

Modern Technology and Sustainable Future

Y. J. Lee

*Department of Technology Education
Korea National University of Education
Chungbuk, Korea.*

Abstract

The core technological elements of the upcoming fourth industrial revolution are sensing, communications including 5G, big data and artificial intelligence. An important orientation of this fourth industrial revolution is the realization of a hyper-connected society and a sharing economy. From the first industrial revolution to the third industrial revolution, we have been interested in the accumulation of individual wealth in individuals or countries through economic growth based on technological development. In contrast, the fourth industrial revolution calls for a shift in our values by paying attention to harmony and relations through hyper-connectivity and sharing economy. In this paper, we first investigate the historical progress of mechanical causality supporting the modern technology during past industrial revolutions. We then criticize the view of technology in the past through the problems of modern technology civilization, and look for ways to overcome it. To conclude, we should try to transform our view of value into technology civilization with human mind through fourth industrial revolution.

Keywords: fourth industrial revolution, mechanical causality, technology civilization, monism

1. INTRODUCTION

The speed of technological development accelerated after the mid-20th century is so fast that it is hard to imagine the possibility in just a few years. The view that the pace of technological development, which used to take centuries in the past, will be compressed into a few years now and months or days in the future is sufficient in large part.

As the development of these technologies has had a tremendous impact on modern human life styles and thinking ways, the opinion that modern civilization's value standards are based to some degree on technological progress will by no means be exaggerated.

Furthermore, the optimistic expectations that the future will become a technology driven utopia through the fourth industrial revolution including artificial intelligence and hyper-speed communication of 5G have caused widespread impacts not only in technological competition among countries but also in individual career choices.

The advanced future that technology will bring about seems to be an absolute manifestation of human reason including artificial intelligence, which is a key component of the fourth industrial revolution. But we need to pay attention to another perspective on modern technology which is regarded as a faith.

Aside from the numerous bad effects of technology that have occurred so far, if we consider only one year in 1986, 30 years ago, the explosion of the U.S. space shuttle Challenger, radiation contamination in most parts of northern Europe from the Chernobyl nuclear power plant accident, and the Rhine River pollution from chemical plant waste are dramatic examples that remind us to rethink the blinding values of modern technology civilization.

The after effects of Japan's Fukushima nuclear power plant which exploded in 2011 are still continuing and nuclear processing facility accidents are more frequent around the world than nuclear plant accidents. In the 1950s and 1990s, there were 58 accidents at nuclear facilities around the world. This means that the accident happened once a year. Among them, a total of 28 cases of radioactive materials that affect daily life were reported [1].

Already, nuclear weapons in the U.S. and other nuclear-weapons countries are enough to destroy the planet tens of thousands of times. The level of ecological destruction and environmental pollution due to by-products of technological development cannot be restored to the original state in a short period of time, even if huge costs are invested immediately.

So when we emphasize developmental aspects of technology such as economic growth and neglect costly efforts without looking to eliminate factors that threaten the survival of mankind itself, the conviction that our future will be a Utopia that technology brings will be lost.

The negative aspects of this technology are responsible for bringing the issue of mass protests in developed countries to political and economic issues as well as nuclear and environmental issues.

Indeed, modern technology civilization has Janus's face. Observing only one side, the face each shows great hopes or unavoidable crises.

2. HISTORICAL PROGRESS OF MECHANICAL CAUSALITY

As it is noted, the Eastern view of nature is based on the affinity and harmony between man and nature, and has developed technology from the point of most fully preserving nature.

On the other hand, the Western view of nature regards as an object to be conquered by man from a dualism which separates man and nature into subject and object. Thus, the Western view of nature leads us to recreate nature into a corresponding surplus for human survival and happiness.

This epistemological view of this subject and guest requires preconditions to thoroughly dissect and understand nature. The term science and technology, which we are currently using without much care, is basically based on Western natural views.

But, Western natural views were not originally based on dualism. In the Greek era, the view of the composition of nature as a single substance- atom, water, soil, and so on- can be regarded as a monistic conception although a primitive perception.

However, the monistic natural view lasted for thousands of years since then, could no longer last during the Middle Ages. Man's perception about nature created by God has been unable to escape a given scenario for a considerable period of time. Of course, even in the dark ages, the love of human truth has continued, so that the "earth-centered theory" of Copernicus (1473-1543) and Galilee (1564-1642) can be seen as the primitive basis of modern science and technology civilization.

Descartes (1596-1650) chose mathematics including intuition and deduction rather than formal logic, which had exerted absolute power up to earlier times. He therefore had a desire to establish a "mathesis universalis" based on rigorous mathematical methods.

He listed the following four ways in order to seek the truth accurately. First, we avoid precipitancy and prejudice. Second, we divide each of the difficulties under examination into as many parts as possible and to solve difficult problems. Third, we conduct our thoughts in such order that by commencing with objects the simplest and easiest to know, we might ascend by little and little and as it were step by step to the knowledge of the more complex. Fourth, we make enumerations so complete in every case and reviews so general that we might be assured that nothing was omitted [2].

However, Descartes had a problem of relying too much on intuition rather than experimentation.

After then, we reach Newton (1642-1727), and we discover the origin of modern Western civilization. Newton's three laws of motion have meaning in themselves, and have brought us a revolutionary way of thinking of "mathematical thinking." In other words, the idea that nature can and must be defined in a mathematical formula that has exact cause and effect explains clearly the meaning of all "scientific" common to modern times.

Although Leibnitz (1646-1716) opposed Newton's concept of absolute space and insisted on relative space, it was considered ridiculous until Einstein's (1879-1955) principle of relativity was accepted in the early 20th century. The opinion that a single natural phenomenon can be like this or that is acceptable only in an Oriental view, but it is no longer acceptable in a Western view of nature. This mechanical causality was a firm belief system until quantum mechanics came into being in the 20th century.

Western science and technology after Newton continues to develop rapidly. We need to pay particular attention to the fact

that advances in technology are a faithful subordinate to the mathematical worldview.

For example, like the law of nature that follows a course that is already scheduled by a rigorous formula, a machine is equivalent to a mathematical formula that derives a specific output for a particular input. From this perspective, mathematical natural views are called deterministic or mechanistic causality, and by extending this perspective a little further, we can think that Western civilization after the Middle Ages has been built based on deterministic causality which natural science established concepts.

This view of nature was reflected in the way history was viewed. Hegel (1770-1831) developed dialectical thinking that the world is led by a cycle of thesis, antithesis, and synthesis. But because dialectics itself was already merely a methodology that existed since the Greek era, Hegel established the concept of the zeitgeist as the law governing its movement.

In other words, a hypothetical mathematical formula was established to sum up each reason and necessarily integrate it as a deterministic causality.

Hegel's ideas are transformed from young Hegel (Linkshegelianer) to old Hegel (Althegeianer). While the world of youth Hegel is in the development of dialectics and should be reformed into a better one, the world of old Hegel should be maintained as it has already reached the highest goal of dialectics.

H. Spencer (1820–1903) borrowed the principle of survival of the fittest, which is the driver of evolution from Darwin's (1809-1882) "On the Origin of Species". This theory states that the evolution and change of society depends on the deterministic causality from natural science.

Now let's look at socialism and capitalism, which can be called the two major ideologies of the West. Karl Marx (1818-1883) combined the thoughts of young Hegel Linkshegelianer and materialism to establish the so-called "scientific socialism".

Here we need to note that Marx had named his ideas scientific socialism. Before Marx, there were utopian socialists in France, such as Saint-Simon (1760-1825) and Fourier (1772-1837) who were thinking of ideological socialism without setting deterministic causality.

Marx, in response, sought to prove that his theory was different from utopian socialism by setting up the inevitable laws derived from the contradiction of capitalism and modulating the term scientific socialism in order to show that it would not deviate from mechanistic causality of Western civilization.

In the "The Wealth of Nations" which was then the parent of capitalism, Adam Smith (1729-1790) argued that modern industries could be described as division of labor and accumulation of capital, which could be explained by individual interests or by nature's order, that is, the invisible hand.

In other words, he believed that without government intervention, personal wealth could be increased by natural laws and thus the wealth of the nation could be increased. Here we can see the concept of mechanistic causality even in capitalism as in socialism. However, it can be said that Adam Smith is different from Marx in that he did not create his own decision-making principles like Marx did.

As we have seen briefly so far, when observing the term ideology, we can see that it is by no means a concept that contradicts the deterministic laws spoken in science.

However, the Western view of interpreting social phenomena from the perspective of nature inevitably led to dogma and had to seek alternative ways to uphold the law of internal collapse.

On the socialism side, China, which called the former Soviet Union the revisionist in the late 1960s, becomes now G2 country with its capitalist reform and opening-up policy that began in the late 1970s. The former Soviet Union has already disintegrated into Russia and other countries.

On the capitalism side, the principle of free competition and the market law- the classical economics- originated from Adam Smith was challenged by the Great Depression in the 1930s. As a result, the socialist government's policy of economic intervention was generalized as proposed by economists such as J.M. Keynes (1883-1962).

In the end, attempts to see and control social phenomena by mechanistic causality led to the end of ideology as noted by Daniel Bell (1919-2011).

In this context, if we add another change to the way history is viewed, L. Lanke (1795-1886), a 19th century positivist historian, thought of history as basically describing it as it was in the past.

This positivist view can be seen as the intention of interpreting history in terms of mechanistic causality, and has had considerable influence until the early and middle part of the 20th century. After World War II, however, E. H. Karr (1892-1982) has more relativized its view of history, making the argument that "history is a constant conversation between the past and the present".

So far, we have briefly investigated that some examples of mechanistic causality established in natural science influenced on Western society and the process of mechanistic causality became more relative.

Now let's turn the issue back to the natural sciences. As already mentioned, the history of science and technology since Newton has been based on a mathematical and mechanistic worldview, and almost all natural phenomena can be well explained on this basis.

However, even the laws of nature that were believed to be absolute could be relative in the micro world. A 1932 Nobel Prize winner in physics, Heisenberg (1901-1976) said in his uncertainty principle, "Even if the same initial conditions are repeated, the position or the motion amount of the particle varies with each observation, so only predictions by probability distribution are made".

At the same time, the mathematician K. Gödel (1906-1978) announced the incompleteness theorem in 1931. Before this theorem, most logicians including B. Russell (1872-1970) believed that there exist absolute guidelines for determining the true and false of a given mathematical proposition.

In other words, all true propositions were thought to be verifiable. But Gödel proved her own incompleteness theorem by presenting an expression that is true but impossible to verifiable [3]. Later, J.R. Oppenheimer (1904-1967) praised Gödel's work, saying, "This study clarifies the role of limits in the general reason of human beings" [4].

These theories led to a change in the perception of mathematical causality that "the laws of nature must achieve the same result under the same conditions". Of course human beings managed to prevent the absolute collapse of mathematical equations by supporting the probability function of statistics, but the classical Western nature view was greatly disturbed.

In anyway, Heisenberg's next comment has become a bitter reference against the Western dualism based separation between man and nature.

"Now we do not insist on the strict separation of the subject and the object as in the past. This separation has been an important attitude to scientific methodology in the past. Today, however, there can be no strict separation in modern physics and the relationship between the two is important. Full objectivity can be an illusion" [5].

This argument goes beyond the scientific position at A. N. Whitehead (1861-1947) and into a more extended form of consideration for civilization. He argued that modern science is indulged in a dualistic separation of material and spirit because it has taken materialism as its worldview for centuries. He also insisted on overcoming of this separation and an objective monism of viewing the ultimate component of the world as an organism of process, not any one of material and spirit.

This view meant a mechanistic dualism with no regard to mental or human basis, or, in turn, a self-reflection of Western civilization itself. In other words, such a view has led us to agonize over the true direction of science and technology by giving us a warning that the more we give blind values to the material worldview, the greater the negative impact on the way humans and nature exist.

3. SITUATION OF MODERN TECHNOLOGY CIVILIZATION

We have so far looked at the process in which Western dualistic scientific methodologies and ideologies are becoming more relative from absolute value concepts.

Nevertheless, as French molecular biologist J. L. Monod (1910-1970) says, the proposition that "as long as the unknown remains in human knowledge, dualism will exert its power until beyond the unknown domain and such a fact will be maintained in our lives" seems reasonable when considering the blindness of human about truth [6].

As mentioned earlier, technology is a concept that is strictly dependent on mechanistic causality. In other words, technology is constantly renewing itself with its own blindness, and its attributes are infinite reproduction. Adding economic efficiency to the attributes of these technologies constitutes the definition of engineering.

We call modern civilization 'scientific civilization', but in a strict sense we think the term 'technology civilization' is more persuasive. The reason is why technology is directly affecting human life not only in human concepts but also in real life by implementing the framework of theory that science has proven by experiments and formulas.

Moreover, since the 20th century many scientific theories have been established later in order to provide a foundation for improving the performance of technology developed first.

A linear structure that separated science and technology, which in the past had long led to the recognition of technology only as tools, has now been transformed into a circular structure in which certain new scientific theories are directly changed into technology and commercialized, while again seeking new scientific theories to improve their technological performance.

Because modern technology is deeply embedded in all our lives, it is affecting not only the forms of existence but also the forms of thinking. Every modern civilized man can't even imagine his own life without using a single kind of technology.

Proponents of growth who see this situation argue that the quality of life in modern times has been enriched to the extent that they have hundreds or thousands of slaves under past labor-intensive civilizations. That is to say, the ordinary individual of the present day is enjoying the same good life as the monarch in the past.

This view must be an active advocacy of technology civilization, and form modern man's perception that the development of history providing freedom and economic plenty to more people is due in large part to the development of technology

Therefore, the goal of the modern nation is also bound to lead to the pursuit of economic growth through the development of technology. The place of traditional ideology of the past is being replaced by new ideology of science and technology.

However, the ideology of technology and economic growth may be constantly accelerated and innovative by mechanistic attributes, but lacks the standard of value judgment.

This implies the inhumanity and danger of modern technology civilization. Although there are political problems, the fact that the U.S. and other countries can supply months of food to millions of hungry people with their daily budget for developing nuclear weapons is just one example. According to an UNESCO report, global military spending in 1980 amounted to about \$500 billion, which could provide \$110 per person to everyone around the world.

More serious problems are posed by the deadly danger of the entire mankind which can be caused by reckless technological development for economic growth. According to several

reports, the world's population is expected to reach 7.6 billion by the end of 2017 and to increase to 9.8 billion by 2050, so the food problem is still expected to threaten us.

According to a report by British Petroleum in 2015 [7], oil remains to be mined over the next 49 years, but it will eventually run out. Thus, if the current indiscriminate technological development continues, it brings out the deepening of the gap between the rich and poor due to the energy crisis, the depletion and devastation of natural resources, global warming, destruction of ecosystems and environmental pollution continues, thus human race will face a crisis by losing the necessary time for treatment.

This sense of crisis put a brake on the theory of economic growth by technological development and economists such as K. E. Boulding (1910-1993) argued that economic growth and population growth should be zeroed out as a fundamental solution [8]. In reality, however, a solution to zero economic growth is not easy because it can lead to social confusion caused by unemployment problems. Thus, we have come to a situation where we have to develop technology as a tool for economic growth, while making efforts to develop high technology to solve the side effects posed by economic growth.

As an example of this high technology, we can list new materials, biotechnology, nuclear engineering, and space engineering. They include the development of new materials to prepare for the depletion of nonrenewable mineral resources, bioengineering to prolong the food crisis and human life, and the use of nuclear fuel as an alternative energy source for the depletion of existing energy resources, and space development technology. Thus, current economic growth can continue if research on the development of technology that complements the existing paradigm can proceed smoothly.

However, we need to develop another perspective on the problem. First of all, it is pointed out that nuclear fission plants are still not fully resolved technically to date, so it can cause serious radioactive contamination as seen at the Fukushima plant in Japan. Furthermore, nuclear fission plants is not very optimistic due to the ease of nuclear bomb making, the enormous cost of radioactive waste disposal and dismantling facilities. The countermeasure is a nuclear fusion technology, but it is expected that it will be of commercial value only after 2025.

It is also encouraging that biotechnology uses solar energy which has a self-determined reproduction structure but global consensus is needed on the ecological and moral issues caused by the artificial creation of life.

In addition, most of experts point out that it is still too early to make a huge investment in space development.

So today we have to solve the problem whether the amount of time to develop alternative or high technology is less than the amount of time until the crisis that we will face as we continue to grow.

4. CONCLUSIONS

It is a very important fact that western science and technology civilization based on the dualism and mechanistic causality used to be of absolute value in modern times became more relativized and embraced the value of the spirit in the 20th century.

But, since the above causality is still applied to the field of technology and economic growth, there exists a sense of crisis for the entire human race. Of course, advances in high technology and alternative technology are an active response to this crisis, but they still cannot guarantee visible results. Furthermore, it is possible that even such alternative technologies will be weaponized because of the competition for reckless growth between countries.

Now, human experiments in science and technology may become fatal to the whole world community with just one failure. Therefore, instead of giving technology blind value as a tool for the development of individual countries, we should try to transform the value system into a monistic science and technology civilization with human mind for the whole human being.

The topics of the upcoming fourth industrial revolution are "hyper-connected society" and "sharing economy". The core value system of the ancient East is "harmony". The fact that the core value of the fourth industrial revolution is accordance with the value of the Eastern harmony suggests the direction of human civilization ahead.

Only a harmonious view of man and nature will save the earth from reckless mechanistic causality and when the technology becomes to think harmony first, it will be the true technology for human beings.

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