Membrane Technology
ISSN (online): 1873-4049

Exploration of the Impact of Digital Labor on the Capital Production Process based on Big Data Algorithms

Haiyan Cheng[1], Yan Xu[2*]

[1]*Haiyan Cheng, School of Marxism, Shanghai University of Policical Science and Law, Shanghai 201701, China*

[2]*Yan Xu, Shanghai University of Finance and Economics Zhejiang College, Jinhua 321000, China*

**Corresponding Author.*

Abstract:
In the era of digital economy, the computing and storage capabilities of computers drive the rapid development of digital technologies such as big data algorithms. Digital capital relies on digital technology to establish digital enterprises, making digital labor a new form of labor. However, there is controversy in academia over whether digital labor creates value and surplus value. This article analyzes the impact of digital labor on capital production from the perspective of big data algorithms, and finds that although digital labor changes the premise of capital production, it still belongs to "productive labor" and can create value and surplus value. On the surface, digital enterprises provide free and flexible work, but in reality, they are conducive to capital production. By monitoring workers through big data algorithms, they ensure production efficiency and quality. This "zero cost" form of employment breaks the capital limit of increasing the number of employees and enables the rapid proliferation of digital capital. Therefore, digital labor has not changed the essence of capital production, but has made digital labor production appear "technologically invisible" through the use of digital technology.

Keywords: data algorithms, digital labor, capital production.

INTRODUCTION

As human society transitions from the Industrial 3.0 era to the Industrial 4.0 era, moving from the information age to the intelligent age, information and communication technologies represented by artificial intelligence, big data, the Internet of Things, and cloud computing have achieved significant development. Big data has gradually become a key factor of production, and big data and digital platforms have become new driving forces for global economic growth. The development of the digital economy has rendered the means of production digital, and the digital transformation of the means of production has raised new demands for the combination of means of production and laborers in the labor process. Digital labor has gradually become a new and important form of labor. However, there are significant differences between the digital labor process and traditional industrial labor processes, which has sparked intense discussions among Western scholars about whether digital labor creates surplus value. To summarize, there are mainly two opposing viewpoints. On the one hand, David [1], Alex [2], Michael and Antonio[3], Adam and Eleanor[4], Patricia [5], Nancy [6], and others argue that digital labor does not create surplus value because digital labor is labor within free time, unrelated to productive labor, and the source of value of digital labor cannot be found. On the other hand, Fuchs [7], Mark [8], Aleksandr and Andrey[9], Nancy [10], and others have strongly refuted the viewpoint that digital labor does not create surplus value, arguing that digital labor is an extension of capital exploitation and a more extensive and far-reaching form of labor. At the same time, existing research mainly focuses on sociological and economic perspectives, with little research conducted from the perspective of digital technologies such as big data algorithms. Therefore, clarifying whether digital labor creates surplus value from the perspective of big data algorithms is of great significance for understanding the essence of digital labor.

The term "digital labor" was first proposed by Italian scholar Emanuele Terranova [11], mainly referring to unpaid labor, which belongs to immaterial labor. His concept of digital labor differs from the commonly understood concept of digital labor today. Fuchs[12] , on the other hand, expanded the scope of digital labor from the perspective of political economy of communication, proposing a broad concept of digital labor, emphasizing that digital labor mainly refers to labor that serves capital accumulation with the help of Internet communication technology.[13] According to the definition of digital labor by Fox, a well-known Marxist scholar in the UK, digital labor can be divided into the following types: digital labor after the digitization of traditional industries, digital labor in software development enterprises, digital labor in hardware and software production enterprises, "gig" labor in the platform economy, and "play-work" labor with the integration of production and marketing in the Internet economy. These types of digital labor can be further divided into formally employed digital labor and informally employed digital labor. Among them, digital labor after the digitization of traditional industries, digital labor in software development enterprises, and

digital labor in hardware and software production enterprises belong to formally employed digital labor, while "gig" digital labor and play-work labor belong to informally employed digital labor. Informally employed digital labor is a new form of labor in the era of digital economy, with high flexibility and autonomy, but also facing certain risks and issues of social recognition. The academic disputes about digital labor mainly focus on informally employed digital labor. Therefore, this article will focus on analyzing the capital production process of informally employed digital labor.

Political economy emphasizes that surplus value arises from the capital production process. The widespread application of technologies such as algorithm optimization and data mining in the computer field to the digital capital production process is not intended to alleviate workers' workload; its ultimate goal is to obtain surplus value. This study focuses on how the computational and storage capabilities of computers drive the rapid development of digital technologies such as big data algorithms, and explores how these technological advancements further promote the establishment of digital enterprises and the formation of digital labor. The scope of the study covers the following aspects: firstly, analyzing the rapid development of digital technologies (especially big data algorithms) and its correlation with computer computing and storage capabilities; secondly, examining how digital capital utilizes digital technologies to build digital enterprises, and how this construction promotes digital labor to become a new form of labor; finally, studying the role of digital labor in capital production and its relationship with the creation of value and surplus value. In addition, the study will also delve into the essence of the so-called "free and flexible" work model provided by digital enterprises, and how this work model monitors workers through big data algorithms to ensure production efficiency and quality.

OBJECTIVES

This study aims to delve into the impact of digital labor on capital production from the perspective of big data algorithms, and to explore whether digital labor can still create value and surplus value in the era of digital economy. Specifically, the research objectives include: firstly, clarifying the new role and positioning of digital labor in capital production; secondly, assessing the degree of change in the prerequisites for capital production caused by digital labor, and determining whether this change affects the nature of digital labor as "productive labor"; thirdly, revealing the essence of digital enterprises' monitoring of workers through big data algorithms, and how this monitoring promotes the efficiency and quality of capital production; finally, exploring how digital labor enables rapid proliferation of digital capital under the "zero-cost" employment form, and analyzing whether this proliferation changes the essence of capital production. Through this study, it is expected to provide new perspectives and insights for understanding capital production and labor value theory in the era of digital economy.

METHODS

This article primarily employs interdisciplinary research methods and case analysis in the field of computer science. On the one hand, by deeply integrating theoretical methods from computer science with economic research, a novel theoretical framework is constructed to delve into the specific impacts of digital labor on the capital production process. On the other hand, through carefully selecting and analyzing specific algorithm cases within the field of computer science, it meticulously demonstrates how capital maximizes its benefits through precise control over digital laborers. The specific research process is outlined as follows:

The Rapid Development of Digital Technology, especially Big Data Algorithms

In recent years, with the improvement of computing and storage capabilities of computers, digital technology, especially big data algorithms, has achieved rapid development. On the one hand, the continuous upgrading of computer hardware, especially the performance improvement of processors such as CPUs and GPUs, provides powerful computing support for the operation of big data algorithms. Meanwhile, the development of technologies such as cloud computing and distributed computing has enabled big data algorithms to run in parallel on multiple computing nodes, further improving computational efficiency. On the other hand, the development of new storage technologies such as distributed storage and cloud storage has made the storage and management of big data more efficient and convenient. And with the continuous advancement of storage media, such as the popularity of solid-state drives (SSDs), storage speed and data security have also been significantly improved. Capital relies on advanced digital technologies such as big data algorithms to establish digital platform enterprises, which adopt digital labor as a new form of employment, changing the traditional process of capital production.

Digital Labor has Changed the Premise of Capital Production

When analyzing the process of capital production in the first volume of the political economy work "Capital", the difference between money and capital is first analyzed. It emphasizes that currency is only a general equivalent used for commodity exchange, while capital can bring value appreciation, that is, bring surplus value. So, why can capital bring value appreciation?

This is because capitalists have purchased a special commodity - the 'commodity of labor'. From the perspective of capital psychology, their purchase of this commodity has its own special psychological considerations, satisfying their certain desires, mainly the desire to obtain unlimited surplus value. Therefore, labor commodities have special use value and can bring value appreciation. It can be seen that 'labor becoming a commodity' is the prerequisite and key to the conversion of currency into capital. The production of capital directly determines the capitalist mode of production, and thus "labor becoming a commodity" is also a prerequisite for the emergence of the capitalist mode of production. Labor, as one of the three fundamental production factors of productivity, is not naturally a commodity. From the perspective of workers' psychology, they themselves are not willing to sell their labor force, because selling labor force means being constrained and regulated by capital, losing their freedom. However, laborers do not possess any means of production or livelihood, nor do they have the material conditions to exert their labor force, nor do they have other means to sustain themselves. Workers have nothing except their own labor force, so even if they are unwilling in their hearts, they can only sell their only remaining labor force that they can independently control in order to survive. When the owners of the means of production and living find free workers in the market to sell their labor, capital and the capitalist mode of production emerge. It can be seen that the separation of laborers and means of production is not only a prerequisite for labor to become a commodity, but also a prerequisite for the emergence of the capitalist mode of production. However, in the era of digital economy, the emergence of digital labor has brought about new changes to this premise.

We are familiar with typical digital workers, such as odd jobs employed by the platform and casual workers on the Internet. Their means of production and workers are not separated in the labor process. For example, the main means of production for ride hailing drivers are ride hailing services, which belong to the private property of the drivers. The laborers are the drivers themselves, and the means of production and laborers belong to the same drivers. The means of production and laborers are not separated. In addition, there is no buying or selling of labor goods here. Workers do not sell their labor as a commodity to the platform, and the platform has not signed a formal employment contract with drivers or paid their wages. In short, digital labor has changed the premise of capital production. On the one hand, the means of production and labor of digital workers have not been separated, and the ownership of both means of production and labor belongs to the workers. On the other hand, digital workers have not sold their labor as commodities to digital enterprises. This is inconsistent with the description of the premise of capital production in political economy.

Digital Labor is still Productive Labor, Creating Surplus Value

Due to the fact that digital labor has changed the premise of capital production, there is widespread controversy over whether the process of digital labor belongs to the process of capital production, whether digital labor creates value, and whether it can bring surplus value. Political economy holds that productive labor is the source of value and surplus value. Therefore, to clarify these issues, the first step is to clarify whether digital labor belongs to productive labor. There are two important characteristics of productive labor: first, the result of productive labor is a product with exchange value; Secondly, the ultimate goal of productive labor is to obtain surplus value.

Externally, informally employed digital workers are not employed by capitalists, but rather work for themselves. Taking ride hailing platforms as an example, most ride hailing drivers are their own bosses, and ride hailing platforms do not sign labor contracts with ride hailing drivers, nor do they pay drivers' salaries on a monthly basis. But their labor cannot be separated from the digital platforms established based on digital technology. Ride hailing drivers cannot do without ride hailing platforms, and food delivery drivers cannot do without food delivery platforms. The premise of the existence of digital labor is that there is a platform first, followed by digital workers. It is precisely because of ride hailing platforms that there are a large number of ride hailing drivers. Before the emergence of ride hailing platforms, many drivers had the mentality of pursuing freedom and not wanting to be subject to various regulations from car rental companies. They chose not to be employed by car rental companies and ultimately became illegal and unqualified black car drivers in order to survive. From the perspective of capital psychology, the establishment of various platforms based on digital technology is not necessarily for charity, but for the purpose of seizing more surplus value, which is also in line with the essential attributes of capital. For example, after the completion of the construction of a ride hailing platform, the primary task of the platform is to attract a large number of drivers to join the platform and become ride hailing drivers. It is precisely capital that captures the psychology of drivers that enables platforms to attract a large number of drivers to join in the short term. After the driver completes the order, the money paid by the passenger is directly left in the platform's payment system. After the platform takes a commission, the remaining amount will be distributed to the corresponding driver.

It can be seen that in different situations, the same driver using the same vehicle for the same labor has different attributes. When the driver drives a black car, the driver's labor is non productive labor, because passengers purchase the driver's labor only for

the use value of their labor, which can meet the passenger's travel needs. And when drivers become platform drivers, their labor becomes productive labor, because the ultimate goal of the platform absorbing ride hailing drivers is to increase the value of the platform and earn profits. In short, digital labor is still productive labor, which can not only create value but also bring surplus value to capital. The process of digital labor still belongs to the process of capital production, reflecting the exploitative and exploited relationship between platform capitalists and digital laborers. Digital labor will not change the exploitative nature of capital towards labor, as the pursuit of surplus value by digital capital has not ended.[14]

Digital Labor Utilizes Digital Technology to Make Surplus Value Production More Covert

With the development of digital technology, many emerging digital enterprises have emerged. These enterprises adopt diversified operating models, which have led to a new qualitative change in the way they control their workers. In the traditional industrial 1.0, 2.0, and 3.0 eras, although there were differences in the way companies monitored workers, they all had one thing in common: by establishing a factory system to concentrate workers in the same workplace, the labor process of workers was carried out under the supervision of capitalists. In the era of Industry 4.0, which is the era of intelligence, the emergence of emerging digital enterprises such as platform companies has broken this production model, and workers are no longer working under the direct supervision of capitalists. The platform does not directly hire workers, but mainly undertakes intermediary functions, centralizing the market supply and demand sides on the platform, and using digital technologies such as big data to accurately and efficiently match the supply and demand sides, enabling both parties to quickly achieve transactions. The digital economy has broken the limitations of time and space in the labor process. Workers do not have a fixed workplace and fixed working hours, and they can freely choose their workplace, working hours, and even service recipients. On the surface, capitalists and laborers do not sign employment contracts, and laborers do not work under the supervision of capitalists, giving them ample freedom. But this does not mean that capital's monitoring of the labor process has disappeared.

In fact, although there is no traditional material form of factory, platform workers have formed a new virtual social factory in a scattered form.[15] In this large factory, capitalists do not directly supervise the workers, but the labor products still belong to the capitalists. In order to ensure maximum profit, capitalists will inevitably monitor workers. Capitalists give workers a "flexible" and "free" way of working for the following three reasons.

First, the reason why capitalists are willing to provide this new working mode is that even under this working mode, capitalists can still use digital technologies such as the Internet to monitor the labor process step by step. Taking the delivery digital platform as an example[16], the delivery platform allocates orders through digital algorithms and comprehensively monitors the delivery routes, times, user evaluations, and other aspects of external sellers. The primary task of a food delivery platform is to ensure timely delivery, which is also a prerequisite for the platform to attract users. To this end, the platform calculates the specific time for delivery personnel from receiving orders, picking up meals, delivering meals to completing orders through algorithms based on their daily delivery data. Delivery personnel must ensure that each step is completed on time. At the same time, customers can track the entire delivery process in real-time through the platform app after placing an order. The job of a delivery person is to "race against time", and once the delivery person improves their efficiency or discovers a new route to shorten the delivery time, the algorithm can quickly identify and automatically shorten the delivery time after multiple operations. Algorithms are not necessarily scientific, for example, some delivery drivers have reported that algorithms calculate delivery time based on straight-line distance time, but the actual route may be a circle due to various reasons. Faced with this situation, delivery drivers can only passively accept it. The platform will assess the delivery staff based on their order acceptance, punctuality, user feedback, and other factors, and evaluate them to a knight level (7 levels in total). Finally, the delivery staff will be rewarded or punished according to their level. In addition, due to the special nature of the work of food delivery platforms, the peak period of orders is concentrated on three meals a day, which prolongs the entire working time of food delivery personnel. During non meal peak periods, food delivery personnel's phones will also activate the "order receiving mode". The manager of a food delivery platform is the system. Even if the delivery person does not receive an order, they will complain about the system. When they receive negative reviews, they will complain about consumers, externalizing the traditional labor management conflict into a conflict between workers and the digital system, and between workers and consumers.

Secondly, the platform's compensation and assessment mechanisms are gradually transforming the external monitoring of capitalists into internal monitoring of workers. Taking ride hailing as an example[17], "flexibility" and "freedom" are the main characteristics of ride hailing platforms. The industry admission principles for drivers are low, and drivers do not need the traditional enterprise process based onboarding procedures. They only need two procedures: platform registration and platform order taking. The production materials are provided by the drivers themselves, making them feel like they are "working for themselves". Of course, this is also the platform's promotional slogan to attract drivers. On the surface, the capital of ride hailing

platforms has weakened its control over the form of labor. Drivers and platforms have a non employment relationship, and drivers can take orders on multiple platforms at the same time. Drivers can independently decide their daily working hours and whether to take orders. But the actual control of capital over labor has been strengthened, and although drivers can freely decide their working hours, mechanisms such as platform dispatching and salary make drivers exhibit self pressure characteristics in their work. After the platform driver's order is completed, the driver and passenger will conduct a two-way rating. On the surface, this rating mechanism may seem fair, but in reality, negative ratings from passengers directly affect the driver's income level. Conversely, negative ratings from drivers have almost no impact on passengers, which is actually an unfair rating mechanism for drivers. In fact, the user rating mechanism itself is a way for the platform to monitor drivers, but under this mechanism, the platform does not directly monitor drivers, but transfers the monitoring rights to users. The rating mechanism also reduces the likelihood of drivers turning to other platforms, especially for those with low ratings. Some platforms evaluate drivers' reputation based on their performance in driving, receiving orders, and passenger reviews. Reputation directly affects whether drivers can receive large or good orders. Some platforms even classify drivers into different levels based on their travel and order taking situations, and set different rewards according to different levels, such as setting up "rush order rewards" to promote internal competition among the driver group. Under high-intensity competitive pressure, drivers will increase their own requirements, continuously improve work efficiency, and extend working hours. Drivers generally report that they basically "run for more than ten hours" every day. In addition, the driver appears to be free on the surface, but in reality, they are under "panoramic" monitoring, with monitoring equipment, passenger evaluation and supervision systems, platform "mysterious passengers", etc., and the driver has no freedom at all. In addition, due to the fact that drivers do not have a fixed workplace and do not know each other, it is difficult to form a sense of community, and they can only passively accept platform rules, ultimately imprisoning the entire group of workers on the platform. Ultimately, the "consent" of workers, as the "manufacturing" subject, to the labor process continues to increase.[18]

In short, in the era of digital economy, with the development of digital technologies such as big data algorithms, the degree of labor monitoring is constantly increasing. Workers are subject to monitoring from various aspects such as platform systems, consumers, and themselves. Labor monitoring has also broken through the temporal and spatial limitations of traditional monitoring and become more covert. The intensification of labor management conflicts through traditional labor monitoring has gradually shifted to conflicts between workers and consumers, as well as between workers themselves. For example, Uber, the world's largest ride hailing platform, whose main function is to use digital technology to match drivers and passengers, has become a $149.471 billion company by exploiting the labor of drivers. The company employs hundreds of social scientists and data experts to manage and manipulate driver behavior, attempting to enable drivers to complete the maximum workload at the lowest wage without resistance, while the company's management can monitor the details of the driver's driving process, such as braking, acceleration speed, road traffic flow, and so on.

RESULTS

With the widespread application of digital technologies such as big data in digital enterprises, the surplus value production of digital labor has become "technology invisible"[19]. It is precisely this' invisibility 'that keeps digital labor products under the ownership of capitalists, and the exploitation of digital workers by digital capitalists continues to strengthen, prompting digital enterprises to achieve rapid expansion in the short term.

Digital Labor Products Still Belong to Capitalists

The lack of separation between digital workers and means of production discussed earlier is only superficial, but in reality, the two are not completely inseparable. For example, although the production materials of ride hailing drivers - ride hailing cars - belong to the drivers themselves. However, the prerequisite for freelancers to become ride hailing drivers is the existence of ride hailing platforms. Without ride hailing platforms, drivers cannot engage in ride hailing work and can only engage in traditional taxi services. The number of orders received per day depends on luck. It can be seen that the core means of production in the digital labor process are platforms built based on digital technologies such as big data and cloud computing, which replace ride hailing services as the core means of production. Of course, this core means of production is different from traditional material forms of means of production and belongs to non-material forms. The owners of the key means of production on the platform are capitalists, and the means of production owned by laborers are not the core means of production. The means of production of digital labor and laborers are not completely separated. Of course, this kind of inseparability is different from the industrial labor described by Marx, where industrial laborers have nothing but their own labor power, and the means of production and laborers are completely separated.

It is precisely because the means of production and laborers are not completely separated that digital laborers own some of the means of production, allowing them to organize production on their own without necessarily selling their labor or working under the supervision of fixed locations. Although digital workers have not yet established formal employment relationships with the same platform and do not need to work in fixed locations, digital technology has continuously enhanced capital's monitoring of digital labor, and the relationship between platforms and digital workers is a new form of invisible employment. The reason why capitalists adopt this employment method is that it does not violate the original intention of capital to seize surplus value. Firstly, the development of digital technology has made it possible for new forms of employment. Even if workers are not working in fixed locations or at fixed times, they are still subject to the joint monitoring of many "invisible hands" such as platform systems, consumers, and workers, and labor monitoring continues to strengthen. Secondly, a free and flexible form of employment that caters to the psychology of workers can attract more workers to join the platform, continuously expand its scale, and enhance its overall strength. Thirdly, the new form of employment can save the platform's prepaid capital. The platform's own production materials reduce the platform's constant capital expenditures, and the platform's non prepaid wages save the platform's variable capital expenditures. Fourthly, the means of production owned by digital laborers are not the core means of production, and the core means of production still belong to capitalists. Although capitalists do not purchase labor goods from digital laborers, they rely on their ownership of core means of production to force digital laborers to engage in labor on the platform and accept platform rules, ultimately obtaining ownership of labor and labor products. Generally speaking, after platform workers complete platform work, users' remuneration will be directly paid to the platform, and the platform will give the remaining amount after deducting commission to the workers. The difference between digital workers and traditional workers is that traditional workers' wages are pre agreed upon, while digital workers' wages are paid afterwards and are highly unstable.

In the end, the labor process of digital workers also presents two attributes: firstly, the labor process of digital workers breaks through traditional spatial and temporal limitations, without fixed places and fixed times, but still works under the invisible monitoring of capitalists, and their labor belongs to capitalists; Secondly, capitalists rely on their absolute control over the core means of production to ensure that the labor products of digital laborers still belong to them. Therefore, digital labor has not changed the essential attributes of the capital labor process, but the new changes in the form of digital labor employment have made capital exploitation more concealed.

Digital Labor Breaks through the Limitations of Time and Space, Blurring the Boundaries between Work and Leisure in Traditional Labor Processes, and Continuously Extending the Working Hours of Digital Workers

With the changes of the times, the forms of labor have undergone significant changes, but the completion of any labor process cannot be separated from the labor time invested by workers. Labor time is one of the decisive factors that determine the level of output. Due to objective limitations, a working day is only 24 hours long. Therefore, workers must make a choice between work and leisure, and there is a clear boundary between work and leisure. Even on a deserted island, self-sufficient Robinson had to determine his own labor and leisure time every day. In Robinson Crusoe's economics, Robinson actually plays a dual role. He is both a producer who spends his labor time fishing and collecting coconuts every day, and a consumer who spends his leisure time enjoying life on the beach every day. Collecting coconuts and consuming leisure time are mutually substitutable. The more coconuts you collect, the less time you have to enjoy the beach sunshine. Finally, Western economic research concludes that Robinson would make his utility maximizing choices based on his preferences for coconuts and leisure, ultimately determining his daily work and leisure time. Through the analysis of Robinson's economy, we can see that even in the early stages of human society, the level of productivity development was extremely low, there was no social division of labor, and workers were self-sufficient without any production surplus. Workers still had to decide on their daily work and leisure time. In the agricultural era, farmers were restricted to engaging in agricultural production on land and had strict daily routines, usually "working at sunrise and resting at sunset". After entering the industrial age, human society established the factory system, which concentrated workers in the factory and implemented strict attendance regulations. The factory would set the working day hours. In the era of digital economy, the emergence of digital labor not only changes the content, form, and products of labor, but also breaks the boundary between labor and leisure in the digital workplace[20], making it difficult to distinguish between work and leisure.

The development of platform economy has made many gig workers become digital laborers on platforms, and the typical feature of gig digital laborers is "freedom". This freedom is first manifested in the spatial freedom of workers, where capital no longer confines workers to a fixed location, thereby improving the efficiency of the utilization of means of production and the work efficiency of workers, ensuring that capital can achieve maximum proliferation. Gig digital workers do not have a fixed workplace. Delivery drivers on food delivery platforms shuttle through the streets and alleys of a certain area, while drivers on ride hailing platforms travel throughout the city and may even cross cities or provinces. The workplace of platform self media

workers may be office buildings, cafes, or even private residences, and so on. The freedom of labor space brings about the freedom of labor time. Workers' time is completely at their own discretion, without clear commuting times. It can be during working hours, after work hours, or during holidays. This blurs the boundary between labor and leisure, increasing the uncertainty of the distribution of labor days between work and leisure.

Although digital labor breaks the temporal and spatial boundaries of traditional labor, workers work in a free, flexible, and unconstrained environment, enjoying full freedom. However, due to the existence of digital monitoring on the platform, workers have not been able to escape from the platform's surveillance, and this "freedom" is just a facade. In order to achieve capital growth on the platform, various assessment and reward systems have been established. The platform competition is fierce, and workers generally enter a state of "self pressure". Even many gig workers enter a "long standby state" every day, which integrates work and leisure, making it difficult to divide specific work and leisure time. For example, the "gig" delivery drivers on food delivery platforms tend to have sporadic orders during lunchtime and dinner time, and their phones are usually in the order receiving state. During peak order periods, delivery drivers shuttle through various corners of the city, while at other times, they randomly find a corner in the concentrated area of the restaurant, sit in electric scooters, chat or swipe their phones together, and wait to receive orders. It is difficult to distinguish between the waiting time for delivery drivers during non peak hours, which is both work and leisure. Many food delivery drivers even work 30 days a month, with daily working hours exceeding 12 hours.

The Particularity of Digital Technology has Led to a Rapid Increase in Digital Labor Practitioners in the Short Term, Achieving Rapid Expansion of Digital Enterprises

Digital capitalists closely follow the psychology of workers, using words such as flexibility, autonomy, and free choice to attract workers to work, resulting in a rapid increase in the number of employees on digital enterprise platforms in the short term. In the traditional industrial era, the number of workers employed by enterprises was limited by the amount of capital they had. However, in the era of digital economy, digital labor, as a new form of employment, has broken the capital limitations of enterprise production. The development of digital technology has given rise to a large surplus population outside of formal employment. On Internet platforms such as online car hailing and takeaway, the platform mainly employs "odd jobs", that is, freelancers. The platform "gig workers" have not yet established a formal employment relationship with the platform, and their salary income depends entirely on their daily working hours, work performance, etc. Social welfare such as medical and pension insurance are borne by the workers themselves. Platform enterprises do not need to prepay wages to "gig workers", meaning that the variable capital prepaid by the platform to gig workers is zero. Therefore, when the platform increases the number of hired workers, the variable capital prepaid by the platform to gig workers will not increase and will still be zero. In this way, digital enterprises can continuously absorb these surplus populations and achieve rapid expansion and proliferation in the short term. For example, by 2024, Uber, the world's largest ride hailing platform, will have 7.4 million ride hailing drivers. In the end, Uber developed into a giant enterprise with a market value of $1494.71 in just 15 years. In contrast, Siemens, one of the top ten industrial giants in the world, has a market value of only $1564.33 after 177 years.

From the perspective of capital psychology, capitalists have an unlimited pursuit of surplus value or profit. After obtaining the first bucket of gold, capitalists will continue to accelerate capital accumulation, innovate continuously, improve digital technology, expand production scale, and deprive more surplus value. This further accelerates the accumulation of digital capital, causing the capital of digital enterprises to spiral upwards. Ultimately, digital capital achieved rapid expansion in a short period of time. For example, the top three global brands by market value, Apple, Google, and Amazon, are all digital enterprises with market values exceeding trillions of dollars. However, one trillion dollars exceeds the total GDP of Beijing and Shanghai in China, making them truly wealthy and competitive. Among them, Google and Amazon are also the two largest Internet companies in the world. Both companies were founded in the middle and late 1990s. In just over 20 years, they have reached the scale of today's trillion dollars. The market values of the two companies are respectively 1.94 trillion dollars and 1.73 trillion dollars. As the world's largest manufacturing enterprise, Toyota was founded in 1937. As of August 2021, its market value is over 200 billion US dollars, only about one twentieth of Google's market value. It can be seen that the development of digital technology has brought great convenience to the production of surplus value, and new digital enterprises are showing a trend of rapid accumulation. In the era of digital economy, the speed of capital accumulation is faster than any previous era.

DISCUSSION

With the deep intervention of computer methods such as big data algorithms and machine learning, digital labor, as an emerging mode of employment, has only changed the premise of capital production. Workers have not sold their labor as a commodity to capitalists, and they have not completely separated from the means of production. Workers have control over some of the means of production. But this has not changed the fundamental opposition between capital and labor. From the perspective of capital

psychology, the continuous development of digital technology by capital is not aimed at shortening labor time, reducing labor pressure, or improving people's convenience in life. Its ultimate goal is to achieve capital growth and obtain surplus value. Digital labor is still the 'productive labor' that serves digital capital. The process of digital labor still belongs to the process of capital production, reflecting the exploitative and exploited relationship between digital capitalists and digital laborers. And because digital capitalists have mastered the core means of production - digital technology, the labor products of digital laborers still belong to the capitalists. Therefore, digital labor has not changed the essential attributes of the process of capital labor. Digital labor produces surplus value, but the new changes in the form of digital labor employment make the production of surplus value of digital capital more concealed.

On the surface, digital enterprises provide flexible and free work for workers, but in reality, this new form of labor employment itself is beneficial for capital production. This' zero cost 'employment method breaks the capital limit for digital enterprises to increase their workforce, allowing them to increase their workforce without restrictions. Ultimately, increasing the number of employees has become the main way for digital enterprises to proliferate, enabling them to achieve rapid growth in the short term, thus revealing the mystery of rapid expansion of digital enterprises. Of course, the production of surplus value through digital labor cannot be achieved without the development of digital technology, which has created conditions for digital employment forms. The innovation of digital technology enables capital to achieve precise control over the labor process through means such as big data algorithms and artificial intelligence, even in the absence of direct monitoring. In the era of digital economy, the control of capital over digital workers has reached an unprecedented height. Monitoring methods have extended from the physical level to the psychological level, shifting from direct capital monitoring to "intangible monitoring" involving platform systems, consumers, and workers, making the monitoring of the labor process more secretive.

In short, in the new era of booming digital economy, computer methods such as big data algorithms and machine learning provide powerful tools for capital to capture more surplus value. The profit driven nature of capital determines that it will continue to promote the innovation and development of digital technology, and continuously deepen the capitalization and application of digital technology. With the further development of digital technology, the exploitation of digital labor by capital will intensify, and the living environment of digital workers may face more severe challenges. This is undoubtedly an important issue that needs to be closely monitored in future society.

ACKNOWLEDGEMENTS

The research was supported by Regular Project of Xi Jinping's Research Center for the Thought of Socialism with Chinese Characteristics for a New Era in Zhejiang Province, "Research on Xi Jinping's Innovative Contributions to Important Discourse on the Digital Economy" (Project Number: 24CCG06).

REFERENCES

[1] David Hesmondhalgh. User -generated Content, Free Labour and the Cultural Industries. Ephemera, 2010, Vol.10, No.3, PP 267-284.

[2] Alex Callinicos. Equality. Cambridge: Polity, 2000, PP 68.

[3] Michael Hardt, Antonio Negrl. Multitude. London: Penguin Books, 2005, PP 145-150.

[4] Adam Rrvidsso, Eleanor Colleoni. Value in Informational Capitalism and on the Interne. The Information Society, 2012, Vol.28, No.3, PP 135-150.

[5] Patricia Ticineto Clough. The Digital Labor and Measure Beyond Biopolitic. In: Trebor Scholz(ed.), DigitalLabour: The Internet as Playground and Factory, New York: Routledge Press, 2012, PP 112-124.

[6] Nancy Baym, Robert Burnett. Amateur Experts: International Fan Labor in Swedish Independent Music. International Journal of Cultural Studies, 2009, Vol.12, No.5, PP 433-449.

[7] Fuchs Christian. With or Without Capitalism? A Rejoinder to Adam Arvidsson and Eleanor Colleoni. Triple C, 2012, Vol.10, No.2, PP 633-645.

[8] Mark Andrejevic. Estranged Free Labor. In: Trebor Scholz(ed.), Digital Labour: The Internet as Playground and Factory, New York: Routledge Press, 2012, PP 149-162.

[9] Aleksandr V. Buzgalin, Andrey I. Kolganov. The Anatomy of Twenty-First Century Exploitation: From Traditional Extraction of Surplus Value to Exploitation of Creative Activity. Science and Society, 2013, Vol.77, No.4, PP 486-511.

[10] Nancy Holmstrom. Exploitation. In: Kai Nielsen, Robert Ware and Atlantic Highlands(eds.), Exploitation: Key Concepts in Critical Theory. NJ: Humanities Press International, 1997, PP 76-91.

[11] Terranova, Tiziana. Free Labour: Producing Culture for the Digital Economy. Social Text, 2000, Vol.18, No.2, PP 33-58.

[12] Christian Fuchs. Digital labor. Routledge, 2014, PP 351.

[13] Scholz, Trebor. Digital Labour: The Internet as Playground and Factory. New York: Routledge Press, 2012, PP 220-222.

[14] Comor, Edward. Digital Prosumption and Alienation. Ephemera, 2010, Vol. 10, PP 439-454.

[15] Wenlong Han, Liu Lu. The process of digital labor and its four forms of expression. Financial Science, 2020, No.1, PP 67-79.

[16] Shaodong Zhou. Individual Freedom and Collective Imprisonment: A Study on the Labor Capital Relationship of Online Ride hailing Platforms. Journal of Hebei University of Economics and Trade, 2021, Vol.42, No.2, PP 43-54.

[17] Ping Sun. Digital Labor under Algorithm Logic: A Study on Delivery Personnel in a Platform Economy. The ideological front, 2019, No.6, PP 50-57.

[18] Michael Burawoy. Manufacturing Consent: Changes in the Labor Process under Monopoly Capitalism, edited by Rongrong li, Beijing: The Commercial Press, 1972, PP 243.

[19] Fei Meng, Rong Cheng. How to understand digital labor, digital exploitation, and digital capital?. Teaching and Research, 2021, No.1, PP 67-80.

[20] Harry Braverman. Labor and Monopoly Capital: The Degradation of Labor in the 20th Century, edited by Fang Sheng, Beijing: The Commercial Press, 1978, PP 245.