Ethical adaptation and legal regulation of modern technology

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Abstract
The efficiency and convenience afforded by modern technology have increased its importance to society in recent years. However, the risks and ethical issues associated with it can lead to many social problems. There is consensus in the academic community that standardizing the research and development of modern technology can help solve those problems. Although different in scope, ethical adaptation and legal regulation are both effective ways to regulate modern technology. Ethical adaptation is mainly used to optimize the environment of research and development on modern technology. The coordination of Dao (the ‘way’ in classical Chinese philosophy) and technology is a means of constructing a rational technical ethic. The social construction of technology provides the possibility for Dao–technology coordination, and responsible innovation is a responsibility that should be shouldered by technical workers. The ethical adaptation of modern technology has a significant influence but limited restraints. When ethical adaptation cannot function, it is necessary to consider technical behaviour within the scope of legal regulations and restrain modern technology by formulating and implementing a legal system for it. The relevant laws are grounded in the coercive force of the state and are far more effective than ethical norms. Moreover, a lack of ethics for technological actors has caused some negative consequences in the application of technology. When formulating laws regarding technology, it is important to include science and technology policies and ethical norms to complete the legal system for technology. The derivative effect of modern technology requires the joint action of ethics and law. Only when they coordinate with and promote each other can the benign development of modern technology and the orderly development of modern society be realized.

Keywords
Ethical accommodation, legal regulation, modern technology

Technology is generally divided into traditional and modern technology, and the Industrial Revolution was the point of transition between them. Traditional technology spread and developed slowly and was confined to a certain cultural context. It was perceived positively as a tool. After the Industrial Revolution, technology took on an entirely new look. The invention and use of the steam engine led to innovations in production, which in turn...
prompted the restructuring and transformation of society. As technology has been widely disseminated and has penetrated all aspects of life, it has become a major driving force of social development. At the same time, it has given rise to many social issues. Recent technologies such as nuclear technology, artificial intelligence (AI), autonomous driving and facial recognition are all examples of having both positive and negative effects on social development. Such controversial developments as gene-edited babies and pregnant male rats, in particular, have intensified the scrutiny of modern technology. They have led to a consensus in academia on the regulation of research and development (R&D).

Although they belong to different spheres, ethical adaptation and legal regulation are both effective ways to assign modern technology its appropriate role in society. Ethical adaptation is behavioural self-regulation based on morality; it is encouraged and appreciated but not mandatory. Legal regulation, which is based on the state’s coercive power, is far more effective than ethical norms. Moreover, the occurrence of some social problems in the application of modern technology may be attributed to a lack of ethical and moral fibre on the part of the actors. When ethical norms prove to be inadequate, it is necessary to regulate the use of technology through legal means.

1. Ethical adaptation of modern technology

The ethical adaptation of modern technology occurs mainly through the optimization of its R&D and the environment in which it is applied. Technology is a driving force of social development but is also capable of causing various social problems due to its potential for creating ethical conflicts and other negative consequences. Therefore, defining the ethical boundaries of technology is important, especially for such powerful technologies as AI, genetics and nuclear technology.

The European Union’s draft Ethics Guidelines for Trustworthy AI states that AI should be trustworthy and used for moral purposes while being technologically reliable and should be approached in a way that maximizes its benefits while minimizing its risks. ‘Moral decision-making is as important as any other consideration’ in AI (Wallach and Allen, 2009). At the Workshop on the Sociology, Ethics and Future of Artificial Intelligence organized by the Chinese Academy of Social Sciences on 20 April 2019, experts and scholars agreed on the need to regulate the development of AI while recognizing its positive impact on society. While the specific guidelines have yet to be discussed, the convening of the meeting suggests that the establishment of appropriate ethical norms for AI has been put on the agenda by academia. Setting boundaries for modern technology through ethical norms to achieve the coordination of Dao (the ‘way’ in classical Chinese philosophy) and technology is in line with efforts to establish a rational relationship between technology and ethics. The intensity of information in and the complexity of modern technology have brought to prominence the ethical responsibility of technologists. To achieve Dao–technology coordination, it is imperative for them to embrace responsible innovation.

1.1 From ‘Dao governing technologies’ to ‘technologies departing from Dao’

Ancient Chinese society has a tradition of ‘Dao governing technologies’, which dictates that all technological activities must be carried out within the boundaries of ethics. Without ethical constraints, many technologies risk being abused such that they may lead to chaos and crime in society. Throughout the history of human development, both Western and Eastern societies have had a tradition of regulating technology through ethics. Aristotle (2003: 1) observed that ‘every art and every inquiry, and similarly every action and pursuit, is thought to aim at some good’. ‘Good’, as used here, is an ethical element that means that technological actions should serve according to their purposes. China has the time-honoured precept of ‘do not speak improperly and do not act improperly’, urging propriety in all aspects of life.

Although ancient societies had ethical norms to regulate the use of technology, their respective social value orientations were inconsistent. Chinese society emphasized virtue marked by the ‘Dao governing technologies’ as its value orientation, while
Western society was more focused on rationality. And their different value orientations produced different results. Chinese virtue ethics lacked respect for the subject of technological invention—the technician—so it had no incentive mechanism for technological invention. This led to a lag in technological development in early China. By contrast, the Western rational value orientation claims that technology should operate in the context of rational economic activities. Therefore, Western society encouraged people to increase their social wealth through the use of technology within reason and the relevant legal limits. This rational value orientation eventually evolved into the promotion of technical rationality, which played an important role in the rise of capitalism and the Industrial Revolution.

With the advent of the modern era, there occurred a separation between technology and Dao. The Industrial Revolution is generally seen as the watershed between traditional technology and modern technology as well as between traditional society and modern society. However, in analyzing the relationship between technology and ethics, it is inappropriate to take the Industrial Revolution as a watershed because the relationship between technology and ethics is not static but has gone through the stages of separation and conflict during the three technological revolutions. Therefore, two milestones are usually recognized in this context: the Industrial Revolution and the Second World War.

After the Industrial Revolution, technology transformed from craftsmanship to industrial technology, represented by machines. Machine technology brought about improvements in productivity. A separation appeared in the use of technology between ‘tool’ and ‘purpose’, in which the tool was no longer subordinated to the purpose but had the independence to choose and set its own purpose. The phenomenon of equivalence between technology and purpose thus emerged. ‘Any technology can be used as long as it is useful’ is a representative statement of the idea. Driven by economic interests, there appeared a separation between technology and Dao.

The separation between technology and Dao brought about serious environmental crises and social problems and was clearly unsustainable. At that point, technology attracted the attention of philosophers and became the object of their criticism. But this was a period when technology was developing at a rapid pace and people could not ignore its economic benefits, which caused the philosophers’ criticisms to be confined to the theoretical arena without having a substantial impact on the use of technology.

After the Second World War, technology developed even more rapidly, and its positive and negative implications became more apparent. A situation of ‘technology conflicting with Dao’ arose. Technology played an increasingly important role in society, and people disregarded traditional values in the pursuit of materialistic goals. As urbanization disrupted the older pattern of life, people interacted less and less with one another. The rapid development of modern technology and the accelerating pace of life stressed people psychologically and physiologically and led to various psychological disorders. With continuing technological development and the unabated exploitation of nature, the relationship between man and nature degraded from one of unity to one of conflict. The imbalance in technological development exacerbated inequity and injustice in social development. As the world has entered the era of intelligent technology, technology-related challenges have become even more daunting and sinister, ranging from the ‘trolley problem’ of autonomous driving and the Snowden incident, along with its worrying implications about personal privacy, to the development of ethically controversial technologies such as transgenics, cloning and gene-editing of babies. In this period, a growing number of people have come to realize that boundaries must be set for the development of technology, that just because something can be done does not mean that it should be done, that the R&D and use of technology must be confined within ethical limits, and that ‘Dao—technology coordination’ should be the direction of technological ethics in the future.

1.2 The possibility of Dao–technology coordination: The social construction of technology

Dao–technology coordination is a means of adjusting the technologization of modern society. It regulates
technological development through technological ethics by setting boundaries for the development and use of modern technology. Dao–technology coordination means to establish a form of prior restraint between ethics and technology, which is manifested in the specification and restraint of technical operations. Although not compulsory, this restraint and specification are the result of continuous negotiation among the technical actors. The theoretical premise of Dao–technology coordination is that the Dao can be used to construct and influence technologies in modern technological development, and that premise is supported by social constructionism.

The early philosophy of technology was dominated by two theories: instrumentalism and substantivism. Instrumentalism assumes that technology is neutral and has no moral component. It is subservient to the user’s purpose and is only a means to an end. Substantivism argues that technology constitutes a new cultural system that permeates all areas of modern society and that humankind cannot escape its control. Although these two views have different understandings of technology, they both define what they see as the essence of technology. They claim that technology has its own course of development, and that social and personal factors cannot influence it. Technological instrumentalists optimistically see an inherent good in technology, believing that problems arising from technological development can be solved by technological redevelopment. Technological substantivists, on the contrary, see an evil propensity in technology and claim that humans cannot change the direction of technology. Both theories deny a link between technology and ethics.

Influenced by the theory of the social construction of scientific knowledge in the 1980s, there was a revolution in the field of the philosophy of technology; that is, the ‘empirical turn’. In his book *American Philosophy of Technology: The Empirical Turn*, Dutch philosopher Hans Achterhuis profiled the work of six leading figures of contemporary American philosophy of technology and argued that an empirical turn had taken place in their research.

The new generation of philosophers of technology can be called constructionists, who open the black box of technological development and no longer treat technological products as pre-given, but analyse their concrete development and formation, involving many different actors in the process. They no longer portray technology as autonomous, but reveal the influence of numerous social forces on technology. (Ihde, 2008)

Philosophers of technology in the ‘empirical turn’ changed their perspective from focusing on the use of technology to specific, individual technologies. In their view, technology does not have a single orientation but is constructed by various social factors. ‘An ethical mechanism of technology in which technology and ethics are embedded with each other is gradually taking shape’ (Jia and Chen, 2021). In the process of construction is the possibility of the transformation of technology.

In the social constructionist view, technology is not an inseparable whole or wholly determined by economic and technological logic but is constructed by various social factors with different paths of development. In the specific use of technology, ‘good’ and ‘evil’ are constructed. Technological constructivism, by bridging technology and ethics, points to the theoretical possibility of ethics influencing technology. Ihde (2008) argues for the importance of anticipation in the development of technology. Jonas (1984) goes further and sees the statute of anticipation in the development of technology. Ihde (2008) argues for the importance of ethics in the process of technological development, arguing that ‘the new order of human action requires a commensurate ethics of foresight and responsibility’. Before any technology is developed, it is important to think of its worst possible outcome and to set up suitable solutions.

### 1.3 Responsibility of technologists: Responsible innovation

Social constructionism argues at a theoretical level for the possibility of regulating modern technology through the ethics of technology, but can it be put into practice? That will, to a great extent, depend on the ability of technologists to fulfil this responsibility. It is on this basis that the concept of responsible innovation is introduced. Proposed in 2011 by British scholar Hilary Sutcliffe, responsible innovation is about ‘trying to get better at anticipating problems, taking into account wider social, ethical and environmental issues and being able to create flexible and adaptive systems to deal with these unintended problems.’
consequences’ (Wang and Yao, 2017). This concept offers few specifics about what being ‘responsible’ constitutes. Von Schomberg (2013), a member of the European Commission, sees responsible innovation as ‘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’.

The rise of the philosophy of engineering in the Netherlands has led to discussions on engineering ethics, which involves the ethical responsibilities of technological designers. Technology has evolved to a point where its form, scale and application in society as well as its impacts are far beyond human control and imagination. At the same time, thinkers have been deepening their understanding of it, and, by and by, a new trend has emerged on the basis of the empirical turn in the philosophy of technology: the ethical turn. This trend originated around the beginning of the 21st century, when philosophers of technology ‘attempted to establish an “inner” philosophy of technology, emphasizing a focus on engineering and a philosophical description of technology itself’ (Pan, 2012). Representative figures include Carl Mitcham, Peter Kroes and Anthonie Meijers. In contrast to the empirical turn, they completely abandon the traditional style of the philosophy of technology. They ‘no longer limit themselves to the negative social effects of technology or to textual exegesis … but instead focus on what technologists or engineers actually do, and the selectively understandable relationship between technology and the good life’ (Mitcham, 2014). This shift is grounded in the living world and highlights the positive role of technology in society. In order for technology to play such a role, technological designers have to anticipate the relevant ethical issues in a responsible manner at the stage of technological development, which means that designers are required to innovate responsibly.

Responsible innovation is required of technical workers because modern technological artefacts are made by designers according to a defined procedure and a purpose. The internal structure of technology can be understood only by a few technological designers. The theory of the dual nature of technological artefacts proposed by Kroes and Meijers is intended to address ‘the relation between technological function and physical structure, and the relation between technological function and the intentionality of designers and users’ (Lin and Huang, 2010). Kroes subsequently developed the duality of technological artefacts into a triple nature: physical structure, function and use plan.

The introduction of the concept of use plan highlights the importance of technological design, which Kroes believes is the process of transforming technological artefacts from structure to function. The use plan is an important step in advancing that process. The concept departs from the value neutrality thesis of technological artefacts and defines procedures that must be followed by the tool user in order to achieve the intended function of the technological artefact. The use plan is mandatory and forces users to adopt certain technical behaviours. It lays the foundation for design ethics. Technological design is no longer an irrelevant process but an important part of constructing and clarifying use plans. In this way, the design process of technology must reflect the ethical nature of technological artefacts. ‘Design is inherently an ethical activity’ (Gu, 2016). This quality of the use plan connects technological artefacts with their users, highlighting the ethical nature of technological artefacts while giving the designer a corresponding ethical responsibility. In this process, the user of the technology must also assume a certain responsibility to operate the technology according to its rules.

Mitcham sees modern technology as an engineering project. Activities in engineering technology ‘combine knowledge and will for the manufacture and use of artefacts’ (Mitcham, 1991). The human will is mainly reflected in such aspects as drafting, inventing, designing, manufacturing and maintaining, among which design is the core. ‘The design of artefacts constitutes the essence of engineering and … design links the entire engineering activity into a whole’ (Mitcham, 1994). The design process can reduce physical labour through the expenditure of mental labour. The nature of engineering is thus understood as an efficiency-oriented and manufacturing-focused process. Efficiency constitutes a value criterion for engineering. Given that conflicts inevitably arise in a complex reality, in which the designers and operators of technology are
influenced by culture, interests and other factors, Mitcham emphasizes the importance of engineering ethics. He counts on engineers to integrate social values into the design process of technology from ethical and philosophical dimensions. He points out that technological design is intended to pursue efficiency, but a design that simply pursues efficiency ignores social factors such as beauty, goodness and justice, which are significant for technological performance. Therefore, he supports technocracy.

The Japanese scholar Ken’ichi Mishima is also a believer in technocracy and argues that ‘the Fukushima disaster is the result of the failure of democratic control over industrial technology. Building reactors in an earthquake zone is a crime under the law, a form of organized terrorism against our citizens’ (Garcia and Jeronimo, 2013). The ethical role of the technological designer ‘resides neither in the object nor in the subject, but in the relation between the two’ (Coeckelbergh, 2010).

Mitcham and Andrew Feenberg both attach great importance to public input and involvement in the process of technological design. They also propose strengthening communication with the public about technology in a process in which technological designers should facilitate the practical operation of technology by providing easy-to-understand, simple and clear technical information with a view to avoiding technological disasters as much as possible.

2. Legal regulation of modern technology

Regulating technological development is an effective way to overcome the negative effects of modern technology. This can be accomplished through both ethical norms and legal statutes, but there are clear differences between them. Legal statutes, as a coercive means, are more restrictive than technological ethics. Technological ethics can regulate the development and use of technology but is based on morality and is self-regulatory. Its influence is wide but its coercive power is weak. The law draws its legitimacy from the coercive power of the state and is much more effective than ethical norms. Some negative effects of the technologization of society may occur owing to a lack of ethical integrity of the actors, in whom ethical norms lose their effectiveness. In the face of weakening ethical restrictions, it is necessary to restrain technological behaviour within the scope of legal regulation and to regulate the operation of modern technology through legal means. This can be seen in the enactment of life technology laws that consider both technological ethics and technological efficiency. Legislation on national science and technology policy and ethical norms is an effective way to improve a legal system for technology.

2.1 Integrating ethics and efficiency: Promulgation of laws on life technology as a case

The 20th century witnessed the rapid development of the life sciences, which are dedicated to the study of living organisms to determine the nature, characteristics, occurrence and development of living activities and identify the interrelationship between organisms and biological environments. This research has led to a deeper understanding of the phenomena of life, which in turn has laid the foundation for the modification of life structures and the control of life processes. From the discovery of the double-helix structure of DNA, to the application of organ transplantation technology, to the birth of test-tube babies, to the cloning of Dolly the sheep, to the completion of the sequence map of the human genome and to the discovery of master cells, every milestone in modern technology has the potential to rewrite the course of human life and revolutionize human medicine and health. But, at the same time, these breakthrough technologies have also sparked debates along moral, ethical, technological and legal dimensions. Those debates have led to the question of whether modern technology is the ‘culprit’ for violations of ethics and law. Bridging the gap between the life sciences and technology on the one hand, and ethics and law on the other, has become an important issue in research on life technologies.

Ethical norms have proven to be inadequate in the face of the social problems arising from life technologies, and there is a need for stronger restraint. A consensus has developed on the need for legal regulation. Legislating on the relevant issues ‘can advance the development of life technology by giving legitimacy
to it’ (Huang, 2004). The introduction of laws and regulations pertaining to life technology can ensure its development within reasonable bounds by regulating R&D and its use to avoid potential ethical and legal problems.

Legislation related to life technology is the result of its rapid development as well as the need for its social governance and serves as a bridge between life technology and society. On the one hand, this is beneficial for the development of the life sciences and technology; on the other hand, it provides a basis for the effective governance of issues in life technology. Therefore, it can be seen as an integration of ethics and efficiency.

First, the legislation of life technology meets the needs of people and reflects an ethical dimension of the technology. The development of life technology is driven by the need for human health, and its sound and well-regulated application will bring about social welfare. Organ transplantation technology, for example, has revolutionized human medicine and saved countless lives. ‘Every year, about 70,000 people receive organ transplants to recover from life-threatening conditions’ (Scott, 2005). However, the excessive demand for such surgical operations has given rise to the illegal organ trade. In order to ensure the rational application of organ transplantation technology, legislation is needed to regulate its development and use. For this reason, countries have legislated this technology.

In the United Kingdom, the Human Tissue Act was enacted as early as 1961 to regulate the donation and use of human organs, and a new Act was implemented in 2006 to establish the primacy of the deceased person’s own will by stating that relatives have no right to block a person’s wish to donate their body and organs. In 1980, the United States enacted a law on brain death. Japan enacted the Organ Transplant Law of Japan in 1997 and has since established it as a basic law of the country. The Transplantation Society released the Guidelines for Living Donor Kidney Transplantation in 1986. China promulgated the Regulations on Human Organ Transplantation in 2007, which has since become the most important regulation on organ transplantation in the country. With continual improvements in these laws and regulations, the development and use of life technology will become increasingly standardized.

Second, the enactment of laws on life technology can prevent risks associated with it. Life technology that is applied to human life is subject to uncertainty in specific applications. Gene-editing technology, for example, can both create crop varieties with increased yield and produce experimental objects for use in biological weapons; it can be both beneficial to the human environment and physical health, and harmful, with potentially irreversible consequences. Those uncertainties call for legislation to regulate experimental processes and define exclusion zones according to potential risks. For example, Article 3 of China’s Regulations on Human Organ Transplantation stipulates that no organization or individual may buy or sell human organs in any form. Article 21 of the Convention on Human Rights and Biomedicine explicitly states that the human body and its parts shall not be used for financial gain. The Organ Transplantation Act promulgated in the German Democratic Republic in 1975 states that the party supplying the organ may not demand any remuneration for providing the organ, and penalties are provided for violations. Such prohibitions can reduce risks arising from life technology. In addition, in case of the unreasonable use of life technology, technology laws can provide a basis for responses to improve the efficiency of management.

2.2 Legislating science and technology policy

The high-risk and strongly ethical nature of modern technology has brought to an end the era when technology could be restrained simply by norms and institutions. Modern society has developed various laws to control and regulate technology, but, in reality, it is difficult to control technological development through technology laws. Scholars have explored the reasons for that difficulty. Su and Chen (2008) point out that the problems involved in the control of modern technology through law are mainly reflected in three aspects: the split between the private benefit of technology and the public benefit of law; the conflict between the changeability of technology and the stability of law; and the confusion between the continuous progressiveness of technology and the limited nature of legal control. These problems can be boiled down to one point: the boundary of technology law is not clear enough, and the
two-way interaction mechanism between technology and law needs to be improved. To clarify the boundary of technology law, technology policy is needed to identify the direction and priorities of technological development and raise them to the level of law. This is important for the formulation and implementation of technology law.

First, a country’s technology policy is designed to promote the development and advancement of technology as a driver of social development and economic growth. Specifically, it is about ‘what technology to develop, what technology to restrict and what technology to phase out’ (Peng, 2005). Within this framework, the development of technology is inevitably aligned with a country’s national and social development, and the legislation of such a policy is conductive to technological development.

Second, technology policy is an administrative means that tends to be more targeted, timely and universal in the treatment of technological issues. This makes technology policy unparalleled in its ability to solve technological issues. Therefore, countries have combined strategies for technological development and technology plans with specific national interests and integrated them into science and technology policies to regulate and guide development. However, technology policy is in an auxiliary position in the development of a legal system for technology because its formulation and operation lack stability over the long term, and it is not powerful enough to restrain technology. At the same time, technology policy has advantages in regulating technological development. This points to the need to turn technology policy into technology law so that science and technology policy can better serve the development of the legal system for technology.

Finally, turning technology policies that have a significant role in social development into laws with a coercive power is conducive to the formation of strong norms to restrain errant technological behaviour.

Technology policy has to be properly defined before being turned into law. In the value dimension, the process of formulating technology policy must reflect social fairness and justice and be in the public interest. Formally, a technology law derived from technology policy must reflect ‘openness, continuity, rigor, clarity, authority and universality, among other attributes of a state law’ (Zhang, 1999: 213). Those requirements make it necessary to combine operational and binding aspects in the formulation of technology policy, to take into account both the development of technology and its application, and to overcome the fluidity of technology policy and maintain its stability.

### 2.3 Legislating technological ethics

The power of technological ethics should be considered in the process of formulating technology laws. That power is mainly reflected in the development and application stages of technology. The impacts of ethics on technology are realized by attaching the values of ‘good’ and ‘evil’ to technology and replacing the ‘can’ and ‘cannot’ in the process of traditional technological development with ‘should’ and ‘should not’. However, ethics is only a norm and is inadequate in coping with the negative effects of technology. As ethical constraints lack the coercive power of laws, it is necessary to incorporate relevant norms and standards into the legal system for technology in order to give full play to the role of technological ethics and improve the legal system of technology.

In legislation on technological ethics, it is important to first use this concept to influence the formulation of legal provisions and accentuate the value guidance function of technological ethics. Laws are meant to be universal, compulsory and selfless, but if those cold texts are lacking in moral considerations, their existence is not inherently justified. Technology law is set up to overcome the negative consequences of technology, and a large portion of those negative consequences arise because of ethical violations. Therefore, technological ethics can help create sound technology law.

As technological ethics is a broad concept in which not all elements are suitable for legislation, choices should be made in legislating on technological ethics. Such choices are based on two main dimensions of ethics: lower and higher ethical considerations. Ethical considerations in the lower dimension involve maintaining the social order and basic social morality; in the higher dimension is the pursuit of the quality of life and the exploration of a series of metaphysical issues, such as goodness and truth. Technological ethics is also concerned with those two dimensions. As the higher dimension
involves individual experience and cannot be measured with a uniform standard, it cannot be specified in law. By contrast, the lower dimension mainly centres on the coordination of technological rationality, external organization and the relevant conditions in technological activities and behaviours. Considerations in this dimension can be addressed in law to regulate technology-related behaviour.

There are situations that are not addressed or covered by technology law, in which engineers and technologists find themselves in need of guidance by their ethical self-discipline for action. An awareness of boundaries when legislating on technological ethics is necessary. It is important to give full scope to the role of technological ethics in supporting technology law, but an appropriate distance must be maintained between them based on a stable relationship of checks and balances. Only within that framework can the legislation of technological ethics proceed smoothly.

3. Conclusion

Modern technology, with its colossal structure and massive applications, has become a powerful force sustaining the functioning of society. However, it has also given rise to a series of social issues while driving social development. Such issues as the leakage of facial recognition data, big-data-driven invasion of privacy, ethical dilemmas in genetic engineering and the threat of nuclear technology to world peace have highlighted the duality of technological development and led to the consensus in the academic community that technological development needs to be regulated. The regulation of R&D on technology and its use is a scientific, institutional, ethical and legal issue. While ethical adaptation and legal regulation belong to different domains, both are effective means of regulating modern technology. Ethical adaptation is widely applicable and influential but less restrictive, and many technological issues arise precisely as a result of the lack of ethical fibre on the part of technological actors. In view of the lack of enforceability of technological ethics, it is necessary to bring the R&D on and use of technology under legal oversight by applying the coercive power of state law to technology to make it work for the good of society. Ethical adaptation and legal regulation play different roles and supplement each other. They combine to form an ethically informed and legally framed system of modern technology.

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