

Bridging the gap between critical algorithm studies and the social sciences: the case of platform work

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Since the mid-2000s platforms and platform work have greatly proliferated. Although also research on platforms and platforms has expanded, there seems to be a great gulf between IT- and social research on these issues. In this article, I show, using sociologist Maurizio Lazzarato's concepts, that the technical infrastructure of the platform, in particular the algorithm, has a direct impact on work and the agency of the platform worker. From this perspective, it is possible to ask critical questions about platforms and platform work from a multidisciplinary viewpoint. Methodologically, an ethnographic approach that sees algorithms as part of culture, with its own institutions, impact on people and intersection with different contexts, could support co-operation between different disciplines. When such an approach is combined with insights from algorithm studies, research is also relevant for existing political questions regarding platform workers' labour market status and the functioning of platform firms.

Keywords: platform work, Maurizio Lazzarato, critical algorithm studies, interdisciplinarity



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Introduction

Platform work is a form of work that features complicated technological components as well as human components. Following ILO (2021), platform work is work undertaken on digital labour platforms. These “facilitate work using “digital technologies to ‘intermediate’ between individual suppliers” (platform workers and other businesses) and clients, or directly engage workers to provide labour services.” Broadly, the literature distinguishes two categories of platform work: *online web-based platforms*, where “tasks are performed online and remotely by workers and are allocated to a crowd” and *location-based platforms*, where “tasks are performed at a specified physical location by individuals” (ILO, 2021, p. 31).

Based on these features, research on platforms and platform work intersects many fields. The theoretical basis of platforms is based on the study of multi-dimensional markets. Theoretically, as Rochet and Tirole (2003) have argued, all platforms seem to have the form of two-sided or multi-sided markets (Autor, 2001; 2013; Kenney & Zysman, 2016). Platforms are constructs/technologies that connect two diverse sets of clients that have a mutual benefit through being connected. In social research, studies frequently discuss working conditions, characteristics of platform workers and other labour market issues (ILO, 2021; Drahokoupil & Fabo, 2016). The contracting out of work through platforms has spawned its own literature on the meaning of platform work in terms of labour law and employership (Prassl, 2015; De Stefano, 2016). Other authors have focused on classifications of platforms, either from the point of assets and labour (Balaram et al., 2017) or what the platform does (Srnicsek, 2017; Schor & Fitzmaurice, 2015).

Van Dijck (2020) uses the metaphor of the platform tree (American, European and Asian varieties) to reconceptualize issues of governance, which relates to many of the features above. Platforms exist in an interdependent ecosystem of applications and hardware. The social scientific literature on platforms and platform work frequently mentions the role of information technology, but far less often engages with its implications or how to incorporate technological aspects into research. The technological aspect of platforms fundamentally changes the nature of work through platforms. It is important that scholars of platforms work are aware of what platforms do and what the embeddedness in certain technologies means (Gran et al., 2020). Furthermore, De Reuver et al. (2018) argue that the discussion of platforms should be precise, because there is a diversity of platforms with different boundaries, units of analysis and technical scope.

Against this background, platform work scholars could acknowledge to a greater extent what the platform does and how it connects the different users and clients (Andersson Schwarz, 2017). The main contribution of this article is to show an approach to platforms and platform work that enables such a stance. This approach requires collaboration of social scientists and algorithm scholars, since the fundamental technologies behind platforms seem to necessitate a renewed view on work *through* platforms. Enabled by IT innovations, platforms are software-based and as such have their own emergent properties (Rodriguez & Piccolo, 2020; Andersson Schwarz, 2017). All these layers of code and their interaction with the political economy indicate that studying platform work is complicated because of the emergent properties of these platform environments (Andersson Schwarz, 2017, p. 378).

I argue that the work of Italian sociologist Maurizio Lazzarato provides a fruitful way to critically engage with work through platforms. This way the role of the technology can be explicitly incorporated into the working subject. Lazzarato argues that technology has the capacity to produce subjectivities. Humans have so-called “social subjectivities”, which mean parts of their identity are constituted through social norms. Examples are gender, the distinction between employed/unemployed, employee/employer, migrant/indigenous person etc. These social subjectivities, especially regarding work and social security, are strongly impacted by institutional norms and policies. On the other hand, also technology can produce subjectivities. As Lazzarato argues, this “machinic subjugation” produce subjectivities that are no longer dependent on social subjectivities. This happens through what he calls “asignifying semiotics”, by which he understands technology, code, machines. These transform humans into parts of the platform assemblage as muscles and synapses to reconstitute flows of digital information into human action. As I will show, platform work heavily relies on these asignifying semiotics, which therefore has significant implications on how to study platform work. Building on this re-interpretation of platform work, I show that platform work benefits from a multidisciplinary approach to research.

It is not sufficient to only study people who have done platform work, because the nature of acquiring platform work includes various interfaces and systems of competition, which therefore also exclude people from working the gig (such as gaming and pricing systems; Morschheuser et al., 2018; Oppegaard, 2020). Platform work research should incorporate at least the consequences of the technological side of platforms to be able to ask critical questions. I primarily use insights from information technology studies in combination with Lazzarato’s concepts to show why platform work is different from regular work. The content of platform work (transport, cleaning, coding etc.) is left out in

this article. The focus of this article is mostly on the platform as a certain kind of market device (Callon et al., 2007). In using these examples in conjunction with Lazzarato's work, I construct the reasons why multidisciplinary research is especially important here.

Work as a subjective activity

Work is an eminently social activity, which is shaped by technology, organizations, norms, interaction and reflexivity, preferences, and historical developments (Vallas et al., 2009, pp. 9–16). The framework posited in this article necessarily leaves out other interpretations of “the social”, even when limited to the case of work. Lazzarato's view of social reality as shaped by social norms, culture, and legislation, which in his framework produce individual's (social) subjectivities can appear provocative. Nonetheless, for example Harrison C. White (2008), Jean-Philippe Deranty (2010) and Jacques Rancière (2000) have argued similarly that individuals are shaped by society and its norms and are not atomistic actors. This seems particularly apt regarding work, as it is one of the most heavily regulated spheres of society. Especially White's social network approach could be seen as complementary to Lazzarato's, as he also stresses the control social ties have on the social subject (i.e. other actors shape a person's agency). In this sense, Lazzarato's approach is eminently realist, as it focuses on relations between technology and humans. However, this is not to argue that social subjectivities follow deterministically from social norms: as e.g. White (2008), Bauman (1992) or Bourdieu (1984) show, social subjectivities are shaped by various multi-level processes, in which these are reflexively formed in a dialogue with other actors in society. Lazzarato's point is that technology has the potential to by-pass or discard these processes by producing new subjectivities. In his view, this potential is furthermore essential to capitalist modes of control.

In short, platform work is very complicated to study, because the various sides of the platform interact with the platform algorithm and this algorithm generates gigs, which in the end a human performs. The rest of the article expands each of these arguments. In the next section I introduce the basic ideas of Lazzarato's view of subjectivity and his core concepts. I also discuss critical algorithm studies that show similar issues from within a different field. The third section expands the argument of complexity of platform work, including their emergent properties, the multi-sided market, and the relation with social norms. In the final section I discuss the methodological implications of the previous sections and focus on ways to study platform work that incorporate these ideas.

Platform work reconsidered: Lazzarato and algorithm studies

In this section, I introduce Lazzarato's concepts and how they could be related to recent work in algorithm studies. I argue that these two diverse points of departure are mutually compatible, and Lazzarato's concepts can be used as a bridge between social scientific research on platform work and the more technical approaches of algorithm studies.

Lazzarato's Signs and Machines

Lazzarato's main work regarding this article is *Signs and Machines* from 2014. This study is in a sense a dialogue with Foucault's and Deleuze and Guattari's work. Although in some ways dense and theoretical, it is perhaps surprisingly praxis-oriented. His core concepts are *asignifying semiotics*, *social subjugation* and *machinic subjugation*. In this section I show what these concepts mean and how they can be related to algorithm studies.

Christiaens (2016) provides a concise overview of Lazzarato's main idea: in capitalism, there is a kind of two-fold subjectivation of people. First, social subjectivation produces the general subjectivities of society through existing norms and regulation, e.g. people are divided in men and women, various classes, debtors and creditors, and employed and unemployed people. These societally based subjectivities form the basis for people's identity in society (for a similar but methodologically different approach, see White, 2008). People can accept the social subjectivations or they can rebel against them in any way (Rancière et al., 2000).

In short, Lazzarato states that humans in societies have a subjectivity through processes of social subjectivation. This means that society, through norms, laws and culture assigns subjectivities on people, that are the basis of their (social) identity, or as White (2008) would say: how they are embedded in society. Note, however, that this should not be confused with the subjective experience of people – Lazzarato's point is how people are socialized into society in various roles. These social subjectivities are often, but not always, binary: for example male/female, employed/unemployed, entrepreneur/employee, atheist/religious and so forth. Besides this form of subjectivation, a specific form of subjectivation occurs in capitalism. Borrowing a term from Guattari, Lazzarato calls this "machinic subjugation", which essentially denotes that humans are stripped of their social subjectivation and become a part of technology. In capitalism older forms of subjectivation, such as social status based on birth, are discarded. In the context of capitalism, work is not

an individual endeavour but rather humans are part of an interaction with organizations and technology in order to produce products or services. The main point is, to a large extent, that humans don't have a social identity but only their identity as e.g. an employee of a firm, to which other characteristics of that person do not matter as long as they fulfil that role well.

Christiaens (2016, p. 3) gives a simple example:

a car driver does not consciously decide how to act. The car does not demand the individual's whole mental investment, but instead uses those parts of the driver's body necessary for the act. Dashboard signals stimulate automatic reactions from the driver. The driver and the car merge into a single assemblage of machinic parts connected to each other.

The point is that from the perspective of the activity of "driving a car" it is not necessary to take recourse to a subject-object division, but rather here the driver-car assemblage is ontologically at the same level, i.e. should be considered as a (temporary) whole. Christiaens (2016, p. 3) continues:

some of his body parts function as nodes of input and output to make the human-machine work. The car as human-machine is an assemblage of parts communicating commands to each other through all kinds of asignifying semiotics (electric currents, dashboard lights, nervous impulses, muscular movements, etc.)

The human body, or at least parts of it, function as nodes of input and output, to receive and send information. Christiaens (2016, pp. 7–9) indicates, how Actor-network theory-based analyses differ from Lazzarato's critical interpretation. A main difference is the issue of control and responsibility: the idea of machinic subjugation helps to understand how humans' control is diminished when the technology only provides the information on which the human can act. The recent accidents with Boeing's 737 Max are illuminating: the pilots acted on the information the guidance systems provided them, while the meaning of the information (and the required reaction) from the system had changed.

Nonetheless the biggest difference between ANT and Lazzarato is the incorporation of the *goal* of the assemblage. This may be mundane, as in the case of driving a car (leaving aside the possibility of a human-car assemblage, in which the human is a fleeing armed robber). But like in Christiaens' (2016) example of the financial markets, platforms have distinct goals. As van Dijck (2020) showed, most platforms, especially the "twigs and branches" of sectoral

platforms and apps predominantly privately owned. These have for-profit goals and sometimes actively espouse an ethics of disruption towards existing regulation (Spicer et al., 2019; Duggan et al., 2020; Koutsimpogiorgos et al., 2020). In this context, it is highly relevant to understand how (and why) platform apps generate gigs and how platform workers (and platform users) become nodes of the assemblage through which information flows and parts communicate.

The relevant concept for this understanding is what Lazzarato calls “asignifying semiotics”. Lazzarato (2014, p. 80) argues that technology, as machinic subjugation, often exhibits so-called “asignifying semiotics”, meaning signs that confer meaning and “act”, without there being human-machine interaction/communication. These signs do not involve consciousness (as they reside in the technology) and do not represent anything that could (or should) be translated into language. As examples he mentions stock market indices, currencies, mathematical equations, accounting, and computer languages (2014, p. 39).

The example of computer languages as a form of asignifying semiotics is relevant for the study of platform work. Using a perhaps simplistic phrase, Lessig (1999) talks of “code is law”. Social systems are (also) regulated by code. The idea of asignifying semiotics nonetheless goes beyond this idea, because “code is law” still supposes the human is subject to various forms of regulation. Asignifying semiotics on the other hand assumes that the human is part of the assemblage in which the code produces output and requires input. This input is provided by the human being, in the form of nervous impulses and muscular movements and creativity (Christiaens, 2016, p. 3).

Algorithms and asignifying semiotics

Lazzarato’s work can be termed Critical Theory, and as such it poses a critical consideration of the capitalist mode of production. Christiaens (2016) attempts to show how the use of asignifying semiotics can be subverted in the case of the financial markets. One example is The Yes Men, whose actions caused the share price of Dow Chemical to fall. In this case, the financial market (as an assemblage) was fooled by false inputs – news (language) was translated into actions, which translated into asignifying semiotics (share prices) that in turn caused other actions. Although the interpretable result of this was the share price going up or down, the events in the financial market algorithms are not transparent, as Christiaens (2016) also explains. The traders react to the data that come out of the algorithm.

In this context, it becomes useful to ask how to study algorithms. Lee and Björklund Larsen (2019) discuss the intersection of algorithm research and social science. They note that due to the omnipresence of algorithms in platforms, social scientists are more and more interested in them, because it is evident that algorithms are entwined with normativity. In their article, they posit that in the literature on algorithms one can discern five ideal types of studying algorithms. The first ideal type relates to looking at the algorithm itself and studying how normativities are coded there. Algorithm studies show what can be known about algorithms. Seaver (2019) states that algorithms are tricky to study. Tricky, in this sense, means that a common view supposes algorithms can be known if one has access to the algorithm as well as expertise to understand them. This is a misguided approach because knowing the algorithm by looking at what it is doing produces at most partial, contingent, and temporary knowledge (Seaver 2019, p. 413). The use of an algorithm means we are often using an algorithm which is tailored for us. Firms that create the algorithms are often experimenting with different varieties for different strata, even a group of researchers cannot reveal knowledge about “the” algorithm. This is true because the code of the algorithm tends to change often and through different employees. Complicating matters further, “looking under the hood” means we assume there are firm experts that know what we want to know. Seaver (2019) argues this is a mistake because algorithms are often sufficiently complicated, that their effects cannot be fully predicted. Their complexity also arises from the fact that they are commonly collective work. Algorithms are thus a prime example of systems with emergent properties – both in themselves and with their effects on the outside world.

A slightly similar approach, although concerned with the issue of Big Data is Kitchin (2014). He argues that data are situationally produced by algorithms, so that the analysis of the data can help understand the algorithm, provided the structure of the source (platform or algorithm) is known. Therefore, Kitchin’s work is situated between a pure algorithm knowledge approach and a pure algorithmic effects approach (the second ideal type).

The second ideal type Lee and Björklund Larsen (2019) mention is the diametrical opposite of the first: studying how the algorithm affects in practice. It turns out there is a growing strand of literature that employs ethno-methodological analyses to understand how algorithms affect the construction of realities. The emphasis in these studies is on the meanings of the algorithms in each practice. For example, Ziewietz (2016) shows how in this kind of study algorithms become a figure to sensitize the researcher to specific issues. Lee and Björklund (2019) argue that this approach risks omitting the relevance of the technical aspects of the algorithm. The third ideal type is based on ANT and

focuses on the entwining of humans and algorithms. Lee et al. (2019) approach the effect of algorithms on reality as “folding”, processes which relates things that were previously unconnected (data, methods and objects with multiple ethical and political effects) into generalizable and/or normalizable observations. According to Lee and Björklund Larsen (2019) this method can be criticized as being apolitical as it ignores the political effects of the algorithm.

The fourth ideal type is focused on politics of infrastructures and classification, and how these “torque” the lives of people. Lee and Björklund Larsen (2019) mention the example of classification of worthy recipients of donor kidneys and how such an algorithm and its negotiation by hospital staff produces normativities. This approach is also connected to research on the racist effects of algorithms, which unintentionally reproduce existing racist structures based on the data that is fed to them for training (Sandvig et al., 2016). Lomborg and Heiberg Kapsch (2020) show how this idea can be further developed using communications theory, in order to decode how people engage with algorithmic processes. The fifth ideal type relates to reflexive understanding of social scientists’ own normative assumptions towards algorithms. Grosman and Reigeluth (2019) furthermore show that there are at least three different normativities at work in algorithmic systems: technical, sociotechnical, and behavioural. They state that rather than studying the normativities as such, the tensions between these normativities should be studied in order to potentially find out why some normativity dominates others.

This discussion of algorithm studies barely scratches the surface, but the possible connections to Lazzarato’s concepts should be evident. Although he talks about computer code and technology only in general terms, it is clear that there is a clear relation to some of the approaches mentioned by Lee and Björklund Larsen (2019). The third and fourth ideal types approach algorithms and humans as an assemblage, like Lazzarato. The ANT -approach is criticized in similar terms to Christiaens (2016). The fourth approach has a focus on engagement between humans and algorithms (preferred, negotiated and oppositional modes of engagement; Lomborg & Heiberg Kapsch, 2020). This is a possible point of connect with what Christiaens (2016, p. 11) explains as Lazzarato’s “existential pragmatics”. Asignifying semiotics produces utterances, and the human is free to adapt his/her “existential self-positioning”. This is close to the modes of engagement in Lomborg and Heiberg Kapsch (2020). Their article shows the possibilities inherent in engagement with the algorithm. The approach advocated by Grosman and Reigeluth (2019) seems close to Lazzarato’s asignifying semiotics. Normativities are nonetheless decidedly different than in Lazzarato’s position. In the latter case the technology

determines what the signs are on which the human acts (input and output), while in the former engineers infuse the algorithm with values, which can lead to the algorithm becoming norm-instituting.

What emerges from contrasting Lazzarato's approach with the algorithm studies discussed here, is that the issue of *agency* (both human and technological) is key. The added value of Lazzarato's approach is that it has a clear vision of how humans can be seen in the context of technology, e.g. as a node in systems, supplying input and output that a technology cannot. His approach also provides a way to understand (in particular) the disruptive characteristics of platform work. Before returning to the methodological aspects of platform work research, I discuss some essential aspects of platform work. In doing so, I will also return to the above-mentioned ideal types.

Platform work: multisided markets, complexities and machinic subjugation

In this section, I will discuss platform work only as people's services (Schor & Fitzmaurice, 2015). The ILO flagship report (2021) discusses location-based platform work which includes tasks (services) carried out in person in specified physical locations by workers, such as taxi, delivery and home services, domestic work, and care provision. A sample of recent platform work studies by social scientists reveals that they are indeed often concerned with platform workers for companies like Uber, Deliveroo, Helpling and Fiverr (e.g. Wells, Attoh, & Cullen, 2021; Gregory, 2020; Hannák et al., 2017; Jesnes, 2019; Veen et al., 2020; Timko & van Melik, 2021). These firms exemplify the idea of multisided markets: an assemblage of clients, platform workers and the platform infrastructure.

Multisided markets

The idea of multi-sided markets in practice is not new, but theoretically it is a recent advance in economic theory. Eisenmann et al. (2006) provide a concise overview of what these are in the context of platforms. They state that two-sided markets "provide infrastructure and rules that facilitate the two groups' transactions". Although there can be more than two distinct groups connected by these markets, the core effect is that "the platform's value to any given user largely depends on the number of users on the network's other side." (2006, p. 2). The literature on multi-sided markets is outside the scope of this article, but

these network effects are the core of a successful platform, be it a platform for videogames (Playstation) or service provision (Uber, Deliveroo).

The idea of the multi-sided market has a profound impact on how we can study work, as they provide infrastructure and rules that bring providers and consumers together (Eisenmann et al., 2006, p. 2). One could replace that phrase by “algorithm” or “asignifying semiotics” – as both provide the infrastructure and rules of the platform. Multi-sided markets facilitate transactions, which assumes money. Lazzarato explicitly mention money as a form of asignifying semiotics (2014; 2011; Christiaens, 2016, p. 5). Asignifying semiotics “construct a human–machine assemblage, or network” which is “organized by diagrams, or performative economic theories.” (ibid.) In multi-sided markets money is one instrument to connect the different sides of the market. Eisenmann et al. (2006) discuss pricing mechanisms, which are a crucial part of successful platforms. In labour research, the issue of pricing in platforms is often discussed (ILO, 2021).

Complexity

The discussion of algorithms and multi-side markets shows that platform work is complex in a technical sense. The distinction between social and machinic subjugation that Lazzarato (2014) identifies is relevant for the issue of complexity. The algorithm and theoretical construction of platforms (including matching and price-setting elements) can be included in the category of machinic subjugation.

However, the algorithm also produces subjectivities that have effects in the sphere of social subjectivities. The literature on the employment relationship studies the legal conditions of platform work. It is studied whether platform workers are employees. It is difficult to include these in categories of current labour law, because platforms produce new subjectivities. Prassl’s (2015) *The Concept of The Employer* is a major advance. Platform work happens in a triadic relationship between platform, user, and platform worker (Prassl, 2015; Jenum Hotvedt et al., 2020). On that basis, it can be argued legally, that platform workers are in fact employees, as the functioning of the platform and in particular the issue of supervision and control point towards “employership”.

The issue of control is closely entwined with algorithms (Norlander, 2021; Woodcock, 2020). Although the triadic relationship can be fruitfully studied to answer questions of employee status, it can also be argued that this is an attempt to bring platform-produced subjectivities back into the sphere of social norms. Through Lazzarato’s framework it can be seen why platform work is politically divisive and why it is disruptive in a fundamental sense: the idea

of machinic subjugation also casts a critical light on existing social norms of employment. The fact that algorithms can constitute an employer and produce subjectivities (e.g. an Uber driver) has an impact on how to see the employee relation also in the sphere of social subjugation. If a worker has an employee subjectivity through working on a platform, then this also has consequences for access to certain forms of social security. This also has consequences for the platform firm. However, the reconstitution through technology of a platform worker into an employee must engender a rethink of other forms of precarious work and on what (normative) basis they are included or excluded from social security. This view of platform work shows its complexity and emergent properties that clearly spill over to the real world. Legal studies on this issue, therefore, are quite close to the understanding of the relation between technology and individuals' subjectivity that Lazzarato presents.

Asignifying semiotics and machinic subjugation in platform work

In addition to the multi-sided market as coded in the platform algorithm, there are at least two other obvious asignifying semiotics at work: gig pricing and the platform as such that produces new subjectivities. The ILO (2021) report notes that it is the platform companies who unilaterally can set pricing mechanisms and labour conditions. These are important to study, but any new knowledge of algorithms will be partial, contingent, and temporal. Examples of such research are Marshall (2020), which shows that Uber at various points has changed its algorithm for the dynamic pricing of rides. Van Doorn (2020) discusses calculability in the case of the Deliveroo pricing algorithm, in the context of wage politics. Richardson (2020) discusses a similar "contingent pricing arrangement" for the UK division of Deliveroo.

Munn (2018) shows in detail how the Uber algorithm produces a new subjectivity, by transforming a human being into a large set of variables. This reconstructs the subjectivity of an Uber driver in a "a highly articulated understanding of earnings performance and product preferences" while leaving out or only sketching other aspects of the driver, thereby transforming him/her into "a generic driver, interchangeable with any other." As Lazzarato (2014, p. 27) writes: "Human agents [...] function as points of 'connection, junction and disjunction' of flows and as the networks making up the [...] assemblage." As Munn (2018) shows, platforms algorithms really do reconstitute humans into new subjectivities, in which they can be nodes in the flows of data and money.

Summarizing, the platform structure as a multi-sided market, its complexity (in terms of technology and social effects) and at least two other asignifying

semiotics are pressing reasons to reconsider the methodologies of platform research.

Methodological considerations

This article is not a systematic review of the platform work literature and it is not possible to comment in depth on existing literature. However, the issues discussed above provide hints for future research on platform work. It is *tricky* to study platform work. The discussion of algorithm studies above makes clear that there is a major barrier to studying platforms and platform work. There are many approaches that deal with the complexity of algorithms. As Lee and Björklund Larsen (2019) show, these approaches range from knowing/revealing the algorithm as a technical process to studying what algorithms do in practice. Between these approaches, there are the issues of classification, “folding” and reflexive approaches. In this final section, I wish to highlight some methodological considerations that follow from the discussions above.

What can we know about platform work?

Whether seen through the approach of Lazzarato or ANT-based approaches, the study of platform work undeniably belongs to a realist conception of science. In its simplest formulation, this means that there is a reality that exists also without us studying it. Platforms are not just the algorithms or the firm or the application. A platform consists of all these elements, including humans. In studying platform work it is also important to highlight the spatial/geographical dimensions of work, as well as the element of time. The spatial and time elements are probably highly contingent in themselves, but they must be addressed in some way.

What we can know about platform work depends on what our data is. Interviews and surveys of people who have been a platform worker can highlight certain aspects that should be studied in more detail by other methods. An interview with a Deliveroo rider may contain different questions whether machinic subjugation is acknowledged or not. For example, an interview may include a discussion of how the rider interacts with the app, as he is a node in the platform network. The researcher may find out about inputs and outputs and features of the app that influence the behaviour of the rider. Careful analysis of this data may yield insight of the ways the platform “uses” the human. However, as van Doorn and Badger (2020) show, data is one of the central assets of platform companies, which likely restricts access for research.

Following Kitchin (2014) regarding Big Data, both digital and human data in/from platforms should be situated. Depending on the data available, this can be done in greater or less detail. For example, Jonker-Hoffrén (2020) had the opportunity to use the system data of a (lean) platform. Using this data, it was possible to reconstruct a model of the platform and its various phases in facilitating between customer and provider. This data also had its drawbacks since it excluded the broader pool of potential providers. The data only had the interacting providers. Furthermore, the final stage of interaction between provider and customer took place outside the platform, which means pricing issues were excluded. This means that the practical effects of the platform were outside the scope of the research.

Jonker-Hoffrén (2020) nonetheless shows an important aspect of platform research which (by necessity) frequently is left out: how the platform and the user (customer) exclude platform workers from gigs. The broadening literature on platform reputation studies this issue, but from the outside, not from within the algorithmic process (Hesse & Teubner, 2019; Basili & Rossi, 2020).

In short, platform work has many elements that can't be known in detail. This is also due to the value of data for the platform firms, and the risk that high levels of transparency may endanger business secrets. Nonetheless, within the limits of what can be known, scholars should approach platforms and platform workers as networks between humans, connected and to some extent steered by technology (Seaver, 2019). Platform workers cannot be seen separately from what the platform is and does.

How can we study platform work?

Some of the most insightful studies of platform work employ multiple research strategies. The different parts in the “platform assemblage” may need different methods for sensemaking. Furthermore, different theoretical approaches may highlight specific aspect of the functioning of the assemblage.

An example of the latter is the research on UberEatz by Veen et al. (2020). They employ a Labour Process Theory lens, as they argue with Gandini (2018) that LPT is a useful resource to evaluate production relations in digital environments. The focus on the labour process means, that the various steps in the work were reconstructed. This is way to empirically study Lazzarato's asignifying semiotics, as they are experienced by the platform worker. Veen et al. (2020, p. 394) shows how platform work is a flow of information, in which the humans are nodes that react to input and output (waiting for requests, accepting or rejecting requests). Their research was an extended case study, involving interviews and meetings with platform representatives. They

conclude that in this case platform work is characterized by control of workers through technology and asymmetric information, and opaqueness of performance management systems. Norlander et al. (2021) and Woodcock (2020) notice a similar lack of agency in platform work. Another approach is the use of trace data, to observe human activity in and through the digital sphere (Crowston, 2017; Jonker-Hoffrén, 2020)

Deep case studies are one approach to study platform work. Another promising approach is Andersson Schwarz (2017). He combines insights from information management sciences with critical political economy to study the issue of domination. He argues that at the platform (local) level, the platform has “exclusive control over the surface on which the exchange takes place.” (ibid., p. 382). This means that the platform determines how users behave, using terms of service, code and other “hard coded” rules. Studying these comes close to studying Lazzarato’s asignifying semiotics.

There are limits to the knowledge of algorithms and to our understanding of how gigs are generated. In this context, ethnographic methodologies can be useful. Seaver (2017) argues scholars should “seek to enact algorithms ethnographically, seeing them as heterogeneous and diffuse sociotechnical systems, rather than rigidly constrained and procedural formulas.” He describes some ethnographic tactics, which can help with understanding the “black box” of algorithms. These are: scavenging, attending to the texture of access, treating interviews as fieldwork, parsing corporate heteroglossia and to beware of irony. Scavenging means collecting and interpreting information from diverse sources, such as informal chats and press releases (Crowston, 2017). The issue of access relates to what can be known about the limits of the algorithm. Interviews as fieldwork means tracking how dialogue is constitutive of processes. Heteroglossia refers to “many voices”, which is important to be sensitive to when analysing corporate documentation. Finally, Seaver states that programmers often employ irony, so that researchers should be aware of this.

Seaver’s (2017) tactics are useful, because they are aimed at gaining knowledge about algorithms. In the context of platform work, these tactics can be employed in addition to studying the substance of work. Bonini and Gandini (2020) studying music curators of streaming platforms is a good example of these tactics. Ribes (2019) additionally advocates, based on an ethnomethodological approach, that “When there are claims that things are the same or different, seek out the work and technologies that make them so.” This is a very useful idea in platform research, because sometimes only by looking at the substance of the work (driving an Uber, delivering food) it could be wrongly concluded that these gigs are the same as regular work. Through Lazzarato’s discussion of machinic subjugation it should be clear that this is not the

case. An interesting use of this process, which was documented by Van Doorn (2020) in a group of Deliveroo riders that reverse-engineer the platform's pricing algorithm. Oppegaard (2020) uses a so-called travelling ethnography to reconstruct Uber Black's technological work arrangement. Although partial and temporal, these approaches yield useful knowledge (Seaver, 2020).

There may yet be more fruitful methods to approach knowledge of the "black box". Platform work research benefits from using multiple methods, such as an extended case study with interviews or ethnographic methods. Implicit in many examples here is the necessity to understand the algorithm. Explicitly invoking interdisciplinary methods should lead to a deeper understanding of the interaction of humans and platforms. The examples mentioned here are notable in their documentation and reconstruction of processes mostly internal to the platform. The demand side of the multi-sided market should not be forgotten – without customers using the platform, there would not be platform work.

Conclusions

The dialogue between Lazzarato's theoretical conception of social and machinic subjugation with algorithm studies points to a conundrum: on a certain level, it is understood that algorithms (and other technology) produce subjectivities, that turn humans into nodes of technological networks. This is evident from the many studies on algorithmic control, algorithmic bias, dynamic pricing on platforms and so forth. On the other hand, algorithm studies also show, that these same subjectivity-producing algorithms cannot be conclusively known, because they are the work of many people over time, exhibiting change and in particular many emergent properties (both within the technology and in society). Also studies on the platform work employment relation aim to give a meaning to the platform algorithm.

Using Lazzarato's concepts I have shown that the human component cannot be seen separate from the technological component. Some studies, notable those that employ a Labour Process Theory approach, note virtually the same issue: that humans in platform work have limited scope for agency. Platform work can be studied very well using existing methodologies, provided insights from algorithm are included and acknowledged. Good examples are various ethnographic approaches and in-depth case studies. The main obstacles to understanding platforms are the algorithms themselves and researcher access to platform companies (data, fieldwork). The latter serves as a reminder that platform work ultimately serves the interests of the platform companies. As

Van Dijck (2020) reminds us, many fundamental technologies of platforms are in private hands. Therefore, a critical view on how platform work emerges from and with those technologies remains essential.

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