

# Human Intelligence: Fundamental Driving Force of Social Progress

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**Abstract:** *This article is devoted to the study on the development of tools and machines, the important part of productivity. The author introduces the characteristics of the development process and analyzes the radical reason and the driving force for the development. Based on the effect of tools and machines on human social development, the author tries to illustrate it is the intelligence that drives the social progress and human society have entered the intelligence age and become intelligence society.*

**Keywords:** Tools and machines, intelligence, intelligence revolution, intelligence society

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## I Introduction

Since human beings as a new living species appeared on the earth, they have been facing various challenges and trying to use every single kind of means to change the world they live in and create things for themselves to survive. There are fundamental differences between humans and animals, although humans evolved from animals. Animals' development conforms to the theory of biological evolution disclosed by Darwin, but the mankind develops according to a new evolution mode. Animals only passively adapt to natural environment, but humans can transform the environment actively to meet their own needs. Engels said, "animals only use the outside natural world and simply

change the natural world with their existence; humans make the natural world serve their purposes by changes they cause to control the nature. This is the last essential difference between humans and other animals, which is caused by labor." Animal adapt to the continuously changing environment by the evolution of body organs to maintain their existence. The streamline shape of fish and the appearance of the gill or similar organs of respiration are the result of adaptation to living in water for a long time; the limbs structure of Mammals and the appearance of lung respiratory organs are the result of adaptation to living on land. Human evolution depended not on the change of natural organs, but mainly on the man-made organs -- the improvement of tools and machines to control the nature and

extract the material wealth from the nature. The research result of archaeologists and biologists showed, "Homo sapiens appearing about 200,000 years ago do not have obvious difference from modern man in the body structure including brain and hands. It means the evolution of the human body (biological evolution) has not been the main content of human evolution." People make carriages, cars, trains and planes in order to cross over the lakes, rivers and seas; they make spaceships to expand their scope of activities; and they make various machines to improve labor capacity.

It is these man-made organs -- tools, machines -- that greatly strengthen human capacity to transform and control nature. This kind of ability is mainly manifested as the transformation of the first nature and the creation of the second nature. Mankind's history is the history of human beings utilizing various tools of production to transform the first nature and create the second nature. The history of development of the instruments of labor is the device measuring the development of human workforce, and is also the indicator of the social relationships that are on the basis of these instruments. The division of different economic times does not lie in what is produced, but in how to produce, and with what instruments of labor. As for this problem, Karl Marx has a famous saying, "It is the society headed by feudal lords that is produced by hand mills and it is the society headed by industrial capitalists that is produced by steam mills."

From the described above, it is easy to find out that the mankind developed in a new way of evolution while its history is closely connected with the history of the evolution of tools and machines. In order to further study mankind's new way of evolution, we here start with the study on the history of the evolution of

artificial organs -- tools and machines.

## **II The Evolutionary History of Machines**

### **1. The characteristics of the evolution of tools and machines**

Machines did not appear at the beginning of human society. There were only simple tools and no machines at all in the primitive society. The statement that tools were regarded as simple machines did not conform with historical facts. The evolution of tools and machines has shown the following characteristics:

1) Just as same as the process of biological evolution, the development of tools and machines also underwent a process from nonexistence to existence, from few to many, from low-level to high-level and from simplicity to complexity. Tools have continuously been improved in terms of texture, kind and property from the stone knives, stone axes to the copper shovels, copper hoes and then to the iron plough, iron saw, iron plane, iron hammer. Although the appearance and utilization of some machines was very early, the large-scale manufacture and wide use of machines is associated with capitalist mode of production. The machines were produced and developed through long-term improvement and innovation on the basis of hand tools.

2) Similar to the biological evolution which has experienced time evolution, i.e., the metabolism of germ line or metabolism in the development of system and space evolution, i.e., ecological metabolism or metabolism in the spatial development, the development of machines also went through two kinds of metabolism or two kinds of evolution. The first was time evolution, that is, the old kind of machines was replaced by the new kind of machine as time went on. The new kind of

machine replaced the old kind through inheritance and innovation and there was a relationship of inheritance between the old kind and new kind, just as there was the blood relationship between the new species and the old species, in which the new species replaced the old through hereditary and variation. For example the spinning machine was the inheritance and innovation of hand reeling machine and the cutting machine was the inheritance and innovation of the cutter. The second was the space evolution, which means the machine metabolism in space. Being not suitable for the need of production, some machines had already withdrawn from the original domain, lost the right of survival and become extinct; some machines met needs of production, occupied the domain, and continued going through the changes in spatial structure from simplicity to complexity. The evolution of machines also has gone through numerous great innovations: In terms of machine material: A. from stoneware to bronze; B. from bronze to ironware; C. from natural material to artificial material. In terms of machine power: A. from the wind power, waterpower to heating power; B. from heating power to electricity; C. from electricity to atomic energy. In terms of information processing of machines: from material and energy system without information processing capacity to information and control system.

3) As we know, the immanent cause of biological evolution is variation and heredity from the perspective of the evidence and impetus of evolution; it is the natural selection that motivates biological evolution in view of the high-level structure of organisms and ecology. There are also inherent cause and developing power in the machine development. Marx made a penetrating explanation about the foundation of tools development in Capital. He said, "The direction in the change of tool form is

determined by the experience obtained from the special difficulty brought by the original tool form. The foundation of tool development lies in two aspects: one is to inherit and keep the applicable part of the original tool; the other is to accumulate the experience overcoming and modifying the defects of the original tool for a long time. Succession and innovation are the foundation of machine evolution just as variation and heredity are the foundation of biological evolution. Just as natural selection is the motive force for harmful and favorable mutations at the level of organic phenotype and at the molecular level, artificial selection is the motive force for machine evolution. Specifically speaking, the unity of opposites between machines and social production (also called the external environment of machines) motivates the machine evolution; the need of social production manifests as artificial selection through which machines form their own phylads.

4) Organisms evolved from the inorganic substances without sensing ability to living beings with sensing ability and finally to mankind with thinking ability. It is interesting that machines also evolved along this direction, which is from machine systems without sensors to the automatically controlled machine systems with sensors and feedback function, and then to intelligent control system with self-adaptation and self-learning ability.

No matter how similar machine evolution and biological evolution are, there is essential difference between them, and we must not mix them up. There are essential differences between machine and living beings. The man-made machines, including bionic machines and intelligent machines, however exquisite and advanced, cannot reproduce the essential characteristics of life, let alone equate with human brain. The biological evolution is the self-development of organic substances,

and is natural selection; the machine evolution is mainly artificial production of inorganics, and is manual selection, and historical selection. In a word, living beings mainly evolve naturally (some living beings may need artificial selection), but machines are totally artificial evolution intervened by human beings. Generally speaking, the biological development has no purpose, while the development of machines totally reflects human purposes. Human needs are the mother of machine generation, while possible conditions are its father.

## **2. The Radical Reason for the Machine Development**

Transforming the first nature and creating the second nature are the basic characteristic of human activities. Engels pointed out, "animals in a narrow sense also have tools, but this refers to the four limbs of their body such as ants, honeybees and beavers; animals also carry out production, but the effect of their production on nature around is equal to zero." Only human beings can put their own brand on the nature, because they not merely changed the position of plants and animals, the appearance and climate of the place that they inhabit, and even plants and animals. In a word, animals only change the nature with their own existence, but the human make the nature serve for their purposes and control the nature through the changes they have made.

The basic task of mankind practicing activity lies in knowing and transforming the first nature and creating the second nature to better meet human material and spiritual need. Human transforming the first nature and creating the second nature is realized through human labor. Human labor refers to human transforming objects purposefully through the

instruments of labor in order to meet their needs. In production, human is the subject and the active part in productivity; while the material world is the object and the passive part in productivity. The contradiction between the subject and the object, mainly manifested by the contradiction between human beings and intermediate (tools) located between the subject and the object, promoted the development of production tools. Because of the constant development of social production in depth and width, the existing intermediate no longer met the growing need of production and required people to replace it with new intermediates, and then new production tools appeared. The course of constantly solving the contradiction between human and machine is the course of machine evolution and is also the developing course of productivity.

However, in the course of solving the contradiction between human and machine human intelligence played a critical role. Intelligence is the totality of abilities to know and solve all kinds of problems. To mankind, knowledge is the foundation of all intelligence behaviors, and intelligence is the ability to acquire knowledge and solve problems with knowledge. The machine is a hard tool and the cultural and scientific and technological knowledge is a soft tool in the process of human knowing and transforming the world. The soft tool is the soul and the hard tool is the materialization of soft tools in the whole human tool system. Human experiences, scientific knowledge and skills about the intermediate (tools) were turned into direct productivity; meantime they were also turned into the prerequisite of further reforming production tools and were materialized into a new production tool.

### III Human Intelligence is the Driving Force of Social Progress

#### 1. A New Division of Human History

The prominent difference between human beings and animals is human subjective initiative. The manufacture and use of production tools is the foundation for human breaking away from the nature. The improvement and development of production tools is the sign of human evolution and social development. The production tool is the most revolutionary and active factor in productivity. The quality transformation of production tools is the starting point of productivity revolution and the impact of machine tools on the subject of labor and the replacement of technological principles is bound to cause the revolution of productive force.

When human natural labor organs (hands) and limited physical power didn't meet the need of increasingly complex, strenuous production labor any more, there appeared machines - working machine, generator and actuator. The invention of working machine began simple mechanization of production, replacing the working function of human natural labor organs. The invention of the steam engines began to replace human power function. The first industrial revolution at the end of the 18th century and at the beginning of the 19th century was caused by the appearance and application of the steam engine. The wide application of steam engine changed the power of industry fundamentally, changed the appearance of the whole social production, and made the handicraft industry and workshop handicraft industry production transit to the mass production. It opened up the path to the integrated mechanization and human production entered the stage of mechanization.

Because of mechanization, the increasing number of machines people had to control and the increasing speed of machine operations made it difficult for people to finish the task of handling mass production only relying on human energy. The requirement for the management of machine system operations promoted people to add the new machine - control machine replacing the control function of human beings. Human production entered the automatic stage. Though it has a lot of advantages, the modern control machine (electronic computer) still can't meet demands of the high development of production. Human beings outperform the modern control machine in accurate analysis and synthesis capability, the fruitful methods of processing information and other aspects such as reliability and economy. To overcome the disadvantages of modern control machines and make possible the communication between machines and environment and among every part in machines to automatically adapt to the changes of internal and external environments, there appeared a new machine system -- intelligent machine. Some of human intelligence is replaced by intelligent machine. Thus, with the driving of human demands and with the critical role of human knowledge and experiences (intelligence), production tools evolved from human natural organs (hands) to working machines, from simple mechanization to mass production and to modern control machines. Correspondingly, human society evolved from primitive agricultural society to industrial society to information society.

Now, more and more researches show that intelligence is the key to human social development and human society will become intelligence society. Tong Tianxiang held the point just opposite to that of **Wavism** that we cannot divide the human civilization by several "waves" but with two revolutions --- energy

revolution and intelligence revolution. Mankind has experienced four energy revolutions: making fire by friction, manufacturing steam engines, employing electricity power and nuclear power. Energy revolution enlarged human physical power with machines, creating enormous material wealth and opening up human pre-civilization. But it obtained this at the price of vast consumption of resources on the earth, deteriorating ecosystem, the big gap between the poor and the rich and the worship of money. The society left people an impression that the spiritual civilization is far behind the material civilization. Intelligence revolution tries to set free the potentials of human beings and machines, leading to social intelligentization and creating a post-civilization era with intelligence society as the starting point. Thus human beings will eventually break away from the animality and replace the survival competition with intelligence competition.

Zhang Baosheng held that it is possible to divide human history from the perspective of technology and economy. Because sometimes the appearance of a techno-economic factor will bring about great influence to the civilization of human society. The coordinate of the division made by Tong Tianxiang is the radical change of the relation between human beings and the nature that with the transition of industrial society to intelligence society the relation between man and nature transit from confrontation to harmony.

## **2. Intelligence: Key to Future Social Development**

With the rapid development of science and technology, mankind has known more about the world and about himself. Human society seems to enter an era of knowledge explosion.

Many schools such as Wavism stressed the role of information and knowledge, believing it is knowledge that drives economy and society. Tong Tianxiang deemed that although information and knowledge is important, the statement that knowledge is power is still a traditional concept. In fact, knowledge itself is not power. It is the acquisition, processing, utilization and innovation of knowledge that is the really strong power. This is just the reflection of human intelligence. So it should be said that intelligence is power. It can be concluded that the critical factor determining social development is new knowledge and high intelligence instead of common knowledge and information.

There are two approaches through which industrial society can transit through information society to intelligence society: one is by computers and high informationization and after computers develop into intelligent machines high informationization becomes intelligentization; the other is by robots and high automation and after industrial robots develop into intelligent robots high automation becomes intelligentization. These two approaches all result in intelligence revolution and intelligence society. Intelligence revolution consists of two trends: computer revolution and robot revolution.

Computer revolution changes information processing into knowledge processing and results in the appearance of intelligent machine. When digital computers develop into intelligent computers and realize computer revolution, industrial robots will also develop into intelligent robots and realize robot revolution, making robots develop from flexible automation to intelligentization. Human-machine intelligent systems will become the main form of the productivity of a new generation which hence has two essentials: high intelligence and intelligent machines. Intelligence (human

intelligence and machine intelligence) becomes the key force driving economy and society.

#### **IV Conclusion**

From the history of tools and machine development, we can see the development of these tools and machines, an important part of productivity, not only reflect human demands but also manifest the knowledge, experiences and skills mankind has mastered. They are the essence of human intelligence. Driving by

intelligence, material economy shifts to intelligence economy. Human society also enters the intelligence age. The economic development of intelligence society does not lie in financial power but in intelligence. High intelligence is the core of the overall national strength. As the materialization of high intelligence, high technologies are bound to accelerate the development of world economy and the competition of high technology is sure to be the important feature of intelligence age.

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