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# The Machine System of Digital Labor Platforms and the Algorithm as Transmitting Mechanism

Archer Buissink

*Central to the increasing digitization of contemporary capitalism are platforms such as Twitter, Uber, and Amazon. Utilizing large amounts of data and the internet's global network, digital platforms allow for connection between users, workers, suppliers, employers, and other economic or social actors. Using Marx's triadic conception of the machine from chapter 15 of Capital, "Machinery and Large-Scale Industry," this essay highlights how the digital platform can be viewed as a machine system of the twenty-first century once technological changes are accounted for. Key to the digital platform as a machine system is its transmitting mechanism, the algorithm. The algorithm allows the central driving force, the technology firm, to regulate gig or click-work labor processes that take place on the platform. This framework provides a clearer positioning of the digital platform within the capitalist mode of production.*

**Key Words:** Algorithm, Gig Economy, Labor Platforms, Machine System, Platform Capitalism

The rise of digital platforms such as Facebook, Uber, Alibaba, and Amazon within the global economy is undeniably changing the nature of work, education, commerce, and every other facet of socioeconomic life. The scale of these transformations has led some scholars and activists to question whether our present economic system has changed qualitatively to become no longer capitalism but some form of technofeudalism (Geddes 2019; Dean 2020). These theories are based on the premise that "history is simultaneously moving forwards technologically and backwards politically" due to this economic shift (Waters 2020, 408). While the idea of technofeudalism is increasingly subject to critique (e.g., Morozov 2022), the general question of how capitalism is developing remains open for debate.

This essay further theorizes the nature of platform capitalism based on Marx's original critique of the capitalist mode of production. Specifically, I argue that digital platforms can be seen, *mutatis mutandis*, as a modern, digital form of Marx's machine system. Key to the operation of digital platforms is their analysis

and processing of data produced between end users and the platform's internal backend. To drive this process, digital platforms use (often proprietary) algorithms as transmission mechanisms to, from, and between their end users.

Just as the machine system of large-scale industrial capitalism created an objective organization of production within which the worker was a mere appendage of the machine, this algorithmic machine system shapes a "cyber-proletariat" working within platforms as moderators, gig workers, click workers, and so on, all of whom service and support the needs of the algorithm and its clients (see Dyer-Witheford 2015). Their labor is managed entirely by the same algorithms, from provisioning tasks to confirming their completion to penalization or dismissal of workers if the algorithm deems necessary.

The first section presents Marx's (1990) understanding of the machine system and the mechanization of production as seen in chapter 15 of volume 1 of *Capital*. I focus on two key parts of his analysis: (1) the triadic nature of the machine, which includes the motor mechanism, the transmitting mechanism, and the working machine; and (2) the development of mechanization from manual labor to the machine system. Under the machine system, an increasingly coordinated and interconnected technological network relies on the machine's triadic nature, with an increasing number of working machines relying on a central driving force as the scale of production increases.

At the end of this section, I also briefly discuss Marx's (1993) earlier elaboration of the machine system in the "Fragment on Machines" from the *Grundrisse*. In this rough draft, Marx discussed the consequences of the automation of production, but he had not yet grasped the importance of relative surplus value to capitalist production. Because of this, he expected the machine system to lead to the collapse of capitalism. This erroneous conception was later abandoned by Marx in *Capital's* more sophisticated analysis of the importance of relative surplus value and productive power.

The second section of this essay then introduces the concept of digital capitalism and the digital platform as a pivotal technology for capitalism's actualization in digital environments. I outline the place of platforms within capitalism and introduce several ways in which platform firms can be classified, based upon the existing literature. Next, the components of Marx's theory of the machine system are revisited in the context of the platform, with analysis of how the motive power and the working machine appear within the digital platform.

The third section continues by discussing the role of algorithms within digital platforms as transmitting mechanisms. The specific triadic nature of platform work, between the technology firm, the client, and the worker (Joyce 2020), means that algorithms function as a more complex, networked transmitting mechanism than the radial nature of industrial capitalism's "original" machine system permitted. This section ends with discussion of the algorithm's role in shaping workers into its "living appendages" (Marx 1990, 548), as a "hybrid machine/human computing arrangement" (Jones 2021, 32).

Through this movement from Marx and, implicitly, early industrial capitalism to the digital platforms and algorithms of contemporary capitalism, the differences between the machines and factories of his day and the algorithmically networked digital systems of the present will be clear. Of course, one does not need Marx to realize how the scientific and technological basis of capitalism has been repeatedly revolutionized. However, I argue that, by studying contemporary political economy with Marx alongside us, the fundamental continuity within the logic of capitalism and the structure of the labor process must be recognized.

### **Marx's Theory of Machinery in *Capital***

Marx devoted the lengthy chapter 15 of *Capital* (chap. 13 in the Dietz German edition), "Machinery and Large-Scale Industry," to the impact of machinery and mechanization on the production process. As Heinrich (2013) notes, this was not a great or unique insight in and of itself. Rather, Marx's interpretations of mechanization are of interest. In this chapter, Marx (1985, 449) sought to surpass the "crude" formulations of the mathematicians, engineers, and English economists who, in their theories of the machine, went in circles defining the machine as a "complicated tool" and the tool as a "simple machine." To address this undertheorization, the fifteenth chapter has an ambitious scope, providing not just a generalized abstract account of the machine in capitalism (similar to earlier chapters) but also a historical account following the progression from simple tools to the machine system and its effects on the labor process, on workers themselves, and so on. While the conjuncture we seek to understand surpasses the historical and technomechanical era within which Marx worked, "Machinery and Large-Scale Industry" contains several aspects that can be adapted for a study of the contemporary machine system.

Key to Marx's theory of the machine (as opposed to the simple tool) is an understanding of its three components. In Marx's (2018, 393) view, a machine has "three essentially different parts, the motor (*Bewegungsmaschine*), the transmitting mechanism (*Transmissionsmechanismus*), and finally the tool or working machine (*Werkzeugmaschine; Arbeitsmaschine*)." The motor provides the "motive-power" and acts as the "driving force of the mechanism as a whole," and then the transmitting mechanism "regulates the motion, changes its form where necessary, as for instance from linear to circular, and divides and distributes it amongst the working machines"; each machine then seizes "on the object of labor and modifies it as desired" (Marx 1990, 494). Using the motor and transmission mechanism to harness the working machine, the machine can therefore perform similar tasks to those manual workers had formerly completed with similar tools.

The advantage of machines over human laborers comes from the scalability of machine production. While the number of working tools a worker can use is limited by their own "bodily organs," the machine can operate at a faster pace

using “a combination of different tools.” These machines, thanks to the coordination of the motor and transmitting mechanism, can then be combined to have many machines all operating within a single production process. As Marx (1990, 500) notes, “All the machines receive their impulses simultaneously, and in an equal degree, from the pulsations of the common prime mover, which are imparted to them by the transmitting mechanism.” The production process is in this way mechanized through the *cooperation* of machines.

Yet Marx (1990) does not see the cooperation of machines as the end point of the mechanization of production. This position rather belongs to the “machine system” created by a production process involving “graduated processes carried out by a chain of mutually complementary machines of various kinds” (501). As a machine system develops, the coordination allowed by the transmitting mechanism becomes increasingly important to production (503). This coordinated system of machines restructures the production process and orients it around the chain of machines necessary to transform raw materials into the desired product.

This restructuring of the production process has significant effects on the role of labor within large-scale industry. The machine system creates an “entirely objective organization of production” that “confronts” workers as the logic of machine processes rather than workers’ subjectivity now shapes the labor process (Marx 1990, 508). Workers become the “living appendages” of the machine system (548), as labor is used to “aid” the movements of machines where they cannot be fully automated (502). This is the basis of the real subsumption of labor. Despite machines being built by labor, they “take on the appearance of its masters” (1055). Mau (2021, 35) correctly observes that Marx’s conception of power is not just attributed to individuals and class but also to “things and social forms,” such as machinery. Machines, through their fundamental position within large-scale industry, shape the role of labor and direct its activities within production.

This change of position within the labor process led Marx to view the nature of workers as being transformed. In contrast to the “particularism” of the wage labor of manufacture (Starosta 2013, 239), the machine system shapes a *universal worker*, able to work anywhere within the system. Yet this did not mean that capitalism would not discriminate in whom it would employ. As Marx (1990, 545) wrote, “There appears, in the automatic factory, a tendency, to equalize and reduce to an identical level every kind of work that has to be done by the minders of the machines, in place of the artificially produced distinctions between the specialized workers; it is natural differences of age and sex that dominate.” The deskilling of labor simply means that capitalists can decrease the amount of variable capital expended by hiring from social groups that can be paid lower wages. In Marx’s day this took the form of child labor, but this tendency of capitalism did not disappear with the passage of child labor laws.

A small but interesting section of Marx’s chapter discusses the impact of this change in the demographics of labor on employment and the purchase of labor power. Marx (1990, 519; and see Marx 2018, 417) argued that “machinery also

revolutionizes, and quite fundamentally, the agency through which the capital-relation is formally mediated [*die formelle Vermittlung*], i.e. the contract between the worker and the capitalist.” With their children being sent off to work, workers themselves become like slave dealers (Marx 1990, 519), selling their children’s labor and receiving their wages as profit. For the purposes of this essay, the practice of child labor is not of importance itself. Perhaps for today the most useful piece of analysis within this section is Marx’s recognition that, as capital seeks to employ different demographics to cut wage costs, the “formal mediation” of the capital relation or, in simpler terms, the form of the contract also shifts to accommodate and expedite this process. We can see a similar shift today with the rise of contracting and “false self-employment” (Thörnquist 2015; Kösters and Smits 2020). Not just labor itself but also how that labor gets performed are shaped by the needs of the machine system.

It is worth noting that chapter 15 is not the first introduction in Marx’s economic writings of the concept of a machine system. In the “Fragment on Machines,” drafted during the winter of 1857–8 and published within the *Grundrisse* by the Marx-Engels-Lenin Institute in Moscow from 1939 to 1941, Marx (1993, 692) noted how “the means of labor passes through different metamorphoses, whose culmination is the *machine*, or rather, *an automatic system of machinery ... set in motion by an automation.*” He observed the very visible tendency of the mechanization of the process of capitalist production but was unable to justify that tendency within the logic of capitalism—that is, the production of surplus value—because he had not yet grasped the importance of relative surplus value.

Instead, Marx (1993) emphasized a perceived contradiction taken from the empirical evidence. He noted that “direct labor and its quantity ... is reduced ... compared to general scientific labor, technological application of natural sciences, on one side, and to the general productive force arising from social combination.” From this, he concluded that “capital thus works towards its own dissolution as the form dominating production” because labor time is no longer the measure of wealth (700). In other words, Marx believed that the automation of production would lead to the collapse of capitalism as a system of production.

In chapter 15 of *Capital*, Marx studied the same developments of the machine system but was able to interpret these in the context of the production of relative surplus value. An increase in productive power leads to a reduction in the value of labor power and thus to necessary labor time. The role of science in “the service of capital” within large-scale industry is seen as merely “completing” this process of the development of the production of relative surplus value that begins with simple cooperation (Marx 1990, 482). This shift is useful for attempts to highlight how the mechanization, and now digitization, of the political economy has not surpassed (or reverted) the capitalist mode of production. For these reasons, I base my discussion of the algorithm as a machine system on Marx’s formulations within volume 1 of *Capital* rather than his earlier, albeit still influential, interpretations from the *Grundrisse*.

This is not a full exposition of Marx's theory of machinery, of course. Even within chapter 15, he continued to talk about various related topics such as the Factory Acts, the education of workers, the mechanization of agriculture, and so on. These sections mostly deal with the effects of the machine system's rise, not just on industrial production but also on capitalist life as a whole. For the purposes of this essay, only Marx's theory of the machine and the rise of the machine system are directly relevant. I will therefore present the development of digital platforms and their role within the circulation of capital by adapting Marx's theory of the machine system.

## The Rise of Digital Capitalism and the Platform

Production has only continued to increase its mechanization and, indeed, its automation since Marx's day. Alongside current discussions about the future of human work and its predicted abolition through technology (e.g., Srnicek and Williams 2016; Bastani 2020), predictions of the automated factory and related social strife were also made in the 1930s, 1950s, and 1980s before reemerging in the postdigital 2010s (Benanav 2020; Jandrić and McLaren 2020). Now, however, rather than just machines further automating the factory, labor is confronted with an objective production system based upon big data and artificial intelligence.

Particularly within heterodox or Marxian literature, the term digital capitalism is often used to define this conjuncture. This shared vocabulary, as happens with more than one Marxist theory, hides a disagreement around what it means for capitalism to be digital. For Schiller (1999, xiv–vi), digital capitalism is a historical “epoch” within which digital media forms “the central production and control apparatus” of a global capitalist market system. However, Pace (2018, 262) argues that digital capitalism is “neither a structural totality nor a historical period” but rather capitalism's “complex actualization in digital processes.” A similar position is taken by Sadowski (2020, 50), who focuses on “the operations of capital ... adapting to the digital age,” and by Fuchs (2019, chap. 5). This essay uses Pace's definition as an operating principle, as I highlight how the role of machinery systems within capitalist production is maintained despite a shift from physical to digital or informational production processes.

Given the broad nature of how digital technologies can be implemented within capitalism, much of the existing scholarship looking at digital capitalism has sought to supplement and further specify digital capitalism. To achieve this, other adjectival “capitalisms,” such as surveillance capitalism (Zuboff 2019), bio-informational capitalism (Peters 2012), digital ID capitalism (Hicks 2020), and algorithmic capitalism (Bilić 2018) are often specified. I specifically look at *platform* capitalism in this essay, a field of analysis focusing on a type of data-driven digital infrastructure known as the platform. Digital platforms are a particularly

important area of digital capitalism to research due to their significance in all areas of our daily lives. For example, we may connect with our friends on Twitter, study via Moodle, shop on eBay or Facebook Marketplace, and travel or work using Uber. Despite the different aim of each of these platforms, they all use digital networking technologies and exchange of data to make a desired connection.

In *Platform Capitalism*, Srnicek (2017, 43) defines platforms “at the most general level” as “digital infrastructures that enable two or more groups to interact. They therefore position themselves as intermediaries that bring together different users: customers, advertisers, service providers, producers, suppliers, and even physical objects.” This relies on concentrating big data through the platform and processing that data in a useful way for would-be users (Marciano, Nicita, and Ramello 2020). Depending on a firm’s business model for a particular platform, this data is used in various ways, from delivering personalized advertisements to hiring labor.

These operational structures have led to various attempts to classify digital platforms within political economy. The neatest of these comes from Boyer (2021), the Parisian regulation theorist. He divides digital platform business models based on their source of profit: either revenue from advertising and indirect marketing access to data collected from an immense number of users able to access the platform free of charge (e.g., Google or Facebook), or those relying on margins from sales (e.g., Amazon or Uber). Microwork is explicitly absent from Boyer’s analysis, though it could be included within the latter category.

Sadowski (2020, 61) argues that platforms are “new landlords” that function as rentiers through the conversion of utilities into “services” for which they can charge access rights. Other classification schemes for digital platforms tend to focus on the category of the service provided. Gnisa (2022, 280–1) separates platforms into four categories: the gig economy platform, the microtask platform, the creative platform, and the social media platform. Similarly, Srnicek (2017, 49) delineates platform firms into five different categories: the advertising platform, the cloud platform, the industrial platform, the product platform, and the lean platform. Among these platforms are those offering “humans as a service” (Irani 2015; Prassl 2018)—that is, labor power for hire on a flexible basis mediated through the platform.

As Langley and Layshon (2017, 13) note, this service-based model is not specifically focused on production but is rather a “new form of digital economic circulation” aimed at selling access to services. Growth of the digital economy occurs largely through avenues focused on realizing value through “distributive forces” (Pfeiffer 2022, 141). Given the importance of promoting platform use, this business model has high “pure costs of circulation” (Marx 1991, 403), counterbalanced by the scale of its operations and user base. In volume 2 of *Capital*, Marx (1992, 284) wrote that “a machine, as the product of the machine-builder, is commodity capital for him, and as long as it persists in this form, it is neither fluid nor fixed



capital. When sold to a manufacturer who puts it to use, it becomes a fixed component of a productive capital.” But this is not the case in capital circuits within the platform economy. For the Big Tech firms that operate most platforms, the architecture and technology of their machine systems remain productive capital and do not enter circulation. Access to the services such systems provide is sold as a commodity, often on a monthly or yearly basis.

Despite these differences in how digital platforms act within the circulation of capital compared to machines in Marx’s day, I argue that digital platforms can be seen as a machine system of the twenty-first century. Given the significant technological advances that have occurred since the publication of *Capital*, it would be an oddity to see machines performing identical functions as in the 1860s. In fact, given the historicist presentation of the development of the machine system that Marx provides in chapter 15 of *Capital*, I would argue that Marx fully expected the technical and economic nature of the machine system to continue to develop. And while digital-labor platforms cannot be seen as the only contemporary machine system, they increasingly play a significant role in contemporary capitalism.

In contrast, Gnisa (2022, 219) argues that digital platforms cannot be seen in this manner because, rather than engaging in the immediate production process, they manage the “coordination of producers.” He views platforms as an “allocative means of production” that allows for the allocation of tasks, resources, and capacities, and therefore platforms are “fundamentally different” from the industrial machine system. In other words, because they do not participate in production themselves but allocate the means necessary for production to occur, platforms perform a different role in the circulation of capital than the machine systems of industrial production as discussed by Marx.

I would argue, however, that the machine system of large-scale industry also plays a fundamentally allocative role that allows for, and indeed requires, a specific form of labor-performing task required to augment the machine system. In Marx’s (1990, 508) words, “The co-operative character of the labor process is in this case a technical necessity dictated by the very nature of the instrument of labor.” The delocalized nature of digital networks simply changes the form of this cooperative character of labor in a way that preserves cooperation from a systemic perspective while labor seems entirely individualized from the position of individual workers.

This contradictory character of platform labor is reconciled through the worker-oriented applications and websites that platforms operate. These working machines of the platforms are the interfaces through which platform workers can access the machine system within which they work. One can drive around the city for hours and not find a single passenger requesting an Uber unless one is registered and active as an Uber driver. Furthermore, platforms such as Uber intentionally design their worker-facing apps to encourage drivers to work more often and for longer hours than they may have otherwise planned (Vasudevan and Chan 2022). Depending on the situation, the app may display text such as “SURGE PRICING,” indicating a time-sensitive pay boost;

Type of Work Arrangement	Dimensions of Work Arrangements				
	<i>Who is the de jure employer?</i>	<i>Who is the de facto employer?</i>	<i>Is continued employment by de jure employer assumed?</i>	<i>Is continued employment by de facto employer assumed?</i>	<i>Who directs the work?</i>
Day Labor	Organization A	Organization A	No	No	Organization A
Temporary Help Agency	Agency	Organization A	Sometimes	No	Organization A
Contract Company	Contract Company	Organization A	Yes	No	Contract Company
Independent, Contracting, Self-Employment	Self	Client(s)	Yes	No	Self
Platform Work	Self	Organizations A, B, C ... (through platform)	Yes	No (But assume platform access)	Algorithm

**Table 1.** Characteristics of Nonstandard Work Arrangements. Adapted from Kalleberg (2006, 138).

“ARE YOU SURE YOU WANT TO GO OFFLINE? Demand is very high in your area. Make more money, don’t stop now!”; and “YOUR NEXT RIDER IS GOING TO BE AWESOME! Stay online to meet him” (Rosenblat 2018, fig. 19–21). In this way, platforms’ worker-facing apps, as a digital form of the working machine, are still able to pressure workers in a particular manner despite the supposed flexibility of gig work compared to industrial production.

The allocative functions of digital platforms allow labor power to be hired and labor to then be performed. Platform workers toil and are indirectly paid by the end users, the third party in the “triadic” work arrangement of digital-labor platforms. Yet the platforms play a more significant role in this process than just connecting parties, as the above messages from Uber highlight. Platform workers are not just directed by their clients but are also “subordinated” by the digital platform itself (Wood and Lehdonvirta 2021, 1369). While platforms play an allocative role, they are not neutral. Platforms’ rentier business models give platforms the ability to appropriate the surplus labor of workers operating within them despite the fact that no formal ties of employment exist.

Referring to Marx, digital-labor platforms have changed the “formal mediation” of the work arrangement to accommodate both their allocative role and the rentier business model. Many comparable features to platform work can be found in similar, more traditional though nonstandard “offline” work arrangements. In table 1, I compare the characteristics of platform work with Kalleberg’s (2006) work categorizations: day labor, temporary help agency, contract company, and self-employment. Excluding platform work’s classification as self-employment—one of the main challenges for both union and regulatory efforts—the main novelty of platform work can be seen as its use of an allocative machine system to facilitate the labor process on a global scale and with maximum levels of precarity.

Lying between the tech companies that operate platforms and their end users are the algorithms that connect these relatively small companies and their backends to the often globally distributed end users. These algorithms are the regulatory regime of digital platforms (Yeung 2018; Cristianini and Scantamburlo 2020; Ulbricht and Yeung 2022), and, using Marx’s terminology, they function as the transmitting mechanism between the two. The next section therefore discusses the vital importance of the algorithm as transmitting mechanism for an understanding of the machine system of digital platforms.

## The Algorithm as Transmitting Mechanism

To revisit Marx’s (1990, 494) formulations in *Capital*, the transmitting mechanism has both a form, such as “fly-wheels, shafting, toothed wheels, pulleys, straps, ropes, bands, pinions and gearing,” and a function: it “regulates the motion, changes its form where necessary ... and divides and distributes it.” Understanding the algorithm as a transmitting mechanism requires comparing the similar

function—that is, the algorithmic regulation mentioned in the previous section—and not the form, which for digital platforms stands in stark contrast to the Industrial Revolution-era machines described by Marx.

The digital platform's function—to “monopolise, extract, analyse, and use” data (Srnicek 2017, 43)—places data itself as the form of the transmission mechanism. After all, computer code—from “Hello World” programs to the complex matrices that run Amazon Web Services—is data. The novelty of the platform's algorithm as a transmitting mechanism is that it does not run in a radial fashion via centralized factory control to individual work machines. Platform work involves “triangular” or “triadic” relations between the platform mediating the transaction, those workers being paid to work, and the end users paying for the work (Joyce 2020, 543). Therefore, the digital transmitting mechanism is dispersed around a network, connecting many end users to both the central servers and other end users. In this way the mechanism ensures “a top-down orchestration of bottom-up networking between producers and consumers” (Papadimitropoulos 2021, 250). This networking could not function without the algorithmic transmission of data.

This top-down transmission is not solely for connecting various parties, such as Uber drivers to Uber riders, but it also ensures the technology company itself benefits from the interaction. Algorithms function as normative tools, allowing the technology company to influence outcomes in service of its own business interests (Viljoen, Goldenfein, and McGuigan 2021). The need for platform workers to be seen favorably by the algorithm's review criteria (accuracy, high user rating, etc.) leads to the proliferation of “algorithmic lore.” This knowledge, which promises platform workers greater numbers of “hits” and therefore more work, simply teaches one how to best fit a platform's organizational strategies and business model (Bishop 2020). In this way, the objective organization of the platform machine shapes the nature of the labor process, yet unlike the industrial machine system, it does so subtly, using positive or negative sanctions to enforce normative behavior.

The platform machine system also uses algorithms to organize the labor process at a large scale: far beyond what one factory could achieve and with none of the face-to-face cooperation industrial production requires. The precarious nature of platform work means that platforms can employ “just-in-time” labor hiring (Vallas 2018, 48) whenever a client requires a task fulfilled. For gig platforms such as Uber, this can simply mean replacing a permanently employed taxi driver with Uber's “pay-by-the-ride” business model. Click workers or microworkers, however, face an even greater subordination as the “living appendages” of the machine system. Just as Marx's workers only acted to support the industrial machines, platform workers are tasked with supporting the algorithm when artificial intelligence cannot act alone. In typical corporate speak, Amazon calls this a “hybrid machine/human computing arrangement” (Jones 2021, 32). The domination of the platform machine system is so totalizing that clients know nothing

about who is working for them within it, just as they are often unaware of the purpose or end use of their own tasks (Tubaro, Casilli, and Coville 2020, 10). Workers are only brought into the system to augment and support the functioning of the platform, and they appear to clients on the other side to exist below rather than alongside the algorithm.

The algorithm also operates as a reverse transmission mechanism, feeding information about its workers back into the system. For example, Uber tracks a wide range of information relating to driver behavior and telematics, gathering data on how drivers are braking, accelerating, and speeding (Rosenblat 2018, 139). Jamil (2020, 241) has dubbed this surveillance system an “algoticon” in which the “all-seeing” algorithm replaces the central watchtower of the traditional physical panopticon. The lack of formal employment protections means that platform companies face very little restriction as to the disciplinary use of this data. This control mechanism is reinforced using so-called compliance-based agreements such as end-user licensing agreements (EULAs) rather than employment contracts (Sadowski 2020, 56). Based on the “objective pretenses” of the algorithm (Jones 2021, 52), data such as client satisfaction can be used to restrict or close worker accounts, preventing them from further work within the platform. Like the gig economy of early industrial capitalism (see Holgate 2021), the gig economy of platform capitalism provides precarious, insecure work, but now even the supervisory functions can be brought within the machine system.

This unprotected, insecure form of labor leads to a significant growth in the relative surplus population. Dyer-Witford (2015, 188–9) notes how the expansion of the platform economy creates the “moving contradiction of the induction of the global population through networked production and their redundancy through algorithms.” Platform workers are part of the “floating surplus population” (Marx 1990, 794), enabled to intermittently work on platforms but with no promise of the continued availability of work, despite the promises of Silicon Valley’s ideologues. This is highlighted by research showing that those with standard employment are less likely to do platform work than precarious workers. Furthermore, 22 percent of platform workers had no other form of employment or work outside of digital platforms (Piasna, Zwysen, and Drahoukoupil 2022, 35). The nature of the algorithm allows for both a rise in the relative surplus population and, when needed, temporary work to complete tasks that the algorithm cannot achieve on its own.

## Conclusion

Unlike the beginning chapters of *Capital*, Marx’s discussion of machinery and the capitalist mode of production has a clear sense of historical movement. Chapter 15 follows the increased mechanization of the labor process as it moved away from manual labor using simple tools or instruments through increased complexity of

individual machines able to replace these tools in the machine system of the factory. As this process happened, machines confronted workers as the objective process and condition of production. Labor became increasingly pigeonholed, supplementing machinery where technology found itself unable to operate autonomously.

This movement of increased mechanization and, indeed, the automation of production has only intensified since Marx's passing, with the rise of electronic, microelectronic, and digital technologies within the production process and everyday life more broadly. Rather than leading to the shortening of the working day and other beneficial changes that could arise from the great increase in productive power, digitization has enabled an immense expansion of the machine system. Labor can be coordinated by machines in the interest of capital not just within one plant but worldwide, with click workers and gig workers from the Philippines to Portugal all working within the same platforms. This expansion of the machine system has also led to the rapid expansion of the relative surplus population and of deskilled insecure work.

Recognition of the comparability between Marx's analysis of the machine system of production and the features of the contemporary algorithmically regulated platform economy is important not just for the analysis and critique of present-day capitalism. This recognition also attempts to challenge capitalism's foundations and to achieve socialist transformation. Important questions of political strategy remain, such as can the heavily atomized platform proletariat still form a "class-for-itself" and act as a political movement? Yet recognition of the fundamentally capitalist nature of the digital platform economy allows for the potential of a revitalized workers' movement and socialist strategy for the twenty-first century in a way that theories such as that of technofeudalism, seeking to separate the present conjuncture from the capitalist mode of production, are unable to achieve. While charting a path forward is not easy, this at the very least allows us to know where we stand.

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