Reconsidering digital labour: Bringing tech workers into the debate

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Abstract
The digital labour debate has produced manifold insights into new forms of work emerging within digital capitalism. So far, though, most research has focused on highly precarious labourers, neglecting the growing ranks of affluent ‘tech workers’. I argue that this analytical oversight can be attributed to a narrow conceptualisation of digital labour. Thus, this article first proposes a broadening of the digital labour concept to encompass all work entangled with the digital economy. In a second step, I demonstrate the heuristic surplus of this theoretical broadening through a discussion of the empirical literature on tech workers. By bringing tech workers into the debate, I point to the cultural, technological and organisational relations between high and low-paid digital labourers. Pursuing twin-aims, the article combines a theoretical reconsideration of digital labour with an analytical discussion of the literature on tech workers to provide a more relational account of work and class in digital capitalism.

KEYWORDS
class, crowd work, digital capitalism, digital labour, gig work, knowledge work, platform capitalism, professions, tech work
INTRODUCTION

Under the banner of digital labour, social scientists across a range of disciplines have produced insights into the new groups of workers that have arisen from within digital capitalism. Terms like gig workers, crowd workers or prosumers are deployed to categorise these new groups who sell or trade new forms of labour in segments of the economy created or genuinely transformed through Internet-based digital technologies and business models (Bergvall-Käreborn & Howcroft, 2014; Fuchs, 2013a; Gerber & Krzywdzinski, 2019; Graham et al., 2017). Digitalisation thus impacts existing worker groups—for instance, by confronting many of them with the possibility of automation (Frey & Osborne, 2017)—but it also leads to the creation of new ‘occupational classes’ (Grusky & Sørensen, 1998).

Surprisingly, though, the concept of digital labour has been primarily used to analyse highly precarious new forms of work. While the debate thus far has been very productive, it has concentrated on the lower occupational classes: social scientists have primarily focused on the new ‘cyber proletariat’ (Dyer-Witheford, 2015; Huws, 2001) or ‘digital underclass’ (Dawson, 2002; Gray & Suri, 2019). This narrow take on labour within digital capitalism seems out of date given the growing number of affluent digital labourers or so-called tech workers, who earn high salaries for programming, designing or managing digital technologies and digitally mediated services (Dorschel, 2021; Tarnoff & Weigel, 2020, p. 4; Thaa, 2020). Since the 1990s, the Internet industry has produced new forms of work and corporate cultures (Fuchs, 2013a; Neff, 2012). Within this context, usage of the term ‘tech worker’ has shifted, with the term now signalling the distinctive (self-)classification of white-collar employees such as UX-designers, software engineers or data scientists, who sell their labour-power to Internet-based companies (Tarnoff, 2020).

Hitherto, the social sciences have barely addressed this new generation of tech workers. The sheer number of studies about food delivery couriers, one of the most visible occupational classes of digital capitalism (see Anwar & Graham, 2019; Goods et al., 2019; Tassinari & Maccarrone, 2020), might in itself surpass the amount of research that has been done on tech workers. This solidarity towards highly precarious classes of workers within the digital environment has come at an analytical cost. It has produced a sociological blind spot concerning the upper echelons of digital labourers.

This paper pursues two interconnected aims. First, I make the case for a broader conceptualisation of digital labour. I address established authors across the digital labour debate and recapitulate their central theoretical arguments. Building on Fuchs’ definition of digital labour as corresponding to an economic field (Fuchs, 2013a, p. 296), I then argue for terminology that ties digital labour to its economic sector, the digital economy, understood as that part of economic output that rests on the ICT-sector and platform companies, including their various supply chains (Bukht & Heeks, 2017). Thus, our understanding of digital labour should include tech workers—as well as the often forgotten miners, hardware assembly workers or digital waste workers—in addition to crowd workers, gig workers and the prosumer. This means the supply chain or sector-level definition of digital labour is not limited to the digital media industry, as Fuchs argues. Instead, it covers all work activities entangled with the digital economy as a whole.

In the second part of this paper, I will support this theoretical argument by discussing a range of empirical studies on tech workers and relating their findings to the digital labour debate. The paper does not intend to present a genealogy of the tech worker subject. Rather, following contemporary debates, I limit my discussion to professional digital labourers at
Internet-based companies. Hitherto, studies of this new generation of tech workers exist without much dialogue or common theoretical frameworks. In a sense, the body of existing studies on tech workers constitutes a research field in itself but not for itself. Based on my analysis of a selection of relevant literature, I identify three frequent areas of inquiry into the work and lives of tech workers: (1) subjectivity studies, (2) inscription studies and (3) network studies. By discussing and systematising selected studies, I demonstrate the need to conceptualise both lower and upper classes of digital workers within the theoretical framework of digital labour. I show how upper-class digital labourers and lower-class digital labourers are culturally, technologically and organisationally related—demanding for a theoretical framework that enables an integrated discussion. This framework opens new perspectives on the digital labour debate as well as liberatory politics by allowing us to analyse the class matrix of digital capitalism and grasp its social relationships of domination, exploitation and (potential) solidarity.

The digital labour debate

The terminology of digital labour was first popularised by Tiziana Terranova in her influential article ‘Free Labour: Producing Culture for the Digital Economy’ (2000). Terranova argues that the digital economy led to a diffusion of the phenomenon of ‘free labour’, which she mainly understands under the rubric of social media activity. Terranova diagnoses an explosion of disguised and unrewarded labour in manifold online user activities. In her view, practices like coding Internet websites or participating in mailing lists constitute digital labour and form part of the capitalist value production process (Terranova, 2000, p. 33). Hence, Terranova posits that so-called cyberspace does not stand outside of capitalism, but is rather an integral part of post-Fordist societies (Terranova, 2000, 53). She connects the Internet to the concept of the social factory developed by Italian Neomarxist autonomists (e.g., Tronti, 1962). But the term digital labour really took off only after 2009, when conferences on the topic were held at the New School in New York (Scholz, 2012) as well as at the University of Western Ontario (Burston et al., 2010). Around the same time, the idea of ‘digital labour’ as unpaid work also found its way into the popular concept of the ‘prosumer’ (Ritzer & Jurgenson, 2010), which refers to the hybridisation of producer and consumer in contexts such as the social media economy.

Like Terranova, Fuchs uses a Marxist framework in deploying the term ‘digital labour’ to diagnose new and old practices of exploitation through contemporary social media usage (Fuchs, 2013b; Fuchs & Dyer-Witheford, 2012). Fuchs makes a further effort to theoretically differentiate between digital work and digital labour by referring to the latter as work that takes place within capitalist societies (Fuchs & Sevignani, 2013, p. 251). However, Fuchs’ theorisation of digital labour goes beyond unpaid labour practices. In his book Digital Labour and Karl Marx (2013a), Fuchs makes the case for a broader materialist definition. Delving into case studies of labour processes that are connected to social media prosumption, Fuchs argues that all value chains and all production processes that make social media usage possible should be regarded as digital labour:

We can conclude from the discussion in this book that social media prosumption is just one form of digital labour which is networked with and connected to other forms of digital labour that together constitute a global ecology of exploitation enabling the existence of digital media. It is time to broaden the meaning of the
term ‘digital labour’ to include all forms of paid and unpaid labour that are needed for existence, production, diffusion and use of digital media. (Fuchs, 2013a, p. 296).

In a sense, this conceptualisation of digital labour connects to approaches within science and technology studies that urge us to follow supply chains to grasp contemporary capitalism (see Tsing, 2015). Yet Fuchs’ broader, more theoretically grounded way of conceptualising digital labour has not been taken up in the research environment. Scholars seem aware of other groups in the social media industry beyond prosumers—including rare earth miners, employees in hardware production, IT service desk workers, software engineers or digital designers—but they have not systematically integrated these groups into the digital labour debate (Scholz, 2016b, p. 33). Furthermore, Fuchs himself, by limiting his industry-based definition of digital labour to ‘digital media’, still contributes to a narrow understanding of digital labour (Fuchs, 2013a, p. 296; Fuchs & Mosco, 2015, p. 47). Of course, the social media industry is a core part of digital capitalism and deserves significant attention. But where is the theoretical basis for limiting ‘the digital’ to ‘social media’? It seems more productive to link digital labour with the digital economy in general.

It is important to note that the digital labour debate is now concerned not only with unpaid work practices but also with the systematic analysis of paid work practices. Mark Graham, for example, has performed extensive studies on digital workers who sell their labour-power through digital platforms, like crowd workers (Graham et al., 2017). Crowd work consists of the remote provision of a wide variety of digital services mediated by online platforms. Most crowd work is characterised by low pay, repetitive tasks, new control regimes, irregular work hours and social isolation (Gerber & Krzywdzinski, 2019). Graham and colleagues take special interest in their geographical attributes, arguing that digital labourers are spread around the globe yet often stuck in precarious working conditions (Anwar & Graham, 2019). They theorise that even though crowd work, for example, offers a flexible and remote way to sell labour-power that benefits some, it also brings with it a great range of risks and a radicalisation of global competition, which often leads to a race to the bottom in terms of wages (Graham et al., 2017, 144–46). Furthermore, they diagnose that Internet platforms through which digital labourers sell their labour-power are often designed to prevent workers from organising, blocking the potential formation of something like a virtually connected digital working class (Graham & Anwar, 2018, p. 181). Hector Postigo (2014) also addresses this aspect, arguing that platforms constitute ‘Architectures of Digital Labour’. He highlights that platforms possess affordances, meaning they impose certain action possibilities. This highlights that functions and features of platforms are inscribed by tech workers and must be reinscribed by social media users or crowd workers (Akrich, 1992, p. 208). Along similar lines, Lehdonvirta (2018) has provided insights into how technical arrangements of platform companies structurally and culturally constrain crowd workers’ flexibility in scheduling decisions.

What unites these different scholars is their rejection of techno-optimist visions of digital labour. Digital labour has thus generally been studied, in this context, with a primary focus on how power relations alter through the new forms of work. Trebor Scholz also pursues this line of inquiry in the postconference edited volume of Digital Labour: The Internet as Playground and Factory (2012) as well as his more recent monograph Uberworked and Underpaid: How Workers are Disrupting the Digital Economy (2016b). Scholz highlights the most precarious conditions endured by workers within the platform economy, such as gig workers. Like crowd workers, gig workers also depend on digital platforms to sell their labour-power, but their services are typically bound to specific locations, such as particular cities for Uber drivers. Furthermore,
Scholz goes beyond the critique of power relations by laying down a vision of platform co-operativism (Scholz, 2016a). He develops an analytically grounded political vision, that promotes ownership of platforms by the digital workers themselves. However, in his innovative elaborations, Scholz mostly dodges the question of how to mobilise tech workers that would be necessary for such a project.

The second wave of digital labour studies, which broadens the concept of digital labour to include paid work practices, is influenced by many more researchers. Authors like Melissa Gregg and Andrijasevic (2019) or Jarrett (2015) push for a heightened understanding of the gendered histories and economies of digital labour. Brooke Erin (Duffy, 2015; Duffy & Schwartz, 2017) provides a feminist perspective on digital labour through an analysis of influencers in the cultural industry of the social media economy, while Brendan Churchill and Craig (2019) demonstrate that men more often occupy digital platform jobs related to traditionally male tasks (such as transport), while women are overrepresented on platforms that specialise in traditionally female tasks (such as caring). Casilli (2017) has explored digital labour in the context of globalisation and new forms of colonialism.

Lilly Irani, another central figure in this second wave, has contributed to the digital labour debate through multifaceted inquiries into Amazon’s crowd work platform Mechanical Turk (Irani, 2015; Ross et al., 2010). One of her core arguments is that digital labourers—such as crowd working ‘Turkers’ labouring for Amazon Mechanical Turk—must be understood in relation to tech workers and entrepreneurs. According to Irani, the labour of the crowd is essential labour even to the ‘smartest’ tech companies (Irani, 2015). Yet, she argues, it is kept hidden and at a distance from the more visible centre stage of digital capitalism. The result is that ‘rather than understanding themselves as managers of information factories, employers can continue to see themselves as much-celebrated programmers, entrepreneurs, and innovators’ (Irani, 2015, pp. 226–227). While Gandini considers the broadening of digital labour to include paid-labour as a development of the concept towards becoming an ‘empty signifier’ (Gandini, 2020), Irani demonstrates the heuristic surplus of a broader conceptualisation by unveiling that the subjectivities of valued actors within the digital economy depend on hidden relationships and that relations of dependence and disavowal are symptomatic within the digital economy (see also Qiu et al., 2014). As discussed in the following sections, deploying the term digital labour to refer to both lower-paid and higher-paid class segments could help to establish more integrated discussions and clear conceptual ground to further explore the interconnectedness between different classes of labourers within digital capitalism.

Reconsidering digital labour

I hold that we should reconsider the scope of the digital labour debate. Three waves of digital labour research can be distinguished (see Table 1). Extending Fuchs’ theorisation and arguing for the third wave of digital labour research, I contend that we need to fully subscribe to the sector-level definition of digital labour—linking digital labour to a specific mode of production (Fuchs, 2013a, p. 497; Fuchs & Sandoval, 2014). However, the concept should not be narrowly limited to the social media industry. Instead, it seems more fruitful to link the term digital labour to the notion of the digital economy. The term ‘digital economy’ can contain aspects of noncapitalist organisation and thus it has been chosen instead of ‘digital capitalism’. Unsurprisingly, there are various definitions of what the digital economy entails. Following Rumana Bukth and Richard Heeks, the digital economy can be defined as ‘that part of
economic output derived solely or primarily from digital technologies with a business model based on digital goods or services’ (Bukht & Heeks, 2017, p. 11). The ‘digital’ in digital technologies is defined as intensive and extensive use of information and communication technologies (ICTs), referring to ‘a combination of manufacturing and services industries that capture, transmit and display data and information electronically’ (ibid.). While it is conceptually unavoidable to define the digital economy in this broad sense, we may centre our attention on the commercial Internet, with its focus on data generation and the establishment of proprietary platform markets, as the analytical core of the digital economy (Graham & Dutton, 2019; Staab & Nachtwey, 2016; Zuboff, 2019). Studies of digital labour thus centre on the diverse range of workers labouring for Internet-based companies.

Digital labour is the flip side of a particular economic field—the digital economic field. Digital labour should thus not only be understood as that practiced by heavily exploited classes like crowd workers, gig workers and prosumers but should also include high-paid labourers. Digital labour should encompass all human-performed work tasks, whether material or immaterial, that are performed in segments of the economy created or genuinely transformed through Internet-based digital technologies. This supply chain or sector-level understanding creates a heuristic through which we can grasp the various groups of digital labourers in the context of a dynamic digital economy. Digital labour then includes tech workers, who configure, design and manage the digital technologies and services that permeate social space (Irani, 2019). However, it also includes other precarious classes often forgotten in the digital labour debate: miners, often located in the global south digging up rare earth elements under dreadful conditions (Smith, 2011); proletarians in the modern sweatshops that produce digital hardware (Lüthje & Butollo, 2017); IT service desk workers (Murphy, 2011), logistic labourers working for platform companies (Delfanti, 2019) and the workers recycling poisonous ‘digital rubbish’ (Gabrys, 2011). Digital labour also refers to prosumers—a group that has roots in all echelons of digital labourers because it can be assumed that almost all low- and high-paid workers consume and produce digital media content regularly (of course, though, different patterns of prosumption will exist across different groups). Furthermore, a broad understanding of digital labour also needs to take into account more established professions and occupations and investigate the extent to which their increased performance of work tasks related to the digital economy transforms them into digital labourers by drawing them into the sociotechnical web of relations of the digital economy. Figure 1 provides a speculative map of the status hierarchy of a selected number of these different groups of digital labourers.

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<th>Wave</th>
<th>Focus</th>
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<td>First</td>
<td>Digital labour as unpaid social media work</td>
<td>Prosumers</td>
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<tr>
<td>Second</td>
<td>Digital labour as unpaid social media work and also low-paid crowd- and gig economy work</td>
<td>Prosumers as well as crowd workers and gig workers</td>
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<tr>
<td>Third</td>
<td>Digital labour as all work within the dynamic and fluid digital economy (understood as the ICT and platform sectors and their various supply chains)</td>
<td>Prosumers, crowd- and gig workers, as well as tech workers, digital service workers, digital hardware assembly workers, certain miners, and digital rubbish recycling workers</td>
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While Huws contends that the digital labour debate raises questions that apply generally to labour under capitalism (Huws, 2014, p. 150), I argue that the proposed conceptualisation of digital labour will allow us to focus our attention on the specific class matrix of the digital economy. As Burrell and Fourcade have argued, the economic field around Internet tech firms has evolved into a sphere with relatively autonomous class relations (Burrell & Fourcade, 2021, p. 215).

**BRINGING TECH WORKERS INTO THE DIGITAL LABOUR DEBATE**

The social sciences have a rich history of studying high-paid or so-called ‘high-skilled’ labourers, ranging from the sociology of professions (Abbott, 1988; Freidson, 1988) and the labour process debate (Braverman, 1998; Knights & Willmott, 2016) to diverse studies interested in post-Fordism and the cultural industries (Barley & Kunda, 2006; Boltanski & Chiapello, 2018; Florida, 2003; Kunda, 1992; Reckwitz, 2017). Yet beyond some early remarks—such as McKenzie Warks’ notion of a ‘hacker class’ (2004)—no new tradition has emerged with regard to the high-paid tech workers who are in charge of developing or managing Internet-related digital technologies or digitally mediated services.

It is important to emphasise though that the term ‘tech worker’ has not suddenly entered the lexicon. The term has been deployed for quite some time in the academic field within the school of ‘information systems’ (IS). This discipline has its origins in the 1950s, when computers became more widespread for data processing (Avison & Elliot, 2006, p. 4). Since then, IS scholars have been interested in the broader activities between people, organisations and technology (Alter, 2008, p. 449). Naturally, they have inquired into the roles of IS workers and professionals, groups they have typically referred to as ‘technology workers’ (e.g. Thatcher et al., 2002). A broad range of studies have analysed IS technology workers, for instance, with
regard to occupational culture (Guzman et al., 2008), professionalism (Avgerou et al., 1995) or gender differences (Igbaria & Baroudi, 1995).

This paper will concentrate its analytical spotlight on a new generation of ‘tech workers’. As the heart of digital capitalism, the commercial Internet has brought about new forms of work and corporate cultures (Fuchs, 2013a, p. 213; Neff, 2012). Within this context, the terms have shifted about who is considered a tech worker. ‘Tech worker’ now signals a rather exclusive (self-)classification of white-collar employees at Internet-based companies (Tarnoff, 2020). This article limits itself to discussing this distinguished social group. This does not mean, however, that I want to neglect the relevance of established technology workers outside of Internet-based companies. Furthermore, I want to emphasise that this article does not offer a genealogy of the tech worker subject (though it would be a highly interesting endeavour to merge and systematically discuss literature on IS workers and Internet tech workers).

The new generation of tech workers also differs from the mass of highly precarious digital labourers that have arisen with the spread of Internet business and the platform economy. Tech workers have a much higher economic income than other digital labourers: data scientists in the United States, for instance, have an average annual self-reported salary of $113,000 (glassdoor, 2020) while an Uber driver nets only about $33,000 excluding costs for car insurance, maintenance, petrol and so on (Hall & Krueger, 2018). This does not mean that tech workers are free from precarity. They can also be subject to temporary contracting (Marks & Scholarios, 2007, p. 99; Tarnoff & Weigel, 2020, p. 6) and generally live under the Damocles sword of deskilling (Sennett, 2007, p. 98). At the very least, though, contemporary tech workers belong to an occupational class with a higher status and less precarity around salary. To secure their symbolic and economic capital, tech workers undergo intensive training in some way to acquire the professional knowledge expertise, cultural codes and skills which grant them protection and some level of autonomy in their jobs and on the labour market (Abbott, 1988; Freidson, 1988). By considering tech workers as professional digital labourers, it is possible to examine their ‘contradictory class location’ (Wright, 1976) in digital capitalism. ‘Tech workers’ ultimately refers to a number of occupational groups with a ‘family resemblance’ (Wittgenstein, 1953), who share commonalities in terms of sector, income, work characteristics, training and (self-)classification. Last but not least, it is important to note that the question of which individuals classify—or self-classify—as tech workers is fraught and subject to continuous change. Currently, some actors aim to challenge hegemonic understandings by broadening the category. Thus, they also refer to highly precarious digital labourers at Internet-based companies as tech workers, evident, for instance, in the campaign ‘Tech Workers for Tech Workers’ by the Tech Worker Coalition. Class, and thus also class terminology, is a continual process.

The existing literature on tech workers at Internet-based companies is scarce, despite high levels of public and cultural interest—evident, for example, in the success of Dave Eggers' 2013 novel ‘The Circle’, a fictional depiction of tech workers in California. The social scientific work that does exist is spread out across a variety of disciplines and relies on disconnected theoretical frameworks. In the following section, I will recapitulate and discuss a range of these studies. This will allow me to illustrate the heuristic surplus of a broader conceptualisation of digital labour. I divide the studies into three main areas: (1) Subjectivity studies, which focus on the cultural self-understandings, attitudes and motivations towards labour that are dominant among tech workers. This line of anthropological or sociological research is interested in understanding the hearts and minds of tech workers. (2) Inscription studies, with a primary interest in how the practices of tech workers impact the functions and features of the digital
technologies they develop. This line of research operates especially in the wake of science and technology studies. (3) Network studies, which provide accounts of how tech workers are organised and embedded in larger organisational, cultural and spatial structures. This line of research mostly originates from sociology or communication studies. This three-part typology provides an analytical-interpretative overview of a selected range of studies that take a systematic interest in tech workers. No claim is made that the typology represents the vast terrain of research on tech workers. I discuss the insights of the three study areas with regard to the body of knowledge of the digital labour debate. By doing so, I open up more relational perspectives and questions within the digital labour debate and for the sociology of work in general.

**Subjectivity studies**

Subjectivity studies of tech workers are the first area of research I will discuss against the backdrop of the digital labour debate. The vanishing point of subjectivity studies is the process of incorporation, which involves the ways humans are structurally constituted as well as self-constitute into historically specific types of subjects (Foucault, 1988), with habitualised schemas of perception, recognition and action (Bourdieu, 1984). Turning once again to Lilly Irani, we find a contemporary study of tech workers in her work ‘Chasing Innovation’. Irani draws from participant observations at a digital design consultancy that cooperated with Google and explores the practices of knowledge and power that contribute to the drive, among India’s middle class, to render social transformation entrepreneurial (Irani, 2019, 11). Irani finds that tech workers appear to attractively combine work and normative goals with enjoyment, cultivating ‘lives of experiment, exploration, and curiosity—but directed towards problematising the world as in need of innovation’ (Irani, 2019, 211). Irani makes clear that these attitudes cannot be simply considered a thin ideology. She argues that the young and well-educated Indians who pursue careers in the tech economy demonstrate a great deal of motivation, goodwill and ambition to contribute to a ‘better’ Indian society and nation-state. Her finding goes beyond Evgeny Morozov’s claim that the centres of digital capitalism are run by an ideology of technological solutionism (Morozov, 2013). Irani highlights a deep longing for political and cultural purpose within this demographic but points out that this desire is subsumed under economic logics, rendering it productive for capitalist accumulation (Irani, 2019, 141).

How can we use Irani’s findings to push forward the digital labour debate? As I discussed, Irani posits that while the labour of crowd workers is deeply necessary for the digital economy to function, it is often invisible, enabling tech workers and entrepreneurs to maintain their preferred identities rather than seeming like managers of information factories (Irani, 2015, p. 226). Irani exposes the existence of hierarchical relations between different labour groups in the digital economy. Her work thus unravels hidden social relations between the different classes of digital labourers. It makes sense, then, to further consider how different occupations within the classes of digital workers relate and interact with each other and how these processes are shaped by imagined selves. We may ask: how do tech workers relate to the class of precarious digital labourers? How do software programmers or interface designers, who value world improvement, autonomy, flexibility and creativity, perceive the crowd workers their technologies increasingly surveil and control? Furthermore, we may inquire in more detail how a certain longing for political purpose distinguishes tech workers at Internet-based companies.
Gina Neff, in her book *Venture Labour*, provides an insightful account of the early phase of digital capitalism where changing relations of work went hand in hand with a new subjectivity among high-paid knowledge workers. Neff’s central claim is that the rise of the Internet industry in the 1990s corresponded with an expanded positive framing of risk among its employees. She finds that short-term contracts and uncertain career paths were not regarded as threats but rather envisioned as opportunities by new media workers, which resulted in tech workers blaming themselves when they lost their jobs after the dot-com crash. Similarly to Gideon Kunda’s (1992) study of an earlier generation of tech workers, Neff argues that organisational cultures within the pioneering Internet economy exert subtle forms of control and subjectivation. The new element Neff identifies within the Internet and startup economy is its unknown embracing of risk (Neff, 2012, p. 17). She contextualises her micro and meso-level findings by connecting them with shifts at the macro-level, like the dominant neoliberal political rhetoric during the Reagan and Thatcher era (Neff, 2012, pp. 46–48). Fuchs also diagnoses this new cultural embeddedness of tech workers (Fuchs, 2013a, p. 213). He argues that the ‘labour aristocracy’ of Silicon Valley is embedded in a work context that flanks long working hours with an embrace of flat hierarchies, openness and cooperation. Furthermore, companies like Google lure employees with perks such as free food, sports facilities and other fringe benefits (Fuchs, 2013a, p. 223).

Neff’s and Fuch’s studies can be read as accounts of how the digital economy relies on a new mode of subjectivation, which harmonises with the economic interests of capital. Bergvall-Kåreborn and Howcroft (2013) as well as Nemkova et al. (2019) reach a similar diagnosis in their analysis of mobile app developers and design professionals. They reconstruct the subjectivities of tech workers as being characterised by self-control, self-rationalisation and self-commercialisation. However, as the authors argue, in line with Neff, such entrepreneurial behaviour is less a choice than a necessity in the competitive labour market segment of tech workers.

This line of research, focused on exploring the relations between the subjectivity of tech workers and larger structures, is also pursued by scholars interested in the role of race and border regimes. Amrute, for instance, has shown how the subjectivities of Indian tech workers labouring within Western digital economies are deeply affected by visa regimes (Amrute, 2019, p. 60). In light of their temporary work permits, she analyses how Indian tech workers must embody the habit of risk to an even greater extent than nonforeign (and non-Western) tech workers. This finding illustrates how the contemporary global economy is structured by bordered mechanisms of ‘differential inclusion’ (Mezzadra & Neilson, 2013, p. 131) that leave tech workers exploitable to different degrees and thereby fracture potential solidarity among them (see also Amrute, 2016).

These studies thus highlight the need to understand the subjectivities of digital labourers in relation to larger structures such as platform capitalism, financialisation, racialisation and political orders. The current digital labour debate often lacks exactly this kind of systematic thinking and fails to reciprocally contextualise findings at micro-, meso- and macrolevels. Moreover, the studies point us to a general question: are the subjectivities of high-paid workers in digital capitalism still the same as in the post-Fordist era? We should consider whether the classic post-Fordist diagnoses of highly educated workers as subjects longing for creativity, flexibility, self-fulfilment, risk-taking and project-based work (Boltanski & Chiapello, 2018; Bröckling, 2015; Sennett, 2007) hold true for digital capitalism in its now consolidated state.

Through her anthropological study of social practices and identity construction procedures within Silicon Valley, Jan English-Lueck ([2002] 2017) has provided another perspective on how the inner workings of the tech industry relate to identity and subjectification processes.
The central claim of English-Lueck's ethnography is that the narrative of meritocracy is so strong in Silicon Valley that it overcomes sedimented societal cleavages: 'the extreme discourse of meritocracy inherent in high-technology work, emphasising pragmatism and achievement, undermines the identities that are birth-ascribed—ethnicity, race, and even class status.' (English-Lueck, 2011, p. 98). Studies diagnosing a ‘brogrammer culture’ in the digital tech industry contradict English-Lueck’s observation. These studies argue that gender identity plays a big role in high-tech industries, which are often dominated by cultures of masculinity that contribute to unmeritocratic social orders at work (see Salter, 2017; Wu, 2020). Such disputes open up further questions of how class, race and sex intersect (Crenshaw, 1989) and play out within the different work settings of digital labourers. We may, for instance, ask whether the more remote and anonymous work of low-paid digital labourers offers more chances or new disadvantages for marginalised groups compared with office-bound high-paid tech work (even though it may be doubted that tech work will fully return to corporate offices after the Covid-19 pandemic).

In line with traditions of digital labour research to address forms of resistance among crowd workers or gig workers (see Anwar & Graham, 2019; Fuchs, 2013a, p. 286; Scholz, 2016a), subjectivity research of tech workers also extends to how these resist subtle forms of cultural control and discriminatory practices at work, and how they join ranks with highly-precarious digital labourers to do so (see Tarnoff, 2020; Tarnoff & Weigel, 2020). There are further studies related to the subjectivity of tech workers which, due to space, cannot be elaborated in detail here. Some of these studies focus on kinds of tech workers who have existed for decades, but who are now also embedded in the work relations of the internet economy,—which is the case for software engineers (Beecham et al., 2008; Marks & Scholarios, 2007). Members of this occupational group have developed different organisational identities depending on whether they have higher IT-related qualifications (Marks & Scholarios, 2007, pp. 105, 110). Furthermore, Marks and Baldry have argued that software workers still resort to the repertoire of class as a form of self-identification and as an explanatory framework for society (Marks & Baldry, 2009). Other studies focus on newly emerging groups of tech workers, such as the profession of data science. Based on a discourse analysis, Dorschel (2021) finds that the professionalisation of data scientists rests on their construction as hybrid subjects capable of integrating conflictive roles and discovering unknown needs in big data sets. A longer established group of tech workers that has received high interest from subjectivity scholars is that of game developers (Petitca-Harris et al., 2015; Weststar, 2015). Research into game developers has shown how extreme working conditions are increasingly problematised and resisted by the gaming community (Petitca-Harris et al., 2015, p. 575). The multiple strands of tech worker subjectivity studies sensitise us to an understanding of the cultural worldviews, emotions, affects and self-understandings of digital labourers as interconnected within a plurality of societal power structures.

**Inscription studies**

I will now discuss inscription-focused studies about tech workers to illustrate the heuristic surplus of a broader conceptualisation of digital labour. Alice Marwick’s ethnographic research on the social media industry in San Francisco clearly aims at this kind of investigation: she seeks to address ‘how status was built into Web 2.0, and thus illuminate how popular social software may promote inequality rather than counter it.’ (Marwick, 2013, p. 4). Marwick argues
that the community of tech workers, who manage and construct popular and supposedly horizontal social media applications, is actually deeply hierarchical. One of her central claims is that social media developers often have status-oriented mindsets which translate into the technological configuration of social media platforms (Marwick, 2013, p. 73). Her work unravels the intersectional power structures that underlie knowledge workers’ personal social networks and considers how these correspond to platforms fixed on celebrity-culture and ranking systems (Marwick, 2013, pp. 107; 112). This interest in correspondence and translation has much in common with work in science and technology studies (Jasanoff, 2004; MacKenzie & Wajcman, 1999). Whereas scholars of subjectivation are interested in habitualisation processes as such, scholars of inscription shift focus to considering how habitualised dispositions translate into technosocial artefacts.

Judy Wajcman, who is even more closely aligned with science and technology studies, suggests that sociological inquiries into the design and implication of technology are necessary to understand how technology affects society (Wajcman, 2018a, 2018b). Her 2018 study provides such insights: by investigating how Silicon Valley tech workers configure digital calendars, she demonstrates how the beliefs and worldviews of one particular group can influence the functions and design of popular apps, like calendars, that are widely used by ‘prosumers’ for structuring day-to-day activities. In the interviews she conducts with a number of Silicon Valley engineers, Wajcman diagnoses a strong rationale to mechanise and quantify human action to increase efficacy and reliability, which finds its way into the functions and user interfaces of digital calendar apps (Wajcman, 2018b, p. 18). Furthermore, Wajcman follows the theoretical principle of symmetry by drawing attention to the fact that these engineers are themselves passionate users of their self-programmed apps, and so are reciprocally influenced by the affordances of the very artefacts they shape (Wajcman, 2018a, p. 1284).

The studies by Marwick and Wajcman highlight that the relation between precarious digital labourers and affluent digital labourers is not only marked by social and symbolic hierarchies but also entails a material dimension. Understanding tech work is important because ‘ICTs have the capacity for degrading the job quality (…) asserting technical control through logics “embedded in the technological structure” of their design’ (Trusson et al., 2018, p. 166). Even though Marwick and Wajcman do not explicitly use the concept of inscription (Akrich, 1992), both researchers focus on how social norms and practices make their way into technology. So, while digital labour scholars have thus far concerned themselves with how prosumers or crowd workers engage in deinscription processes (Postigo, 2014), Marwick and Wajcman provide new insights into the ways in which certain rationales and life conduct shape the configuration of digital technologies. Studying inscription vis-à-vis deinscription could provide new insights into the role of affordances. Yet neither Marwick nor Wajcman engages with the concrete work practices of tech workers in programming, designing and using digital technologies. It will be important for future research to explore to what extent, and in which ways, tech workers are subordinate to digital capitalists, like entrepreneurs and venture capitalists, when they generate the technologies that permeate the work and life sphere.

Hitherto, digital inequalities have been discussed in two regards. First, DiMaggio and Hargittai (2001) drew attention to the variance in Internet access between different groups of people. Following this, other scholars highlighted that technological skills by which individuals can make use of the Internet, understood as ‘digital capital’, also vary between groups (Ragnedda et al., 2020). Studies on tech workers such as those of Marwick (2013) and Wajcman (2018a) can be regarded as enfolding a third dimension of digital inequality. They draw attention to the fact that digital technologies are not neutral but rather inscribed by tech workers
and the structures these actors are embedded in. Digital labourers with the capacity to inscribe digital technologies thus influence inequalities. An intersectional lens can then be used to explore the plurality of inequalities that are (re)produced through the work of tech professionals. It would allow us, for example, to consider how the middle- and upper-class encoding through the work of tech workers is decoded (and resisted) by prosumers and low-paid digital labourers. On another matter, feminist scholars, for instance, have problematised the ways in which technological ‘innovations’ are often designed from ‘men’ for ‘men’ (Rosser, 2005; Wajcman, 1991). The question of how racial biases are inscribed into technology (Benjamin, 2019)—an issue that is increasingly problematised with regard to algorithms—also merits further exploration. Along these lines, studies of tech workers can shed light on the inscription of power relations into the digital technologies that structure the social space.

**Network studies**

A third research area concerned with tech workers can be subsumed under the banner of network studies. Manuel Castells’ broad-stroked account, in his book *The Information Age: Economy, Society and Culture* (Castells, 2009), is one such study. Castells’ main claim is that the ‘Information Age’ is organised around new types of networks, which include the new occupational segments in the world of work. He argues that ‘high technology manufacturing’ has a bipolar structure: on the one hand, depending on a mass of unskilled workers engaged in routine assembly and auxiliary operations, and on the other hand, relying on a highly skilled, science- and technology-based labour force (Castells, 2009, p. 417). Castell describes this latter group of ‘high-skilled’ labourers as organised in ‘milieux of innovation’ (Castells, 2009, p. 419), which he also calls technopoles (Castells & Hall, 1994). These networked technopoles are generally located in gentrified metropolitan areas, socially and spatially connected to universities and finance capital, where inhabitants from the growing ranks of highly skilled information workers (see also Ferrary & Granovetter, 2009, for an inquiry into the specific network structures of venture capital in Silicon Valley). Castells argues that social networks, embedded in space and time, play a crucial role in these milieux of innovation by ensuring the circulation of ideas and labour as well as the cross-fertilisation of technological development and business entrepreneurialism (Castells, 2009, p. 422). Thus, while Mark Graham and colleagues highlighted the geographical diversity of locations where low-paid digital labourers are situated (Graham et al., 2017), Castells directs our attention towards the dense social networks between tech workers as well as the larger networks they are positioned in. Drawing on Castells, we can understand tech workers not as loose nodes (even if some are considered ‘digital nomads’ (Reichenberger, 2018)) but rather as actors embedded in a plurality of organisational and spatial networks. This line of spatial thinking about tech workers can be extended to explore how the value production of the tech industry takes place well beyond the offices of tech workers.

Fred Turner offers another study that emphasises the importance of networks for the high-tech industry and its dominant groups. In his work *From Counterculture to Cybertulture* (2008), Turner provides a genealogical account that describes how networks of people and ideas propelled the network society. Through a Foucauldian and Weberian lens, Turner traces the making of cybertulture from the 1960s up to the 1990s by demonstrating how a network of engineers, counterculturalists, libertarians, new right-wing politicians, entrepreneurs and promoters contributed to a shift in the public's perception of digital technologies (Turner, 2008, p. 232).
While computers in the 1950s were considered to be instruments of a ‘military-industrial complex’, this attitude soon shifted towards a public perception of digital technologies as a means for personal liberation (Turner, 2008, p. 13). This reimagination and alteration of subjectivity only becomes intelligible, according to Turner, by taking notice of the unlikely amalgamation of different social groups with distinct worldviews (Turner, 2008, p. 16). In Stewart Brand, Turner finds an actor largely responsible for bridging these different worlds. His Whole Earth Catalogue, and subsequent Whole Earth ‘Lectronic Link (WELL) online community, as well as his work with the Global Business Network and Wired Magazine all contributed to the establishment of network ties between heterogeneous actors and ideas (Turner, 2008, pp. 141, 175).

Turner’s lucid perspectives on the development of the digital economy encourage the digital labour debate to explore its genealogy and to understand its historical making through particular networked constellations and corresponding knowledge and power relations. This would naturally also draw attention to the importance of pre-Internet generations of tech workers. Furthermore, this perspective also leads us to the dimension of political action. By following Turner and Castells’ lead and paying attention to networks, further research could generate new insights into how tech workers organise in larger contexts and collectives. Tarnoff and Weigel have conducted pioneering work on this matter (Tarnoff, 2020; Tarnoff & Weigel, 2020). They reconstruct how under certain circumstances, affluent tech workers at Internet-based companies have organised walk-outs and strikes with lower-paid and temporarily employed digital labourers. They interpret tech workers as an important economic actor (and implicitly as potential revolutionary subject) due to their contradictory class location between bourgeoisie and proletariat within America’s crown jewel of capitalism. This line of work points to the theoretical question of whether tech workers possibly form a class in itself as well as for itself, and where the class boundaries are socially and symbolically drawn (Lamont & Molnár, 2002; Marks & Baldry, 2009).

CONCLUSION

This article had twin aims. I first recapitulated the digital labour debate and considered how broadening the concept of digital labour allows for more theoretically stringent scholarship. The digital labour debate has broadened in scope before, expanding from an initial focus on unpaid social media practices to an interest in low-paid gig and crowd workers. Now it is time to link digital labour systematically to its corresponding economic sector (Fuchs, 2013a), taking into account all work practices related to the digital economy and its supply chains. I then illustrated the potential of a reconsidered theorisation of digital labour through a discussion of studies on the new generation of tech workers. The analytical discussion not only systemised some of the available literature on tech workers but showed how low- and high-paid digital labourers are culturally, technologically and organisationally related. I showed how the digital labour of highly precarious workers can only be fully grasped by understanding the practices and contexts of professional digital workers, specifically their subjectivation, inscription and networks. And of course, the need for contextualisation goes both ways. Broadening digital labour does not turn it into an ‘empty signifier’ (see Gandini, 2020) but transforms the concept into a framework that allows for an integrated and relational discussion of the different groups of digital labourers and their embeddedness in the class matrix of digital capitalism.
Due to their contradictory class location, ‘tech workers’ occupy a crucial position in this class matrix. On the one hand, they are distinct from tech founders and the cadre of investors because they do not own significant shares of the digital means of production. On the other hand, tech workers are distinct from low-paid digital labourers because they experience less precarity around salary and enjoy a higher social status. Furthermore, tech workers occupy a unique position in the field of tech because they professionally shape the affordances of digital technologies. Tech workers hold not only relatively high volumes of economic capital, but they also command significant levels of inscription power. Tech workers’ specific forms of capital and their contradictory class location within digital capitalism make this group relevant not only for social scientists but also for activists interested in building ‘social blocs’ (Gramsci, 1971) for emancipatory struggles. The desire of tech workers for political purpose (Irani, 2019), their growing unionisation efforts (Tarnoff, 2020), and their protests against discrimination or the business of war (Suchman et al., 2018) indicate that some fertile ground for the building of new alliances exists.

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DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES
1 This new and exclusive usage of the term ‘tech worker’ is practiced for instance by the ‘Tech Worker Coalition’ (TWC). This institution, founded in 2014, primarily aims to organise white-collar employees at Internet-based corporations and start-ups. They do not try to organise technically skilled white-collar workers in other industries.

2 Digital labour however does not refer to ‘digital capitalists’, even though in a relational sense, this group must be considered part of the digital economic field.

3 Unlike the traditional professions like doctors or lawyers, tech workers are typically subject to employers’ authority. While an app designer at Uber will likely hold greater autonomy in his work than an Uber driver, this corporate professional still lacks the degree of autonomy that doctors and lawyers (outside of hospitals and law firms) usually enjoy.

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