Bulletin of Chinese Academy of Sciences

Volume 36 | Issue 11 Article 3

11-20-2021

# Constructing Ethical Order of Digital World

Guoyu WANG
*School of Philosophy, Fudan University, Shanghai 200433, China Center for Biomedical Ethics, Fudan University, Shanghai 200433, China*, wguoyu@fudan.edu.cn

*See next page for additional authors*

## Recommended Citation

WANG, Guoyu and MEI, Hong (2021) "Constructing Ethical Order of Digital World," *Bulletin of Chinese Academy of Sciences (Chinese Version)*: Vol. 36 : Iss. 11 , Article 3.
DOI: https://doi.org/10.16418/j.issn.1000-3045.20211106001
Available at: https://bulletinofcas.researchcommons.org/journal/vol36/iss11/3

# Constructing Ethical Order of Digital World


## Abstract

With the digital transformation and the construction of digital China, a digital world parallel to the real world is being born. Historically, numbers have shaped our perception of the world and human beings. Digital transformation will further expand human cognitive space and means, release productivity, and change the way people think and behave. However, the virtuality and "outof domain" characteristics of people and things in the digital world have caused ethical problems in the digital world. Therefore, it is urgent to construct and improve the ethical order of the digital world. The article summarizes the existing three paths of scientific and technological ethics involved in the digitalization process:the criticism of "Dataism", the embedding of ethics into algorithms and moral materialization, and the responsible innovation through legal and policy regulation. It proposes to shape the ethical order of the digital world. The ability of people to participate in digital transformation and governance in the digital age must be improved. It is recommended to improve the digital capabilities of the public in the digital age just like spending great efforts to build digital infrastructure.



## Keywords

digitization; digital world; ethical order; construct



## Authors

Guoyu WANG and Hong MEI

**Citation:** WANG Guoyu, MEI Hong. Constructing Ethical Order of Digital World [J]. Bulletin of Chinese Academy of Sciences, 2021 (11): 1278–1287.

# Constructing Ethical Order of Digital World

WANG Guoyu[1,2], MEI Hong[3,4]

*1. School of Philosophy, Fudan University, Shanghai 200433, China;*
*2. Center for Biomedical Ethics, Fudan University, Shanghai 200433, China;*
*3. Key Laboratory of High Confidence Software Technologies of Ministry of Education (Peking University), Beijing 100871, China;*
*4. Advanced Institute of Big Data, Beijing 100195, China*

**Abstract:** With the digital transformation and the construction of digital China, a digital world parallel to the real world is being born. Historically, numbers have shaped our perception of the world and human beings. Digital transformation will further expand human cognitive space and means, release productivity, and change the way people think and behave. However, the virtuality and "out-of-domain" characteristics of people and things in the digital world have caused ethical problems in the digital world. Therefore, it is urgent to construct and improve the ethical order of the digital world. The article summarizes the existing three paths of scientific and technological ethics involved in the digitalization process: the criticism of "Dataism," the embedding of ethics into algorithms and moral materialization, and the responsible innovation through legal and policy regulation. It proposes to shape the ethical order of the digital world. The ability of people to participate in digital transformation and governance in the digital age must be improved. It is recommended to improve the digital capabilities of the public in the digital age just like spending great efforts to build digital infrastructure. **DOI:** 10.16418/j.issn.1000-3045.20211106001-en

**Keywords:** digitization; digital world; ethical order; construct

The digitization of the real world refers to the construction of a digital world parallel to the real world, and it has been gradually realized. Based on the in-depth analysis of the digital world, human beings have expanded the field of vision for understanding the world, and released huge market and economic power through deep integration of digital technology, real economy, and industrial innovation. From e-commerce, shared travel, shared education, and network collaboration to online finance, etc., digital technology has changed people's lifestyles, thinking habits and modes, and the development patterns and motivation of society. Therefore, building digital China, developing digital economy, and promoting digital transformation of all walks of life have become the strategies for constructing a great modern socialist country.

However, the laws, ethics, and institutional systems corresponding to digital transformation have not been fully established, and the existing institutional systems of the real world cannot fully cover and meet the requirements of the digital society. Therefore, there is ethical disorder between the cyberspace and digital world to some extent. As a result, while accelerating digital construction, it is necessary and urgent to form the ethical order of the digital world.

## 1 Progress of the digital world

Numbers have shaped our perception of the world and human beings [1]. Human beings have described the world with numbers for a long history. As studied, the primitive concepts involving number, quantity, and shape can be traced back to the earliest period of the human race. The rudiment of mathematical concepts can be found in older life forms living millions of years earlier than human beings [2]. The development of the concept of number is a long process, and the initial mathematics is directly related to the world of our sensory experience. Some even believe that the continuation of human race may not be irrelevant to the development of mathematical concepts. Modern science derived from ancient Greece presupposes the regularity of the universe, which is associated with the view of the universe of the Pythagorean School—"All is Number." "All things which can be known have number; for it is not possible that without number anything can be either conceived or known" [2].

The hypothesis that numbers conceive things proposed by the Pythagorean School has been partially verified in the digital era. The concept of digitization was put forward in the 1950s. The words "digitize" and "digitization" in English are derived from "digitus" and "finger" in Latin, and "digit" and "number" in English refer to the process of converting objects, images, sounds, texts, or signals into digital format files. Digital technology that started in the 1950s has brought about tremendous social changes. Early digitization only focused on the physical world and introduced data and knowledge into computers with binary codes to form

**Supported by:** Science and Technology Ethics Research Project Supported by the Academic Divisions of the Chinese Academy of Sciences (XBKJLL2018002)

 

identifiable, storable, and computable digital data, based on which relevant data models can be established for analysis. At present, by virtue of the integrated innovation and application of the Internet, big data, artificial intelligence, Internet of Things, cloud computing, and other technologies, digitization is extended to the entire economic and social system, and spreads from the physical world to the world of human beings, thereby realizing the digitization of the entire social organization, management, and operation system, as well as human beings. One man can be represented by a set of data, and a society and a country can also be described by a set of data; the identities of people and things can be represented by data. Data have become the basis for connecting everything. In economic life, data have become a new productivity factor besides natural factors and man-made objects, and in industrial circles, data are also known as "digital oil" and "digital energy." As for knowledge production, data have become the ontology for understanding the world and a new source of knowledge. Consequently, countries attach great importance to infrastructure construction and transformation related to digitization.

"Digital object" [3] has attracted the attention of philosophers. Although the relationship between numbers and objects is to be studied, according to the epistemological interpretation of data, data are a collection of facts [4] and can characterize the world. In some cases, your data even know you better than yourself. Bogen and Woodward [5] embrace the thought that data are the representation of facts to be explained corresponding to a certain phenomenon. "As long as a certain state is satisfied, or when a certain state is satisfied, the relevant facts can be explained, and the data can characterize the relevant facts" [6].Therefore, the understanding of the world can be obtained by analysis of data, and the constructed world view depends on data in a certain sense. Jim Gray [7], the winner of the Turing Award, believed that scientific research has come to the "fourth paradigm"—data-intensive scientific discovery. Under this paradigm, data are a new method and new path for scientific research, and data-driven science is more powerful than knowledge-driven science based on deductive methods in explaining the world. Because traditional methods are generally established based on small data sets or local data, only partial knowledge can be obtained, and there is a lack of systematic, macro, and holistic understanding of things. In theory, scientific research based on big data can find universal knowledge through analyzing the statistical laws, thereby understanding the world as a whole.

Take the research of precision medicine as an example: In 2011, the United States National Research Council issued a report entitled "Toward Precision Medicine," in which precision medicine is defined as a more precise knowledge network for molecular disease classification by integrating the molecular research and clinical data of each patient, whose goal is to improve the level of diagnosis and treatment and provide the best available care for each individual [8]. Therefore, the acquisition of biomedical big data is the premise of precision medicine. Biomedical big data involve various omics data, such as the genome, proteome, metabolome, and phenome, as well as environmental data, family and personal behavior data. Such big data contain individual genetic inheritance and life data, data regarding families, groups, and the external environment, and socio-economic data. Through integration and analysis of these multi-dimensional data, the rules can be determined, and the panorama image affecting individual health can be obtained, thus getting the knowledge impossible to be acquired based on small data. In this sense, digitization has changed the basis of our understanding of the world in ontology, and the way we understand the world from the perspective of methodology and epistemology.

## 2 Characteristics and dual effects of the digital world

Since data are a collection of facts or the representation of the world, countries and industries all over the world are promoting digital transformation. Digital technology that converts things containing certain information into digital forms can manage massive data from different devices and systems in a better and more convenient manner, and realize cross-regional and cross-team cooperation, as well as knowledge sharing. For example, when the paper medical records in file cabinets of a hospital are transformed into data and saved in the cloud, the data are also the objects for producing knowledge or relieving diseases whenever and wherever possible. In social life, it doesn't matter what the data are, and what's important is the release of the value of the things. By getting rid of the limitation of "domain," the data, as the carrier of things, can flow in infinite time and space. Because of the digitization of the service industry, guests from afar need not go to a hotel to ask if there is any vacant bed, or travel all over the city to buy something. At the critical moment of "July 20" Torrential Rain in Zhengzhou, Henan Province, some volunteers helped the rescuers to know the most needed people and things through online information transmission and collaboration; in addition, the organic and seamless connection between the digital world and the real world also created miracles of saving lives at critical moments [①].

However, the birth of a new world will inevitably be accompanied by the pains of initial disorder. Data are the carrier

[①]During the torrential rain in Zhengzhou, a woman rescued her mother and two children through remote communication, showing the great wisdom. (2021-07-28) [2021-10-12]. https://baijiahao.baidu.com/s?id=1706418806817711597&wfr=spider&for=pc.

 

of things, and things are the objects in finite time and space. The two-way flow from things to data and from data to things will release tremendous productivity and value, but it will also bring many ethical challenges. The essential reason is that digitization has expanded the activities of people in limited time and space to virtual space without physical and temporal boundaries, but all the existing ethical and social norms are prepared for people in the determined time and space of the real world and those in a specific social network. When the network and digital space deconstruct the existing social network, although people are still those in society, the social network will be invisible. The behaviors in network and digital space can affect the people and society in the real world, but the order of the real society cannot be simply applied to the digital environment. Those factors lead to ethical disorder of the digital world, which is manifested in two aspects at least.

## 2.1 Individual aspect

An individual may acquire a new identity in the digital world, i.e., digital identity, which briefly refers to a set of codes for describing and proving a person. With the digital identity, one can prove his/her identity in the digital world. Different from the electronic identity that is only the electronic version of the identity information, digital identity is related to the digital identity technology system, which can present a "portrait" by introducing digital technologies such as biometrics and big data to confirm that the digital "me" is the real "me." The common applications include the identification or authentication of the banking system, and railway and airport transportation systems. The identification can provide a great convenience for people to conduct financial transactions and travel in an efficient and safe manner. The health code used during the pandemic is also a digital identity. The "green code" and "red code" can outline an individual's life trajectory and social network. Online push is also based on the digital identity of each individual: It can infer and analyze one's behavioral preferences, and even his/her occupation and workplace based on the behavioral footprint and online browsing habits. Therefore, an individual has at least three identities: ① Social identity; ② Biometric identity; ③ Behavioral and psychological identity. Those identities are personal data in most cases, and if others want to acquire such data, they shall obtain the consent of the individual. In the digital space, however, such "portraits" are mostly constructed by digital technology. Especially, personal biological information, inner emotions, and preferences belong to highly sensitive privacy. Since human beings are emotional and extremely fragile, inappropriate exposure of personal privacy will bring great harm to individuals and their families, and sometimes lead to discrimination on the grounds of origin, health, race, and gender.

Personal emotions fall into the private sphere of an individual, and therefore the protection of the private sphere is also the protection of man's dignity and freedom. Nevertheless, there is almost no private domain in the digital world. In the era of the internet and intelligence, as long as you are online, you are in the public domain, which is determined by the logic of the online world to some extent. At present, there are not enough technologies and specifications to completely protect individuals. According to a paper published by Erlich et al. [9] on *Science* on November 9, 2018, the identity of each individual could be easily traced in the database with the data of his/her distant relatives and other demographic information, such as the age of the target or the possible place of residence, without particularly specific information. In theory, a database covering the DNA information of only 2% of adults can trace the distant relatives of any individual and further reveal their identities. The exposure of similar personal biological information may change one's current life, and also affect the future lives of an individual and his/her children.

The "out of domain" of data causes unclear ownership. Therefore, once a value is generated, there will be conflicts in value distribution. Data producers and suppliers can put forward their right claims. In the case of any data transfer and data sharing, it will involve the distribution of intellectual property rights and benefits as well as informed consent. In particular, biomedical data (e.g., genetic data) involves the privacy of individuals and even groups. The rights to data access, agreement, and sharing encompass the ethics of data distribution and also the rights of dominion and autonomy of data.

When private data are digitized and transformed into social memory, it is not clear whether the effects are positive or negative. Human beings are creatures that can forget something and forgetting is an ordinary state, but the data of artifacts will be kept forever if not deleted or destroyed. Today, we may understand the civilization of our ancestors, and the "division of history into periods" and "origin identification" mainly depends on the "memory" of things. However, although forgetting is a "defect" of mankind, it is also a necessary prerequisite for the progress of mankind. Life will be quite heavy without forgetting. Schönberger told a story in *Delete: The Virtue of Forgetting in the Digital Age*: "Take the case of Andrew Feldmar, a Canadian psychotherapist in his late sixties living in Vancouver. In 2006, he tried to cross the US/Canadian border as he had done over a hundred times before. This time, however, a border guard queried an Internet search engine for Feldmar. Out popped an article Feldmar had written for an interdisciplinary journal in 2001, in which he mentioned he had taken LSD in the 1960s. Feldmar was held for four hours, fingerprinted, and after signing a statement that he had taken drugs almost four decades ago, was barred from further entry into the United States" [10]. Therefore, it can be seen that in the digital world, once private information is digitized and transformed into social memory, it may bring not freedom but burden and control. This is the reason why some scholars were strongly against the "Civilization Code" when initially released [11].

 

## 2.2 Social aspect

Digitization has diverse and all-around effects on society. ① Digitization releases huge productivity. The collection, analysis, and application of big data would further alter the modes of production and consumption and continue to promote industrial upgrade and development. Data has become the core production factor after natural resources and monetary capital. The timely collection and analysis of information on production and material allocation with digital tools can quickly complete information exchange between industrial chains and upstream and downstream of each industrial chain, adjust the production and sales structure without delay, and rationally allocate the resources. The production modes have become diversified and flexible. The online transfer of consumption modes has provided data for commodity suppliers to understand consumers' consumption needs and preferences and implement personalized services. ② Digitization has brought about tremendous changes in social life, including medical care, elderly care, education, and social governance. Telemedicine and digital imaging can provide medical consultations for people living in remote mountainous areas. Remote monitoring can help the lonely elder to solve life problems in a timely manner and make up for their longing for children through video chat. As for education in mountain villages with difficulty in traffic, digitization can enable children in mountainous areas to enjoy high-quality educational resources and alleviate the imbalance in the allocation of educational resources between urban and rural areas.

Digitization will inevitably bring about changes in the social structure, such as social employment structure, urban and rural structure, regional structure, organizational structure, social class and power structure. These changes will affect the overall situation: In a family, the unemployment of one member will affect the whole family; in society, the unemployment of a large number of people will trigger huge social unrest. Each transformation will first impact the vulnerable groups. Simple repetitive labor will be first replaced, for the production lines do not need "Chaplin-style" workers. The replacement of physical stores means that a large number of salespersons will be unemployed; driverless cars will eliminate taxi drivers in the near future; there will be no need for bank tellers, for electronic money is replacing currency in the online market; nurses in hospitals and waiters in restaurants may gradually be replaced by robots. Without timely employment guidance and training, social classes will be divided in accordance with digital skills. The one who masters data will have the power: People will be divided into the elite group raised based on the accumulation of massive amounts of data, and the "digital poor" replaced by digital technology. Digitization will lead to "unmanned" labor [12] and the widening of the gap between the rich and the poor and the digital divide, thereby highlighting the ruthlessness and even heartlessness of data.

As for data-driven scientific research, digitization has tremendous effects. The field of science and technology first experienced digital transformation. Nowadays, big data have become an important means of scientific research in physics, astronomy, biology, and ecological environment science. It has also opened up a new world in the fields of traditional humanities and social sciences, history, library science, and literature and art. Data production in science and technology is just like the production of man-made objects, and it is also a process based on the combined action of man and technology. The reliability of data from different sources (especially the internet) should be verified, and data and knowledge can only be obtained through complex data mining and analysis processes. The quality of data is also influenced by data computing, including the performance of infrastructure and tools for data production and processing such as high-performance computing, large data storage systems, and fast and efficient data collection and analysis software. These technologies are being updated and iterated. The authenticity and validity of the data first depend on the reliability and accuracy of such technologies. Data of poor quality (e.g., incomplete, false, and inappropriate data, old data, or data used in the wrong context) will limit the system learning ability, and will also produce a potential negative impact on future inferences and decisions [13]. Ormond and Cho [14] pointed out that the ethical issues arising from large-scale DNA sequencing are essentially different from those arising from medical genetics, partly because massive data generated by whole genome or exome sequencing have increased larger amounts of "variants of unknown significance." These "unknown unknowns" will be magnified by the current immature technologies, the lack of common standards for effectiveness analysis, different measurement platforms, and incomplete or inappropriate reference databases.

Data production is inseparable from people, not an individual but a group of people. The honesty and rigorous style of the leader in this field will affect the produced data and also change the direction of the entire industry, which produces a great impact on society. As reported by *New York Times* on October 15, 2018, Piero Anversa, a well-known cardiologist who worked at Harvard Medical School, falsified experimental data in 31 research papers, one of which was published in 2001 [15]. He claimed that stem cells could regenerate the damaged cardiac muscle. Although other laboratories expressed that they failed to replicate the study, what he published promoted the establishment of several firms for developing new methods for the treatment of heart disease and stroke. National Institutes of Health (NIH) also provided a large number of funds for him to perform clinical trials. Ultimately, the false data and results led to a huge waste of countless public funds and the time and energy of numerous researchers in the whole field.

Digitization has created new tools for social governance and global governance. The COVID-19 pandemic that started

 

at the end of 2019 has posed great challenges to social governance, and the timely control of the pandemic may affect the safety of people's lives and property. During the fight against the pandemic, big data and digitization have played important roles and made great achievements. Although there are great differences in the degree and level of digitization between countries and their attitudes towards the boundaries of applications, almost all countries have adopted digital technology to track and detect viruses and control the development of the pandemic.

However, digitization may also cause security issues to society and even the country. Digital transformation is accompanied by digital sharing. The online world has almost no borders, and once numbers enter into the cloud, they may be attacked by hackers even if not shared. The hackers can infer potentially sensitive information from the training dataset by analyzing the parameters or querying the models. In addition, some safety issues cannot be immediately realized, such as the publication of research results related to synthetic biology, and the biological and ecological data. Although knowledge production is public, once certain published data, especially biological data and data related to national security, are acquired by the terrorists, the security of the country and human beings may be threatened [16].

## 3 How to construct the ethical order of the digital world?

The ethical problems brought about by digitization have attracted widespread attention in China and abroad. It is urgent but not easy to construct a new ethical order for digital and cyberspace, and ensure the efficient and orderly development of digital space while promoting the development of digital transformation and digitization technology. Therefore, it is necessary to make exploration at theoretical and practical levels.

### 3.1 Theoretical level

Theoretically, scientific and technological ethics is involved in the progress of digitization from three aspects.

(1) Continuing the critical reflection tradition of scientific and technological ethics, and revealing that digitization is "Dataism" taking "information flow" as the "highest value." The essence of this new ideology is the thought that "the universe consists of data flows, and the value of any phenomenon or entity is determined by its contribution to data processing," and "we may interpret the entire human species as a single data-processing system, with individual humans serving as its chips" [17]. Under the guidance of this critical paradigm, the criticism of indifferent, anti-democratic, and involuntary "Dataism" has become the main trend for the intervention of humanism into digitization. When data and algorithms, together with capital, have become the forces dominating human life to a certain extent, and individuals and society are brought into the "algorithm dilemma" unknowingly, the criticism undoubtedly plays the role of "enlightenment of fear," reminding people that although data can be a mirror of the lifeworld, data are abstract, while the lifeworld is colorful. The people behind the data are flesh and blood, so digitization should have "temperature."

(2) Advocating that philosophy should intervene in the design, and ethics can be "embedded" in algorithms from theory to practice. This direction is represented by the theory of "moral materialization" of the Dutch School, which is mainly embodied in the embedding of ethical ideas into objects or computing systems through design. The development of various data protection technologies such as data audit recognition technology, encryption technology and key management technology, and security multi-party computation, expects to perform ethical regulation through data cleaning, data shielding, data exchange, data generalization, random interference, and other data disrupting technologies. Such regulation can protect individual privacy. Privacy computing and fair computing in big data and intelligent technology can be taken as the practices in this aspect, with the aim of realizing protection of privacy and fairness with algorithms. This is obviously a vital path, but the technicians are forced to bear the ethical responsibility that they could not bear alone.

(3) Forming an actor-network, and advocating responsible innovation from R&D to marketing. This theory mainly emphasizes that "responsible research and innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)" [18]. Responsible innovation involves four dimensions: anticipation, reflexivity, inclusion, and responsiveness [19]. It can make a breakthrough from R&D to enterprise innovation, and realize the dialogue with the public. European Union started to advocate and publicize this concept in 2013 and guides the scientific and technological innovation of its member states. This may be one of the reasons why the European Union proposed the strictest *General Data Protection Regulation* (GDPR).

### 3.2 Practical level

At the practical level, all countries are accelerating the establishment of data protection laws and regulations. In China, a network for accurate data governance from national laws to corporate and industry norms is being improved, and it has become an important link of the modern national governance system. A network extending from the real world to the virtual world is being gradually shaped.

China has been steadily promoting legal construction in terms of personal data and information protection. On August 20, 2021, the 30th Session of the Standing Committee of the 13th National People's Congress passed the *Personal*

 

*Information Protection Law of the People's Republic of China*, which officially entered into force on November 1, 2021. This law has formed the cornerstone of data and network security governance in the digital age together with the *Data Security Law of the People's Republic of China* passed at the 29th Session of the Standing Committee of the 13th National People's Congress on June 10, 2021, and the *Network Security Law of the People's Republic of China* passed at the 24th Session of the Standing Committee of the 12th National People's Congress on November 7, 2016. These three laws and the *Civil Code of the People's Republic of China* passed at the 3rd Session of the 13th National People's Congress on May 28, 2020 have regulated the activities from data development and utilization to personal information processing and network security review from different angles and levels.

In addition to the gradual improvement of national-level laws, enterprises and industries have also issued different industry codes and norms for ensuring data security. National departments such as Cyberspace Administration of China, Ministry of Public Security, Ministry of Industry and Information Technology, and National Information Security Standardization Technical Committee have issued a series of administrative measures. For example, the *Data Security Management Measures (Draft for Comment)*, *Measures on Security Assessment of the Cross-border Transfer of Personal Information (Draft for Comment)*, *Regulations on Levels of Cyber Security Protection (Draft for Comment*), and *Self-assessment Guidelines for the Collection and Use of Personal Information by Apps* were formulated to further clarify that operators should refer to the relevant national standards, and take data classification, backup, encryption measures to strengthen the protection of personal information and important data. In the *Regulations on Levels of Cyber Security Protection (Draft for Comment)* that divides cyber security into 5 levels, the network operators should determine the security protection level of the network during planning and designing, and App operators should perform self-inspection on the collection and use of personal information.

However, it is worth noting that the ethical problems of digitization cannot be solved entirely by laws and regulations. Laws are not equal to ethics and cannot replace the role of ethics. Laws form the basis of ethics, and many ethical problems in digital transformation are conflicts of norms and rules under multiple values. Not all conflicts can be resolved by legal means. Many problems are the dislocation of public acceptance and technical specifications in time and space, belonging to value conflicts between different value groups. Therefore, in addition to the above-mentioned laws, regulations, industry norms, enterprise self-discipline, and engineer responsibility, another important reason for shaping the ethical order of the digital world is that it is necessary to improve people's competence in participating in digital transformation and governance in the digital era. Just like spending great efforts to build digital infrastructure, measures should be taken to enhance the digital literacy and ability of the public in the digital age, including the ability to understand and use digital technology, the ability to participate in the building and sharing of the dividends of digital transformation, the ability to identify various risks in digital interactions, and the ability to protect personal information security and digital rights in accordance with laws and regulations. Those measures aim to establish a new pattern of the digital world and digital society based on collaboration, participation, and common interests. Digitization is not the end, nor the digital economy, but the share of the benefits of digital transformation is the true purpose of digitization. Therefore, it is necessary to include education, training, job transfer, and the promotion of personal "digital ability" into the infrastructure implementation framework during the period of digital transformation. Risk awareness should be developed to improve the sensitivity to ethical risks.

Digitization and globalization complement each other. Chairman Xi Jinping [20] pointed out at the 14th Summit of the Group of Twenty (G20) that the digital economy is developing rapidly, and it would profoundly reshape the world economy and society. We should create a fair, just, and non-discriminatory market environment, rather than development with doors closed, or artificial interference in the market. Data governance rules should be improved to ensure the safe and orderly use of data. In face of major changes of the world unseen in a century, the ethical governance of the digital world requires mutual trust and cooperation of the international community, including the governments, enterprises, and social organizations. The construction of the ethical order of the digital world is inseparable from global collaboration.

## References


1 Everett C. Numbers and the Making of Us: Counting and the Course of Human. Cambridge: Harvard University Press, 2017.

2 Carl B. Boyer. A History of Mathematics (Volume 1). Uta C. Merzbach, eds.; Qin C A, trans. Beijing: Central Compilation & Translation Press, 2013. (in Chinese)

3 Xu Y. On the Existence of Digital Objects. Li W N, trans. Shanghai: Shanghai People's Publishing House, 2019: 42. (in Chinese)

4 William A, Darity Jr. International Encyclopedia of the Social Sciences (2nd Ed). Dublin: The Gale Group, 2008: 234–237.

5 Bogen J, Woodward J. Saving the phenomena. The Philosophical Review, 1988, 97 (3): 303–352.

6 Floridi L. The Routledge Handbook of Philosophy of Information. London: Routledge, 2016: 191–202.

7 Hey T, Tanskey S, Tolle K. Jim Gray on escience: A transformed scientific method//Hey T, Tanskey S, Tolle K, eds. The Fourth Paradigm: Data-intensive Scientific Discovery. Remond: Microsoft Research, 2009: XVIII.

8 National Research Council (US) Committee on A Framework for Developing a New Taxonomy of Disease. Toward Precision Medicine: Building a Knowledge Network for Biomedical Research and a New Taxonomy of Disease. Washington DC: National Academies Press, 2011: 7.

9 Erlich Y, Shor T, Pe'er I, et al. Identity inference of genomic data using long-range familial searches. Science, 2018, 362: 690–694.

10 Viktor Mayer-Schönberger. Delete: The Virtue of Forgetting in the Digital Age. Yuan J, trans. Hangzhou: Zhejiang People's Publishing House, 2013: 1. (in Chinese)


 

11 Duan W W. Civilization code: Apparent big data, but pseudoscience in essence. (2020-09-08) [2021-11-05]. https://www.bjnews.com.cn/detail/159953012215054.html. (in Chinese)
12 Sun W P. Artificial Intelligence and the “New Alienation” of Human Beings. Social Sciences in China, 2020, (12): 119–137. (in Chinese)
13 Artificial Intelligence/Machine Learning Risk & Security Working Group (AIRS). Artificial Intelligence Risk & Governance. [2021-11-02]. https://ai.wharton.upenn.edu/artificial-intelligence-risk-governance/.
14 Ormond K E, Cho M K. Translating personalized medicine using new genetic technologies in clinical practice: The ethical issues. Personalized Medicine, 2014, 11 (2): 211–222.
15 Wang Y L. 31 papers faked! Harvard cardiologist has been lying to the world for 17 years. (2018-10-18) [2021-11-02]. https://www.sohu.com/a/260323376_617717. (in Chinese)
16 Gao P, Ma S W, Lu D R et al. Prudently conduct the engineering and synthesis of the SARS-CoV-2 virus. Synthetic and Systems Biotechnology, 2020, 5 (2): 59–61.
17 Harari Y N. Homo Deus: A Brief History of Tomorrow. UK: McClelland & Stewart, 2016: 428.
18 von Schomberg R. Prospects for technology assessment in a framework of responsible research and innovation//Dusseldorp M, Beecroft R. Technikfolgen Abschätzen Lehren: Bildungspotenziale Transdisziplinärer Methoden. Wiesbaden: VS Verlag für Sozialwissenschaften, 2012: 39–61.
19 Stilgoe J, Owen R, Macnaghten P. Developing a framework for responsible innovation. Research Policy, 2013, 42 (9): 1568–1580.
20 Duan S Z, Guan K J. Xi Jinping attended the 14th Summit of G20 and delivered an important speech. People’s Daily, 2019-06-29 (01). (in Chinese)

**WANG Guoyu,** Professor, Ph.D. Supervisor of School of Philosophy, Fudan University. Director of Center for Biomedical Ethics, and also Director of Applied Ethics Center, Fudan University. Vice Chairman of Science, Technology and Engineering Ethics Committee, Chinese Society for Dialectics of Nature/Philosophy of Nature, Science and Technology (CSDN/PNST). Chairwoman of Shanghai Society of Dialectics of Nature, Member of the Expert Advisory Committee of Shanghai National Pilot Area for New Generation AI Innovation and Development, and Chairwoman of the Committee for Professional and Academic Ethics of China Computer Federation (CCF). Main research fields: applied ethics, ethics and philosophy of technology. E-mail: wguoyu@fudan.edu.cn

MEI Hong Academician of Chinese Academy of Sciences (CAS), Fellow of the World Academy of Sciences for the advancement of science in developing countries (TWAS), Foreign Member of Academia Europaea, IEEE Fellow. Professor and Director of Key Laboratory of High Confidence Software Technologies of Ministry of Education (MOE) at Peking University, President of Advanced Institute of Big Data, Beijing, President of China Computer Federation (CCF). His current research covers software engineering and system software. E-mail: meih@pku.edu.cn

 