

The Bottom Line and Full Cycle of Ethical Embedding —Ethical Changes in Science and Technology in China's Emerging Technology Era

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ABSTRACT

The new round of scientific and technological revolution and industrial change is completely changing the original global innovation map and optimizing the global economic structure, and the original ethics of science and technology is constantly facing challenges, resulting in a series of problems of coexistence between artificial intelligence machines and human beings, environmental problems, algorithmic decision-making and privacy and security problems, fairness and discrimination problems, etc. Accordingly, a new ethical system of science and technology is constructed, and the bottom line and full-cycle ethical governance of science and technology is embedded. Under the guidance of the governance principle of "science and technology for good", ethical governance of science and technology is embedded in the whole cycle of science and technology activities, such as technology innovation stage, product design stage, enterprise management stage and technology diffusion and application stage, so as to effectively improve the capability and efficiency of ethical review and truly meet the development requirements of science and technology.

Keywords: Emerging Technologies, Ethics, Innovation

1. INTRODUCTION

Since the 21st century, the rapid development of nanotechnology, genetic engineering, information technology, artificial intelligence and other emerging technologies has driven global scientific and technological innovation into an unprecedented period of high density and activity. A new round of technological revolution and industrial change is revolutionizing the original global innovation landscape and optimizing the global economic structure. At the same time, the coexistence between artificial intelligence machines and human beings, algorithmic decision-making and privacy and security issues, fairness and discrimination issues, etc., the topic of technology ethics around emerging technologies is increasingly leading to deep thinking. Technology is the primary driver of development, but also one of the important sources of risk. The ethical challenges brought by positive technology and the enhancement of ethical governance of science and technology have gradually become a global

consensus, and the Chinese government continues to attach great importance to the issue of ethics of science and technology.

The research on ethical governance of emerging technologies in China is still in its initial stage, and scholars mostly focus on emerging technology risks, and there is less research on the process of ethical governance of emerging technologies. As an emerging theory of ethical governance of technology, this paper compares its formation and development based on its connotation, which is conducive to developing the vision of ethical governance of emerging technologies in China and providing new ideas for further research.

2. DEVELOPMENT CHARACTERISTICS AND POTENTIAL IMPACT OF EMERGING TECHNOLOGIES

At present, scholars at home and abroad have different views on the issue of what is "emerging technology" from different thinking perspectives. George

S. Day, a pioneer in the study of emerging technology, believes that "emerging technology refers to innovative technologies or applications that include fundamental and incremental innovations, are based on science, and have the ability to innovative technologies or applications that change existing industries to create new industries." Some scholars suggest that "emerging technology is a newly emerged or innovative high technology that has a significant impact on industry development and economic structure." Some scholars also put forward the view that "emerging technology is a kind of technology with high uncertainty and multiple innovation possibilities. Through reading domestic and foreign literature, I believe that the concept of "emerging technology" can be understood from two dimensions: first, from the time dimension, emerging technology should be a newly emerged technology, people's understanding of it is not yet complete, and its application prospects and development direction are still in the exploration stage; second, from the commercialization dimension, emerging technology should be a technology with greater commercial potential, and to a large extent has the possibility of changing or subverting traditional industries and generating new industries.

In the process of technological change, time confirms the concept of "creative destruction" of Austrian political economist Joseph Schumpeter, as a new technology, emerging technology provides the possibility for human production and life, but also brings human beings to an uncontrollable future. Its development dimension breaks the linear logic of "technology only" and extends to multiple dimensions of technology, society, culture, ecology and ethics, etc. The development of solid emerging technology will trigger innovation and impact in multiple directions, including but not limited to technology, products, markets, lifestyles and production methods, which will produce unprecedented creative destruction to existing products, existing markets, existing life, production methods and even existing ethical order. This "destruction" will not happen at the same time, nor will it have an even and uniform impact on all industries. This will lead to deep thoughts and debates on bioethics and law, the value of life and the fate of all human beings. Nowadays, emerging science and technology have posed a series of important challenges and propositions to human beings, to which we must respond, and the emerging wave of technology now requires better ethical thinking and better ethical action.

One of the main characteristics of emerging technologies is their uncertainty. We should distinguish between understanding risk uncertainty, which refers to the probability or degree of negative consequences that we cause by the way we act or do not act, and uncertainty, which means that we are not able to predict the risk of it due to the lack of necessary information and lack of knowledge preparation on which way of acting or not acting should be used. Emerging technologies by their

nature can be described as a technological change, then the contingency and unpredictability that comes with the change is greatly increased and can be concentrated due to a variety of reasons. For example, we do not know when scientists create technologies or products in the laboratory that are dangerous to people and society; at what point are naturally occurring dangerous organisms readily available; we also do not know what resources, including skills, equipment, and money, they will need to produce dangerous technologies and products; and because of the novelty of emerging technologies, even scientists cannot predict how the products they produce will affect biodiversity and (e.g., we have no similar experience to predict the environmental impacts of synthetic organisms, i.e., we cannot predict the nature, probability, and severity of all potential environmental harm); scientists and regulators are in a state of "ignorance" and cannot determine the probability and nature of their products' impacts on human health and the environment, and thus cannot take effective measures to address them. and therefore cannot take effective measures to address them.

The second characteristic of emerging technologies is that they are risky on both sides, i.e., if they are used in good faith, they will bring unlimited benefits to humanity and society, and if they are used in bad faith, they will then pose a great risk of threatening the survival of humanity. In this regard, the British scientist Stephen Hawking (Stephen Hawking) has more than once expressed his concern about the rise of artificial intelligence. The famous Swedish philosopher Nick Bostrom proposed the concept of "existential risk", which means that the inadvertent use of nuclear, nanotechnology, genetic engineering, and artificial intelligence technologies could lead to the permanent destruction of intelligent life on Earth, i.e. The threat to the survival of the human race is significant. For example, in the field of artificial intelligence, with the communication technology from only supporting voice calls to today's self-media for all people, and then to achieve the interconnection of everything, AI empowerment has given rise to advanced interconnection of everything, but telecommunication fraud, extortion software also proliferated, the malicious use of the technology not only reduces the cost of crime, but also increases the scale of impact to immeasurable. Another example is the research and widespread use of synthetic biology, which can help us solve the long-standing problems of food, nutrition, fuel, medicine and vaccine production in a fast and economical way, but if we synthesize viruses that are highly infectious, cause serious diseases, spread rapidly and are immune to vaccines, we may lose tens of millions of lives. The manufacture of television sets, for example, is hardly a dual use of the technology itself. And the more developed an emerging technology is, the greater the potential for its malicious exploitation.

The third main characteristic of emerging technologies is that with the innovation of technology will break people's transmission ethical perceptions and bring some columns of ethical issues that we have not seen or even thought about before. For example, artificial intelligence technology plays an increasingly important role in aiding human decision making, which is inseparable from advanced algorithms and data collection. Through data collection, user profiles are formed, and predictions are made about user behavior or cognition, including user's consumption behavior, employment behavior, and even criminal behavior. Based on such prediction, the assisted decision making will be very likely to produce algorithmic discrimination and algorithmic bias.

3. ETHICAL ISSUES ARISING FROM EMERGING TECHNOLOGIES

Nanotechnology, genetic engineering, information technology, artificial intelligence and other emerging technologies in the direction of each show their strengths, emerging technologies to enable new applications and new business models, such examples can be seen everywhere, just a single direction of digitalization, for example, with the change in consumer spending habits, the entity store owners do not take the initiative to develop the online economy, such as take-out, live shopping and other ways, revenue will face a decline or even close down; people's reading Changing habits, used to the Internet, cell phone reading, can not successfully complete the digital transformation of newspapers, magazines, printing industry is bound to reduce traditional jobs and so on.

First, the issue of personal privacy and security brought about by emerging technologies: often brought up for discussion, digital technologies have raised concerns about monopolization of large platforms and the leakage and trafficking of personal privacy. Giants like Microsoft and Google have been repeatedly launched anti-monopoly investigations, and Facebook and Twitter often face accusations of abusing their platform power, which is behind people's vigilance and fear of digital technology platforms. Personal privacy and security is already a major information security issue, as data about you can seemingly be collected from anywhere, and the emergence of new algorithms means that these existing concerns will be amplified, with artificial intelligence enabling companies to track what people are doing and predict what they will do next. For example, social media sites and streaming services are able to push content that you might engage with based on previous clicks and plays, even when you might have forgotten. Tracking your every action and building a profile about you can be worrisome.

Second, emerging technologies pose an environmental pollution problem, and in recent years,

technology companies have intentionally designed products to become obsolete or functionally sub-optimal within a specific timeframe - for example, by shortening product life, requiring design and software updates, or discontinuing support for older models. In 2019 alone, approximately 54 million metric tons of e-waste were generated worldwide. On average, 50 million metric tons of e-waste is generated each year, which is roughly equivalent in weight to 4,500 Eiffel Towers. If no action is taken, this number could increase exponentially to more than 120 million tons by 2050. As the e-waste stream grows rapidly, another problem arises: dealing with the e-waste itself. Not only can the disposal of e-waste be harmful to human health given exposure to toxic fumes or exposure to hazardous substances, improper e-waste disposal has also been shown to cause damage to the environment.

4. BOTTOM LINE AND FULL-CYCLE ETHICAL EMBEDDING OF THE ETHICAL GOVERNANCE MODEL OF SCIENCE AND TECHNOLOGY

The current social environment for the development of emerging technologies is characterized by uncertainty and double-sided risk, and the uncertainty feature will increase people's uncertainty about the future society.

We should be prepared for the changes and challenges that will be brought about by artificial intelligence, gene editing, and technological information. In the face of the emerging technological innovations that are taking place today, we should be fully prepared to meet the changes and challenges brought by artificial intelligence, gene editing, technological information and other technologies that are applicable to our production and life, and we should adhere to the development path of "technology for good", continuously deepen our knowledge and understanding of emerging technologies, continuously learn and accumulate the experience and lessons of science and technology We should persist in the development path of "science and technology for good", deepen our knowledge and understanding of emerging science and technology, learn and accumulate the experience and lessons of science and technology governance of other countries, and actively study the mode of science and technology governance in line with China's development characteristics. We should fully consider and respect China's national conditions, objectively treat the differences in development stages between countries and regions, fully consider the uncertainties and double-sided risks in the production and application of emerging technologies, actively promote the international exchange of ethical governance of emerging technologies, and promote consultation and dialogue among multiple subjects.

The bottom-line and cyclical ethical embedding of science and technology governance model is a kind of

governance from the perspective of the subject, through the adjustable communication arrangements of the appropriate participating subjects, so that the scope of governance participants can be moderately expanded, the awareness of emerging technology risks can be enhanced, the pace of emerging technology development can be moderately slowed down or accelerated at a certain point or stage, and the governance principle of "science and technology for good" can be adhered to. Guided by the principle of "good governance in science and technology", the ethical governance of science and technology is embedded in the whole cycle of science and technology activities, such as technology innovation stage, product design stage, enterprise management stage and technology diffusion and application stage, mainly in the following aspects: in the process of technology innovation, the value of reflection on the expected projection from the perspective of multiple social subjects, emerging technology application and unexpected events can be conducted through the pre-rehearsal of the application scenarios; in the product design stage, embedding value-sensitive design theories and methods of technology stakeholders' privacy, informed consent settings, and behavioral approaches; in the process of enterprise management, determining ethical and moral boundary bottom line and enhancing behavioral constraints on innovation subjects through the establishment of enterprise responsible innovation framework; in the stage of technology application, adopting social public opinion feedback, returning to supplement emerging technology decision-making, and involving social public opinion in science and technology ethical governance.

5. CONCLUSION

In summary, the mainstream science and technology development model is facing innovation and the science and technology ethics based on it is constantly facing challenges, reflecting the inextricable relationship between the role of science and technology ethics and the science and technology development model. In order to avoid the failure of science and technology ethics, we should give priority to changing the current science and technology development model, and then build a new science and technology ethics system based on it. The ethical governance of science and technology is embedded in the whole cycle of science and technology activities such as technology innovation stage, product design stage, enterprise management stage, and technology diffusion and application stage under the guidance of the governance principle of "good science and technology", so as to effectively improve the capacity and efficiency of ethical review and truly meet the requirements of science and technology development requirements.

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