

# Marx's View of Science and Technology in Das Kapital and its Practical Enlightenment

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**Abstract:** *Das Kapital* is a sign of the maturity of Marx's view of science and technology. In *Das Kapital*, Marx elaborated his view of science and technology from multiple dimensions. Based on the text interpretation of *Das Kapital*, this paper uses the method of literature research, the combination of theory and practice, and the unification of history and logic to investigate the scientific and technological view of *Das Kapital*. From the perspective of social production, science and technology are productive forces. From the perspective of human development, the innovation and development of science and technology and "real man" constitute an organic whole. From the perspective of natural ecology, the innovation and development of science and technology form a two-way interaction with natural ecology. Marx's view of science and technology in *Das Kapital* provides practical enlightenment for the great rejuvenation of the Chinese nation: focusing on the main economic battlefield, enhancing the international competitiveness; Putting the people at the center to improve their well-being; Based on natural endowments to achieve sustainable development.

**Keywords:** *Das Kapital; View of Science and technology; Practical Enlightenment*

## 1. Introduction

Marx made an in-depth exploration of the development of science and technology based on the environment of the 19th century. *Das Kapital* is a landmark work of Marx's mature view of science and technology, which is still shining with the light of truth in the contemporary era. Through the investigation of the science and technology view in *Das Kapital*, it is of great theoretical significance and practical value for China to accelerate the construction of a strong country in science and technology, realize the high level of science and technology self-reliance, and realize the great rejuvenation of the Chinese nation. The view of science and technology studied in this paper is to investigate the dimension of social production, human development and natural ecology under the theoretical framework of Marx's in-depth analysis of the capitalist system. This study intends to construct a framework from three aspects: the historical background, the main content and the realistic enlightenment, and deeply analyze the concept of science and technology in *Das Kapital*, in order to get valuable enlightenment.

## 2. The background of Marx's views of science and technology in Das Kapital

The writing of *Das Kapital* began in the middle of the 19th century, which was an era of rapid development of capitalist economy. In the early 19th century, the Industrial Revolution led by Britain, followed by France, Germany, etc., ushered human society into the "Age of steam" and into the process of socialized mass production under the background of machine industry. In the late 1860s, the second Industrial Revolution, centered in Germany, ushered in the "electric Age", from which the development of technology and the application of machines became the main driving force for economic development. Besides the Industrial Revolution, another important economic background was the economic crisis of 1825 and 1857. With the development and application of science and technology, world trade expands rapidly, and a large number of emerging countries are involved in the world market, which makes the economic crisis bring worldwide damage.

Beginning in the 15th century, the natural sciences began to flourish, freeing people from the shackles of theology. In the 19th century, the discovery of the cell theory, the law of conservation of energy and the biological evolution laid the theoretical foundation for the formation of the scientific and technological views in *Das Kapital*. Moreover, the development of humanities also promoted the

formation of scientific and technological views in *Das Kapital*. Marx critically inherited the important theories of German classical philosophy, British classical political economy and French Utopian socialism, which provided references for the formation of scientific and technological views in *Das Kapital*.

### **3. The basic connotation of Marx's view of science and technology in *Das Kapital***

#### ***3.1 The role of science and technology in productive forces***

Based on the factor dimension of productivity to investigate the effect of science and technology on productivity. For a long time, whether in the field of political economy or in the field of philosophy, scholars have mostly generalized the factors of productivity as laborers, labor means and labor objects, and the theory of three factors of production labor has been fully reflected in scientific and technological innovation. With the development of science and technology, the quality of workers has taken a qualitative leap, the efficiency of labor materials has been greatly improved, and the scope of the object of labor has been constantly expanded. In other words, the innovation of science and technology cannot be separated from the mastery and application of high-tech workers, high-tech labor materials and labor objects, and the organic combination of the three can greatly improve labor productivity. At the same time, Marx pointed out in *Das Kapital* that "labor productivity is determined by a variety of conditions, including: the average proficiency of workers, the level of scientific development and its application in technology, the social integration of the production process, the scale and efficiency of the means of production, and natural conditions." [1] The status of "the development level of science and the degree of its application in technology" in the factors of productivity is clarified, and from the internal source of productivity, it points out that science and technology is productivity. As a result of the industrial and technological revolution, the capitalist society has accelerated the development of science and technology, so that the capitalist society has "created enormous productive forces that exceed the sum of all previous eras" [2]. It also confirms the productive effect of science and technology. In contemporary society, the achievements of science and technology are rapidly transformed into labor productivity. The emergence of scientific and technological talents promotes the progress and development of scientific practice, and gives birth to a large number of new industries, production techniques, new products, new tools and other scientific and technological achievements, which all reflect the role of science and technology in productivity.

Based on the dimension of surplus value to investigate the effect of science and technology on productivity. In *Das Kapital*, Marx spent a lot of space to expound the theory of surplus value. Under the condition of capitalism, the mad pursuit of surplus value has become the "life instinct" of capital. As a personified capital, capitalists will constantly promote the production of surplus value by means of scientific and technological innovation. First, the capitalist chooses to extend the working day and take the surplus labor of the workers for free, in order to obtain absolute surplus value. However, the extension of working day will lead to the resistance of workers. Subject to the length of working day, capitalists promote the transformation, upgrading and large-scale application of machines, and try to shorten the necessary labor and extend the surplus labor, so as to obtain the relative surplus value. And an individual "capitalist employing an improved mode of production can occupy a larger portion of a working day as surplus labor than other capitalists in the same industry." [3] Producers who first adopt advanced production technology will have higher labor productivity and obtain higher excess surplus value within the necessary labor time. However, with the widespread application of scientific and technological innovation and advanced production technology, labor productivity generally increases and the excess surplus value of individual capitalists disappears, while the whole capitalist class gains more relative surplus value. Under the logic of chasing surplus value, science and technology have realized innovative development and capitalist application in the field of social production. Therefore, science and technology have become the decisive factor to improve labor productivity, that is, science and technology are productive forces.

#### ***3.2 The organic unity of science and technology with "real people"***

Based on the dimension of human alienation to investigate the development of science and technology. Under the capitalist mode of production, science and technology, as a result of the mad pursuit of surplus value, is a force of dissent, leading to the overall alienation of capitalists and laborers. As for workers, with the continuous improvement of labor materials, manual workers only need to adapt to the simple operation of machine operation, resulting in intellectual waste, gradually become a

vassal of machines; Mental workers regard scientific and technological innovation as a means of making a living, rather than a free and conscious activity, and are completely subordinate to capitalists. The application of the scientific and technological achievements of mental workers in the capitalist production process intensifies the exploitation of capital on physical workers, resulting in the deepening of the contradiction between physical workers and mental workers. Under the capitalist application of science and technology, workers are "deprived of all free activities, both physically and mentally".[4] As far as capitalists are concerned, science and technology have become the means for them to obtain high profits. Individual capitalists can improve labor productivity through scientific and technological innovation and obtain more excess surplus value through the way of "less profits and more sales". When the whole capitalist class improves labor productivity through scientific and technological innovation, the socially necessary labor time of commodities decreases and the value of commodities decreases, thus reducing the wages of workers. As a result, the remaining labor time of workers is relatively extended, which brings more surplus value to the whole capitalist class and further intensifies the exploitation of workers. Moreover, the innovation of science and technology presents the characteristics of professionalism. Capitalists do not directly participate in the innovation activities of science and technology, and even show "astonishing ignorance" and pursue surplus value. The innovation of science and technology can give great temptation to the surplus value, and make capitalists become the "slaves" of science and technology and the "one-way people" who pursue the surplus value unilaterally.

Based on the dimension of human's free development to investigate the development of science and technology. Human liberation and free and comprehensive development require the overthrow of the capitalist system and the establishment of a communist society. From the perspective of subject force, scientific and technological innovation under the capitalist mode of production deepened the oppression of the working class, made the working class unite to overthrow the capitalist system through violent revolution, and provided advanced production tools and methods for the working class to establish a new society. From the perspective of the basic driving force, science and technology promote the rapid development of productive forces. When the existing relations of production do not meet the requirements of the development of productive forces, the new relations of production will take their place. The development of science and technology under the capitalist system is subject to the specific form of grabbing surplus value, which will inevitably cause the contradiction with the absolute trend of the development of productive forces. Capitalist society is bound to perish. From the practical basis, the development of science and technology has created a large number of material materials in capitalist production, but only on the basis of highly developed social productive forces, can we build a communist society and realize the free and all-round development of human beings. Science and technology have also increased labor productivity, reducing workers' working hours and giving people more free time to pursue their own development. In a word, the development of science and technology provides the necessary conditions for mankind to realize the leap from the kingdom of necessity to the kingdom of freedom.

### ***3.3 Two-way interaction between science and technology and natural ecology***

Based on the dimension of natural productivity to investigate the interaction of science and technology. Man is the product of natural development, and nature is the basic condition for human survival and development. Natural productive forces mainly include natural force, natural material and natural geographical environment, which have different effects on science and technology due to their different attributes. The force of nature is the basic driving force of scientific and technological innovation. "To utilize the power of water, we must have a water wheel; to utilize the pressure of steam, we must have a steam engine. [5] In order to realize the productive function of natural force, we must create and adapt to the technical products of natural force. Natural material provides the material basis for science and technology innovation, and the diversity of its types and attributes makes the corresponding science and technology also show the characteristics of diversity. Science and technology should also adapt to the law of natural matter's movement, "The law of magnetic needle deviation in the range of current action"[6] prompted the invention and use of telegraph, which is a scientific and technological innovation made by human beings under the guidance of the law of nature. The physical geographical location is also an important factor affecting science and technology, and the types of science and technology are often in line with the geographical characteristics. From the perspective of the development of human society, open areas tend to absorb and develop new science and technology more easily.

Based on the dimension of material transformation to investigate the interaction of science and

technology. Marx's dialectical evaluation of the dimensions of science and technology and natural ecology is forward-looking and comprehensive, and he proposed to break and repair the transformation of human and natural matter. Capitalists' pursuit of surplus value makes them try to use the development of science and technology to carry out unlimited plunder of nature, resulting in the rupture of human and natural material transformation. In view of the excessive expropriation of nature under the capitalist mode of production, Marx proposed to protect and improve natural resources and promote the ecological development of agriculture through the innovation and development of chemistry and machinery in agriculture. Through the invention and use of high-performance machines, reduce the depletion of natural resources, with as few resources as possible to meet the needs of human material production. By promoting technological advances and improvements to reduce the production of "waste" and the reuse of "excrement". "The increasing cost of raw materials is a natural incentive to use waste. In general, the conditions for this reuse are: the waste must be in large quantities, which is only possible under conditions of large-scale labor; The improvement of the machine, so that the original form of the material could not be used, to obtain a new form of production can be used; Advances in science, especially chemistry, have discovered the useful properties of those wastes." [7] Science and technology play an important role in the development of natural ecology. While transforming production tools with science and technology to improve the utilization rate of natural resources, it inevitably causes certain "harm" to natural ecology. However, only through continuous development of science and technology, can we repair the rupture between human and natural material transformation and realize the positive interaction between human and nature.

#### **4. The practical enlightenment of Marx's view of science and technology in Das Kapital**

##### ***4.1 Focusing on the main economic battlefield and enhancing the international competitiveness***

In Das Kapital, the innovation and development of science and technology cannot be separated from the practice of social production. Under the new historical orientation, the development of science and technology should first face the field of social production, accelerate the implementation of the strategy of innovation-driven development, and realize the healthy development of economy and society. In contemporary China, while pursuing high-quality development, capital, including but not limited to overseas capital and transnational capital, also occupies a certain space in the field of social production. For China in the primary stage of socialism, it is very necessary to reasonably control capital and promote its role in promoting scientific and technological innovation. On the premise of adhering to the socialist system with Chinese characteristics, all kinds of capital should be rationally used in scientific and technological innovation, expand the financing channels of small and medium-sized scientific and technological innovation enterprises, and promote the organic combination of science and technology and capital. At the same time, effective regulation of capital should be carried out to improve the standardization of capital operation, so that capital can operate reasonably in the innovation and development of science and technology, and "promote the deep integration of innovation chain, industrial chain, capital chain and talent chain". At present, the world is undergoing profound changes unseen in a century. A new round of scientific and technological revolution and industrial transformation is deepening. The international balance of power is undergoing profound adjustment. Starting from the chip industry, the United States has imposed unlimited restrictions on China, focusing on China's Huawei, and trying to build a world economic system that excludes China from the world's technological system and industrial chain. With the far-reaching impact of COVID-19 and the rise of anti-globalization, the world has entered a new period of turbulence and change. To achieve high-level scientific and technological self-reliance and break the US's designs, we must "integrate industrial, innovation and chain", solve "bottlenecks" in technology, speed up the building of China in science and technology, and form new advantages in international competition.

##### ***4.2 Putting the people at the center to improve their well-being***

Based on the capital logic driven by surplus value under the capitalist system, Marx made an in-depth analysis of the innovation and development of science and technology in Das Kapital, aiming to explore the realistic path of human liberation and comprehensive development through the reflection and criticism of human living conditions. "Science and technology innovation, one by investment and two by talent" Under the new historical orientation, we must pay attention to the originality of scientific and technological talents in order to carry out the strategy of strengthening the country by talents deeply. First of all, we should set up a flexible appointment mechanism for innovative talents to give

full play to the existing innovative talents. Secondly, we should improve the scientific and technological environment for innovative talents and promote the reform of scientific and technological system. Finally, we should improve the training mechanism of innovative talents, pay attention to the training of young talents and talents independent training. Marx's exploration of science and technology and thinking of human nature constitute an organic and unified whole. The innovation and development of science and technology are inseparable from the survival and development of human beings. In the new stage of development, scientific and technological innovation must take the people as the basic point. We should be people-centered and guided by the need for a better life for the people, take the improvement of the people's well-being as the value goal of scientific and technological innovation and development, and organically integrate scientific and technological innovation with the free and all-round development of the people. At the same time, we will build a science and technology community with a shared future, promote the sharing of global science and technology innovation achievements, improve the autonomy and openness of Chinese science and technology innovation, integrate into the world science and technology innovation system with a global perspective, "deeply participate in global science and technology governance, contribute Chinese wisdom, let Chinese science and technology to make greater contribution to promoting the construction of a community with a shared future for mankind"

### ***4.3 Based on natural endowments to achieve sustainable development***

In *Das Kapital*, Marx emphasized the role of natural productive forces in promoting the innovation and development of science and technology. China's vast land and abundant resources provide rich natural conditions for the innovation and development of science and technology, and the development of natural science constitutes an important basis for scientific and technological innovation. Under the new historical orientation, first of all, we should deeply understand the natural productive forces systematically and grasp the nature and movement law of natural productive forces scientifically. Secondly, according to the natural geographical environment to optimize the layout of research and development, according to local conditions, to develop regional characteristics of science and technology innovation; Finally, it is necessary to coordinate the resource flow and sharing among regions, and promote the overall level of scientific and technological innovation by driving the resource-rich area to the resource-poor area. In Marx's time, although ecological problems did not become prominent, Marx's forward-looking vision has already recognized this serious problem. Human productivity has made great progress in the conquest and transformation of nature. The conquest of nature by simple and one-sided use of science and technology makes nature retaliate against human on a large scale. However, scientific and technological innovation is not only the cause of ecological problems, but also the means to solve them. In order to properly handle the relationship between man and nature and realize the harmonious coexistence between man and nature, we must adhere to the concept of green development, emphasize the sustainable development orientation of scientific and technological innovation and development, and make science and technology truly benefit mankind.

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