation of technological innovation in the "Belt and Road Initiative", and engage itself to open absorption and innovative transformation of technologies such as life, environment, information, and international ethical principles.

4.6 System propulsion. Establish a holistic science and technology ethics communication education system

Beijing should carry out science and technology ethics education based on its advantages in culture, citizen science and gathering high-tech talents. Relevant departments and the Association for Science and Technology should implement publicity and education on science and technology regulations, policies and ethics through Beijing workshops, lecture halls and other activities for different groups of people. Scientific research institutes and universities should adopt hierarchical and classified science and technology ethics education to strengthen the ethics of science and technology in the cultivation and use of college students and scientific and technological workers, as well as top talents and leading figures.

By actively setting up public issues of science and technology ethics such as environmental pollution, information security, and gene editing, the media must popularize and promote science and technology ethics policies and regulations so as to drive the attention of the whole society and form social cohesion and reach consensus so as to promote the co-construction, co-governance and sharing.

In conclusion, Beijing must actively respond to the challenges, focus on the goal of "responsible innovation in science and technology to achieve a better life for the people", highlight the characteristic advantages of "co-construction, co-governance and sharing", create a "Beijing model" in which multiple subjects participate in technology governance from top-level design and institutional arrangements, and promote the effective coupling of technological innovation and ethical governance.

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