# Flexibility in the Gig Economy:

# Managing Time on Three Online Piecework Platforms

Vili Lehdonvirta, University of Oxford*

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*Abstract*

Gig economy platforms seem to provide extreme temporal flexibility to workers, giving them full control over how to spend each hour and minute of the day. What constraints do workers face when attempting to exercise this flexibility? We use 30 worker interviews and other data to compare three online piecework platforms with differing histories and worker demographics: Mechanical Turk, MobileWorks, and CloudFactory. We find that structural constraints (availability of work and degree of worker dependence on the work) as well as cultural-cognitive constraints (procrastination and presenteeism) limit worker control over scheduling in practice. The severity of these constraints varies significantly between platforms, the formally freest platform presenting the greatest structural and cultural-cognitive constraints. We also find that workers have developed informal practices, tools, and communities to address these constraints. We conclude that focusing on outcomes rather than control is a more fruitful way to assess flexible working arrangements.

* vili.lehdonvirta@oii.ox.ac.uk / @ViliLe. I am grateful to Paul Mezier for his help with the data collection, and to Alex Wood, Gretta Corporaal, Jörg Flecker, Ralph Schroeder, the two anonymous reviewers, and other colleagues for their useful comments on earlier versions of this paper. I also wish to thank MobileWorks and CloudFactory for the interview access.

## Introduction

Industrialization brought about the 'tyranny of the clock', as workers' daily lives were subjugated to the rhythms of production lines and bureaucratic offices. Information and communication technologies (ICTs) are associated with new forms of work organization that rely less on regular rhythms and instead allocate tasks flexibly, on the basis of demand and availability (Grimshaw et al. 2002, Holtgrewe 2014). Most recently, so-called gig economy platforms seem to give full control to workers over whether they work or not each hour and minute of the day. In a series of surveys, 5-9 percent of adult Internet users in various European countries report working through such platforms weekly (Huws, Spencer, & Joyce 2016). An index measuring the use of online gig platforms suggests that they are growing globally at an annual rate of 26 percent (Kässi & Lehdonvirta 2016). This rise of gig work is expected to allow people to combine work with a variety of life situations and choices, boosting productivity while enabling workers to achieve a better balance between work and other commitments (Malone 2004, Gratton & Johns 2013, Sundararajan 2016).

Yet it was not the technologies as such that changed the temporal demands of work, in the industrial era nor in the age of ICTs (Wajcman 2015). Instead, technologies interacting with existing institutions, structural conditions, and management ideologies gave rise to new practices of how people conducted their working lives. For instance, the adoption of teleworking technologies and flexible working time policies since 1980s has had diverse and often unexpected consequences. Gendered expectations about who should spend time on domestic work have meant that women's and men's time use has ended up being affected differently by the same technologies and policies (Silver & Coldschejder 1994). Differences in bargaining

power have meant that one worker's flexibility has sometimes turned into another's uncertainty (Lambert et al. 2012). In the same way, the gig economy's effects on the temporal structures of work cannot be derived from technological possibilities alone, but are instead to be found in the concrete practices that its users adopt.

In this article we focus on the sociomaterial practices (that is, combinations of practices and material/technical arrangements) of online piecework, a subset of online gig work where the work consists of standardized tasks paid on a piece-rate basis. Online piecework represents roughly 10-20 percent of all online gig work (Kuek et al. 2015, Kässi & Lehdonvirta 2016), and is characterized by a particularly short cycle time and high degree of formal worker control over scheduling. We ask what kinds of structural and cultural-cognitive constraints online pieceworkers face in managing their time, and what kinds of time management practices and technologies they adopt in the absence of regular working hours and other workplace institutions. The objective is to assess how much temporal flexibility online pieceworkers enjoy in practice, and by doing so scrutinize broader claims about technology and flexibility.

Our overall research design is a comparative case study of three online piecework platforms with different histories and demographics. We find that platforms vary in how much competition they expose workers to, and thus how structurally constrained workers' scheduling decisions are. Attempts by workers to 'hack' the rules of the game with custom software ultimately do little to mitigate structural pressures. We also find cultural-cognitive constraints such as procrastination, which workers attribute to the lack of external temporal structures. In response, workers have adopted a variety of sophisticated personal time management practices and communities of practice. We conclude among other things that maximizing individual

control over scheduling may be somewhat a red herring, as successfully coordinating time in social practices with others depends on shared temporal structures.

**Background: Online piecework and flexible scheduling**

Online piecework can be defined as work performed remotely over the Internet for piece-rate pay. It is frequently performed at home, but it can also be performed at school, at an Internet café, or at the site of one's regular employment (Gupta et al. 2014). Typical online piecework tasks are standardized clerical and data entry tasks that are easily metered. Online piecework can be distinguished from online freelancing (paid on an hourly basis or on the basis of unique deliverables), as well as from localized gig work, such as rides and deliveries. Online marketplaces such as Amazon Mechanical Turk act as matchmakers between employers and workers of online piecework (Bergvall-Kåreborn & Howcroft 2014). Internet-based business process outsourcing (BPO) companies such as MobileWorks and CloudFactory offer online piecework to workers through their websites. We refer to all these sources of online piecework as 'platforms'.

Online piecework is conceptually related to crowdsourcing, originally defined as the practice of soliciting work from a "crowd" via an open call on the Internet (Howe 2009). Crowdsourced work can be paid on a piece-rate basis, in which case it is online piecework (Barnes et al. 2015). But crowdsourced work can also be paid on other bases, or not paid at all (Kleemann et al. 2008). Online pieceworkers can also be recruited via conventional job advertisements and referrals. Online piecework and crowdsourcing are thus overlapping but distinct concepts.

Another related concept is microwork, or the decomposing of jobs into tiny "microtasks" that can be digitally distributed (Lehdonvirta & Ernkvist 2011, Irani

2015). Microwork is often but not always performed remotely on a piece-rate basis. Sometimes it is performed by on-site pieceworkers at a conventional BPO company (Lehdonvirta & Ernkvist 2011), by regular employees doing company-assigned microtasks between regular tasks (Vakharia & Lease 2015), or by unpaid volunteers (Miettinen 2011). Even though some studies use the term microwork in the meaning that we have assigned to online piecework, microwork remains a distinct concept, centring on the size of the tasks rather than on the nature of the worker-employer relationship.

Parallels can be drawn between online piecework and industrial piecework. Both involve standardization and deskilling to make labour power measurable and controllable (Braverman 1998). The primary control mechanism in both is piece-rate pay, which encourages workers to work more intensively. But in industrial piecework, control is complicated by the social structures of the workplace. Informal rules can develop among workers on the shopfloor to restrict output to influence work intensity and pay (Roy 1952). The informal rules can become institutionalized and respected in bargaining between work groups and their managers (Edwards 2012). But in online piecework, there is no 'shopfloor' or 'work group' where workers could meet and organize. In this sense, online piecework is perhaps more similar to industrial homework (Benería & Roldán 1987). Online pieceworkers and homeworkers both use their own or borrowed tools to perform the work, remaining physically dispersed rather than collocated at work sites (Lehdonvirta 2016). Administratively they are kept at arm's-length relationships, often treated as informal workers or self-employed contractors rather than as employees (Irani 2015). And temporally they set their own working hours, at least in principle.

There are also differences between industrial homework and online piecework. Access to industrial homework was at least historically controlled by monopsonistic foremen, which severely influenced pay and scheduling (Boris & Daniels 1989), while online piecework is offered by a number of competing platforms. The literature characterizes industrial homeworkers mostly as poor working class women supplementing their husbands' incomes (Benería & Roldán 1987, Boris & Daniels 1989), while online piecework is not associated with any particular social group; surveys suggest that it is done across genders, income classes, and educational backgrounds (Ross 2010, Hitlin et al. 2016). Indeed, one of the main expected benefits of online piecework and online gig work in general is that they can be flexibly combined with diverse and changing life situations (Malone 2004, Horton 2010, Gratton & Johns 2013, Sundararajan 2016). According to a recent World Bank report, online gig work provides "a flexible working schedule [that] allows individuals to take better care of their families, continue to study, or start their own businesses while working and earning a salary" (Kuek et al. 2015).

*Flexible scheduling of work*

To understand the potential for flexiblity in online piecework, it is useful to view it against the background of earlier technology-enabled flexible working arrangements, such as telework/telecommuting, flexitime, and flexplace, which have been intensely researched already since 1990s (for a review, see Baltes et al. 1999). The literature has identified various potential advantages to flexible scheduling, such as reducing work-family conflict (Shockley & Allen 2007) and allowing paid work to be combined with life circumstances that prevent regular work (Silver & Coldschejder 1994). However, empirical studies of the effects of flexible scheduling have often

yielded ambiguous results (Baltes et al. 1999), with the consequence that studies have begun to call for more nuance in what exactly is meant by flexible scheduling (Shockley & Allen 2007). In particular, recent studies have begun to distinguish worker-controlled flexible scheduling from manager-controlled flexible scheduling (Henly et al. 2006). Many of the potential advantages of flexible scheduling are associated with worker-controlled flexibility, while manager-controlled flexibility is associated with some directly opposite effects, because from the worker's point of view it creates uncertainty and inhibits planning (Hyman et al. 2005, Lambert et al. 2012).

The boundary between worker-controlled and manager-controlled flexibility can be ambiguous, because the practices of negotiating working times can be bound up in the power relations of the workplace (Lambert et al. 2012, Wood 2016). For instance, Wood's (2016) flexible supermarket workers were formally free to declare the hours that they were available to work, but in practice had to accept disruptive shifts or risk no longer being offered shifts. Likewise in self-employed work, the technical contractors studied by Barley and Kunda (2004) were formally free to set their own working hours, but in practice some worked through evenings and holidays, because they believed that this would decrease their chances of being laid off and increase the chances of future contracts (similarly in Fraser & Gold 2001, Gold & Mustafa 2013). While the early literature on flexible scheduling saw flexibility simply as a matter of freedom from formal constraints such as mandatory working hours, more recent literature has begun to recognize the importance of these what we will refer to as 'structural' constraints on workers' ability to manage their time.

Online gig work in general and online piecework in particular are thought to provide a great deal of formal flexibility for workers (Kuek et al. 2015), but little is known about the structural constraints in this type of work (on local gig work, see Rosenblat & Stark 2016). We therefore put forward the following research question:

RQ1: What constraints are there on online pieceworkers' ability to schedule their own work?

*Workplace institutions as supporting structures*

The distinction between formal and structural constraints on workers' ability to control their time is starting to be understood and accepted in the flexible scheduling literature. But formal and structural constraints are arguably not the only important constraints that workers face. Consider the following puzzle. Of Barley and Kunda's (2004) more powerful contractors, that is, those who could afford to control their schedules relatively freely, only a minority used this power for anything else than work. Bourne and Forman's (2014) female business owners likewise used their considerable flexibility to prioritize work over nonwork obligations rather than to, for instance, bring about enhanced work-life balance. Similar examples of presenteeism can be found in other studies (Gold & Mustafa 2013, Wright 2015). In each case, workers say that they value flexibility as a means towards achieving work-life balance, but in practice many fail to use it for that, even when not facing any obvious structural constraints.

Consider another puzzle: procrastination, defined as "voluntarily delay[ing] an intended course of action despite expecting to be worse off for the delay" (Steel 2007, p. 66). Surveys suggest that procrastination is extremely common (Ferrari et al. 2005). Labour sociologists are used to approaching voluntary delays through the lens of

structural conflict, so that working below one's capacity is viewed as tactical output restriction aimed at resisting structural pressures (Roy 1952). But procrastination is conceptually distinct from output restriction, because it is done with the expectation of being not better but worse off for the delay – "expecting that it will not maximize your […] interests, preferences, or goals of both a material (e.g., money) and a psychological (e.g., happiness) nature" (Steel 2007, p. 66). Both procrastination and non-structural presenteeism are thus examples of time-use choices that appear to be difficult to explain as moves in a zero-sum tug of war of structural conflict. They are negative-sum in nature.

Such negative-sum choices could instead be explained by what might be called 'cultural-cognitive' constraints on workers' ability to manage their time: constraints resulting from the individual's cognitive limitations as a decision maker, and how the cognitive apparatus incorporates value assumptions, cognitive frames, and taken-for-grantedness (Scott 2014). This encompasses what the psychological literature broadly speaking refers to as self-control: aligning one's behaviour with one's long-term goals despite conflicting impulses (Karoly 1993). It also encompasses internalised controls that have become dysfunctional in the sense of leading to choices that are in no-one's interest (Bourne & Forman 2014). If a worker procrastinates or overworks with the consequence that work ends up taking over hours they had intended for social activities, then worker control over scheduling has clearly failed, as judged by their own standards. Empirically this can be identified for instance by the worker expressing regret or guilt (Ferrari & Beck 1998).

Cultural-cognitive constraints are not merely individual psychological phenomena, because their effects are moderated by workplace institutions (Kaur et al. 2015). By

workplace institutions we refer to institutionalised practices and material/technical arrangements that together constitute the 'rules of the game' at the workplace, especially rules that are formal company policy. Overwork can be reduced by formally regulated working hours (Bohle 2016) and rules against emailing in the evenings and weekends (Derks et al. 2014). Procrastination is moderated by factors such as the availability and proximity of goals and the number of choice points in a task (Steel 2007). In the absence of such structures, cultural-cognitive constraints are likely exacerbated.

Workplace institutions thus appear to have conflicting effects: on the one hand, they introduce formal constraints on worker control over scheduling; on the other hand, they act as supporting structures that help workers overcome cultural-cognitive constraints on the same. This contradictory nature of workplace institutions as both constraints and supports was noted already in early studies on mental health and unemployment (Jahoda 1982, Warr 1987). According to Jahoda (1982, p. 22), "Everybody living in an industrialised society is used to firm time structures – and to complaining about them. But when this structure is removed [...] its absence presents a major psychological burden".

If not by workplace institutions, then these burdens must be addressed by other means for worker control over scheduling to succeed. Externally imposed time structure is especially important in work that is otherwise repetitive and lacking in variety (Roy 1959, Warr 1987). Discussions of flexibility in online gig work have focused on the absence of formal constraints (Malone 2004, Kuek et al. 2015, Sundararajan 2016). The flip side – lack of formal supporting structures – has been neglected. We thus ask:

RQ2: How do online pieceworkers manage their time in the absence of formal workplace institutions?

**Methodology**

Our overall research design is a comparative case study of three platforms: Amazon Mechanical Turk (MTurk), MobileWorks (MW), and Cloud Factory (CF). MTurk has been the subject of much previous research and media interest. By comparing three platforms with different histories and worker demographics, our study contributes towards a more balanced understanding of online piecework. Our main data source is a set of interviews with ten workers from each platform. The worker interviews are supplemented with interviews with platform managers (in the case of MW and CF), hands-on participant observation in the roles of a worker and an employer (in the case of MTurk), observations on workers' public online forums, and secondary literature.

We initially contacted the companies behind all the three platforms. MW and CF permitted us to conduct background interviews with their managers and to contact their online workers to solicit interviews. Amazon did not respond to requests, so we recruited MTurk worker informants through a major worker-run online forum; our MTurk informants are thus likely to be more socially active users than typical. Interviews were conducted via teleconferencing (two informants) and via various text-based instant messaging channels used by the workers in their communications amongst each other (28 informants). A total of approximately 50 hours of interviews were conducted between 2012 and 2013.

The worker interview transcripts were coded in NVivo in a two-stage process to identify themes and practices related to time management. The other data sources were consulted partly before the interviews to gain familiarity with the context and

partly after the interview analysis to cross-check and add detail. The findings from all data sources are synthesized in the three case write-ups presented below. These are followed by a cross-case analysis section that addresses the research questions.

## Findings: Managing time in three piecework platforms

### *CloudFactory's virtual assembly line*

CloudFactory was founded by Mark Sears, a Canadian software developer who traveled to Nepal with his partner in 2008. He started training local computer engineers in web application development and got them projects from European and North American startups. In 2011 the business shifted from software development outsourcing to business process outsourcing. The company hired students in Kathmandu (Nepal's capital with an overall urban population of 6 million) to provide clients with services such as transcribing receipts and audio recordings. Its engineers built a web-based platform that the workers could use to complete the work remotely from their homes and colleges. Payment was on a piece-rate basis, paid out weekly to local bank accounts. Over subsequent years the platform was further developed to support a wider range of business processes. Sears's vision, inspired by Henry Ford, was to create "virtual assembly lines" in which complex jobs were broken down to sequences of relatively simple tasks that could be performed remotely by lower-skilled pieceworkers.

At the time of the study, CF had approximately 3,000 workers registered on its platform. New workers were recruited mainly through existing workers' social networks. The workers whom we interviewed were four women and six men aged between 19 and 29. Most were relatively well-off college students based in Kathmandu. They depended on their parents for subsistence and used online

piecework to earn spending money. Informants highlighted temporal and spatial flexibility as key advantages of the work, allowing them to work alongside studies:

> In Nepal it's usually a ten to five job. But in CloudFactory, we do the work when we have time available, so it is easy for us. [female, 21]

> CloudFactory provides me with flexibility, I can do it from anywhere and anytime, which is not possible with other jobs. [male, 22]

As the reference to assembly lines suggests, the pace of work was nevertheless on a certain level set by the platform rather than by the worker. Each worker had a weekly minimum earnings target that they were encouraged to meet, as well as a weekly maximum earnings cap. These limits could change weekly based on the amount of client work that CF had managed to obtain. For instance, informants quoted 600 rupees and 1,500 rupees as typical targets and caps, with the cap being raised to 3,500 rupees during peak demand. This ensured that at least some work was always available to every worker. Informants' estimates of their typical weekly CF earnings ranged from 1,000 to 2,000 rupees (about 10-20 US dollars; for comparison, an entry-level full-time civil servant earns in the order of 2,500 rupees or $25 USD per week).

Even though the tasks were self-contained and involved no collaboration, each worker formally belonged to a team of five members, including a team leader. Team members were encouraged to communicate with each other via Facebook groups and in weekly face-to-face meetings. Workers used these venues to share tips and discuss difficulties they had encountered with the tasks. The team meetings were also used to deliver CF's brand of leadership training: each week, teams were asked to discuss one of the company's 40 principles, revolving around such topics as individual initiative and community responsibility. Teams also occasionally took part in volunteer

community service. These activities formed the core of what CF's managers saw as the company's social mission. At the same time, the teams were also ranked against each other each week based on their earnings, encouraging competition between teams.

The interviews did not suggest that the informants had any significant problems with managing their time. The workplace institutions put in place by CF provided a significant amount of supporting structure, and informants' weekly and daily schedules were also structured by studies and family commitments. Informants complemented these structures with personal time management practices. Some, especially women with caring duties, adhered to daily routines where online piecework was assigned a slot. Electricity blackouts and other events meant that such plans could not always be followed, though. Some set quotas or earnings goals for themselves; for instance, one informant said that towards the end of each month she would aim to earn enough to pay for her mobile Internet usage. One informant operated a mental 'time bank' so that short hours one day could be compensated with longer hours the next day. One informant strictly limited their daily computer time. Informants also drew on social support from friends, family, and team members:

> When I don't feel like working, I talk to my friends and CF team to get a positive vibe, so that's how I motivate myself. [female, 21]

> When I tell my team members about the target I set for the week, I become more determined to fulfill it. [female, 19]

A few also mentioned informal competition as a means to support motivation:

> I would say there is always a kind of healthy competition among other teams and cloudworkers, but that's what motivates us to perform better. [male, 22]

*MobileWorks's algorithmic workplace*

MobileWorks started as a class project by a group of graduate students at the University of California, Berkeley. In 2011 the team took the project to a prestigious Silicon Valley startup incubator, and over subsequent years successfully raised investment rounds from Silicon Valley funders. Similar to CF, MW's vision was a mixture of social impact and sound business. The business was in the online outsourcing of simple business processes to low labour cost countries; the social impact was in providing decent earning opportunities in the world's poorer regions. The work ranged from transcribing handwritten health insurance forms to combing the Internet for contact details of potential customers on behalf of a vendor ('lead generation').

MW's founders originally framed their project as a practical critique of MTurk. Like MTurk, MW was a "human computation platform" that sought to "allow programmatic access to a large crowd of human workers on demand" (Kulkarni et al. 2012, p. 28). But they criticized MTurk's marketplace-like design, characterized by low pay and lack of work organization. They argued that this resulted not only in dissatisfied workers but also in lower-quality output. MW thus followed a more managed approach, striving to be somewhat more like a workplace than a marketplace. Workers still did self-contained microtasks for piece-rate pay, but rather than choosing the tasks themselves, workers were assigned tasks algorithmically based on their skills. High-performing workers could be promoted to "workforce managers". Workforce managers were responsible for recruiting new pieceworkers,

providing training and supervision, and resolving problems in tasks reported by the workers. The platform provided a text-based chat channel for workers and workforce managers to communicate.

At the time of the study, MW had approximately 500 workers on its platform. Most were in the Philippines, India, and United States, partly because these countries had large supplies of online labour, and partly as a consequence of social networks; one of MW's founders was from India, and one of the first workforce managers was a Filipina woman hired through online freelancing platform oDesk. Our informants were seven women and three men in the Philippines, aged between 25 and 31. Three were workforce managers and the rest were pieceworkers. Half lived with a partner, two with children. Four had college degrees. All were serious about earning income from online work, either as their sole income source or in combination with other personal or household income sources. Seven did other online work besides MW, especially online freelancing via oDesk (now known as Upwork) and online piecework via MTurk. Two had done similar work as temps in the country's conventional BPO industry.

MW's workforce managers resembled conventional teleworkers: they worked in shifts, were paid an hourly rate, and were assigned tasks and deadlines by the developers in California. In contrast, MW's pieceworkers formally enjoyed complete control over the scheduling of their work. They could work when and as much or as little as they wanted. Most informants praised this flexibility and noted that it allowed them to balance work with other activities:

> This job is very convenient. […] I can watch my kids, play with them and I don't get tired that much. Before I [had] to drive for about an hour to get to the office, then when I got home I [had] to sleep. [female, 30]

> I can work while enjoying the flexibility of my time... I am a boss of my time. [female, 28]

Some informants suggested that they experienced difficulties as a result of having to manage their time use. The difficulties related to procrastination or having to summon the motivation to work:

> Since I work here in our home, sometimes I feel like not working because I feel so lazy. That I think is the negative side of this job, unlike when you work in [a] real office with supervisors around you. [female, 30]

A related issue was that informants were very aware of other online work opportunities besides MW, and some ended up spending time and effort on agonizing over which opportunities to pursue instead of actually pursuing them. However, in general the interviews did not suggest that MW's workers had any significant difficulties managing their time. Social dynamics within the platform's own chat channel provided supporting structure. Informants also drew on personal practices: working towards earnings goals, following daily routines, and operating a mental time bank. Some drew on social support from family and other online workers, which was readily forthcoming, as cobbling together an income from precarious sources was not uncommon in the Philippines. In general it seemed that the informants were quite savvy at managing themselves and navigating precarious work opportunities, and also had supportive social networks online and offline:

> I usually start at 12pm UK time for my client who is based in London. My work for her takes an hour or two. So when I finished my task with her, I log in at odesk.com from 2pm to 10pm UK time to work for my other client who is based in North Carolina. After 10pm I work for Mobileworks for 2-4 hours more. [female, 29]

> My friends are also online contractors, so they think it's cool that we have a virtual office. [female, 29]

Informants quoted between 60 and 100 US dollars as their typical weekly earnings from MW piecework, which is around the same magnitude as a conventional BPO in the Philippines would pay for similar work. However, the informants stressed that earnings varied greatly depending on the availability of work. At the time of some of the interviews, informants were finding themselves not being assigned any work on MW. This was a particular problem for a 31-year-old man who had recently quit his BPO job in order to focus exclusively on MW:

> It has been three days that we don't have tasks […] I am investing time and money for internet connection, electricity and more. So if you are not lucky and all the tasks [are] accommodated by other workers, then there is nothing for you to work and no way for you to earn.

His solution was to commit all of his time to being available on the platform:

> I'm sleeping in front of my computer, and to be honest with you I am having my meals in front of my PC just to take advantage of the tasks that are available. […] No permanent time of sleeping, because I need to check if there [are tasks] available. […] I am online for almost 20 hours a day.

*Mechanical Turk's artificial artificial intelligence*

Mechanical Turk is the oldest online piecework platform. It was launched in 2005 by Seattle-based e-commerce giant Amazon as a way to source online pieceworkers for the company's needs, and subsequently opened for any U.S.-based employer. Typical tasks include transcribing receipts and classifying images and videos. Amazon was originally trying to replace human labour with artificial intelligence, but in many cases this turned out to be beyond the capabilities of the technology (Irani 2015). Instead of giving up on its software-first approach, Amazon re-engineered human labour to function as a component of software. With MTurk, "Amazon retained its existing divisions of labor and organizational practices – the same structures into which they hoped to integrate artificial intelligence approaches – while integrating on-demand human workers" (Irani 2015: 4). The platform is named after a 18th-century automaton that was covertly operated by a human, and its tagline is "artificial artificial intelligence". Since artificial intelligence is instantly available to do as little or as much work as is required at any given moment, MTurk's workforce needs to be extremely flexible; the platform has over 500,000 registered workers, but only a small fraction are performing tasks at any given time (Kuek et al. 2015).

Surveys suggest that more than half of active MTurk workers are based in the United States, and roughly a third in India (Hitlin et al. 2016, Ross et al. 2010). We interviewed ten U.S. MTurk workers aged between 23 and 62, eight of whom were women. Seven lived with a partner, four also had children in the household. Three had college degrees, one was a current student. Informants quoted between $14 and $200 as their typical weekly MTurk incomes. Most older workers had stable incomes from their or their partner's regular employment, and used MTurk only for spending

money. Three informants depended on MTurk and to a lesser extent on other gig platforms for significant parts of their income. Informants highlighted temporal flexibility as one of the main advantages of MTurk work, drawing favourable contrasts to standard employment. But compared to CF and MW, informants spoke much more about the difficulties involved in managing their MTurk time.

Informants said that they spent significant amounts of time searching for lucrative tasks on MTurk as opposed to working on them. In part this reflected the difficulty of finding good tasks among the thousands listed. But some informants recognized it as a failure in how they allocated time, akin to procrastination. “I used to notice myself searching [for a task] for a half an hour and then I realized how much I was wasting that way” [female, 41]. The problem was exacerbated by MTurk’s reward structure. The great majority of tasks provided modest rewards, amounting to perhaps $1-2/h. A small fraction provided much more, perhaps as much as $10-$20/h. These ‘jackpot’ tasks appeared only occasionally and tended to be quickly taken. Workers could thus effectively gamble with their time, forgoing modest but certain rewards for a chance to earn bigger rewards.

Like CF’s and MW’s workers, many MTurk workers had developed daily routines, set earnings goals/quotas, and operated mental time banks. One informant started with an easy goal that could be met in a matter of minutes, and then adopted progressively harder goals until sufficient earnings were reached, overcoming procrastination. Other practices included limiting task search time to a maximum of 15 minutes and not working after five o’clock in the afternoon. Informants also managed time use through task choices, favouring “batch hits” or repetitive tasks that were available in plentiful numbers instead of one-off tasks like marketing surveys. Two informants

said that batch hits allowed them to "get into a rhythm"; one informant tried to think of the work as a video game and the earnings as points.

Social support was not as readily available to MTurk workers. The platform provided no means for workers to see or communicate with each other. Most informants felt that their families and friends were not very supportive of their online work, owing to the low pay, the unconventional nature of the work, and the stigma attached to home-based jobs in the U.S. However, all of the informants participated in online communities and networks of MTurk workers, ranging from discussion forums with thousands of active members to private chat channels consisting of handfuls of members. The social dynamics of these networks provided some temporal structure to the work, and they were also used to disseminate self-control practices of the sort described earlier. Some workers also shared daily earnings goals and outcomes as a means to spur themselves and others, as well as "personal bests" that were discussed in the manner that one might discuss achievements in a sport or video game:

> My best earnings day was $52.28 and most [tasks completed] was 722. There are people that have me beat in both, but I'm proud of my records. [male, 29]

> We actually cheer each other on to make our goals. [female, 62]

Some also alerted each other via messages and phone calls when lucrative tasks or tasks matching a colleague's preference became available. But two informants talked about how valuable practices and tasks were being shared with community insiders only, among an "inner circle" presenting a "wall of silence" towards outsiders. Participation in online communities also complicated time management, because it was another unpaid activity to balance with paid work.

Half of the informants made use of an impressive range of software technologies to streamline their work, consisting of PC applications, web applications, browser plugins, and mobile apps. The simplest technologies were user interface enhancements that blocked out undesirable options from the platform. Other enhancements displayed earnings and other statistics in real time over the work view, helping workers to track progress towards goals. A technology that informants attached particular importance to was alerting. Implementations varied, but the general idea was that software was configured to automatically examine tasks on MTurk and alert the worker via sound or mobile message whenever tasks matching desired criteria became available:

> That alert goes off and I stop whatever I am doing and work until that work is gone. […] I have gotten out of the shower, mid shower, to work. [female, 30]

> If I hear an alarm, I literally run across the room to start grabbing [tasks] […] You are chained to the computer to search for [tasks] endlessly without it. [female, 44]

These technologies were produced by the workers themselves, either programmed from scratch or cobbled together from existing scripts and tools. The informants who used them felt that the technologies were very important for managing the work, as much as doubling the income according to one informant. To some extent they were considered trade secrets:

> MTurk is incredibly competitive. When people use […] alarms and things, they don't talk about it publicly. […] If everyone uses all the same bells and whistles, the [tasks] will go even faster. Workers often fight behind the scenes because of how competitive it is. [female, 30]

The low pay naturally meant that workers who depended on MTurk income had to work long hours to make ends meet. But most informants also spoke about issues that suggested varying degrees of loss of control: frequently working longer than planned, thinking about the tasks and rewards they were missing when not working, hearing complaints about overwork from family members, and neglecting other plans and commitments:

> I'm kind of ashamed of myself, because I haven't looked for jobs more since I was laid off [...] I can put energy into getting paychecks months later, or I can get money now, right now [via MTurk]. So I've been going for the right now. But yeah. This is not a sustainable strategy in the long term. [female, 26]

Notably, such problems were also experienced by some older informants not financially dependent on MTurk:

> I find myself working on MTurk far longer than I intended about 95 percent of the time. I'm starting to think it's a problem. Haha. [female, 40]

**Summary and cross-case analysis**

Our first research question asked what constraints online pieceworkers faced in scheduling their work. Across the three platforms, we found that online pieceworkers formally enjoyed a high degree of control over scheduling. Workers for the most part had the right to decide when and how much they worked, and how they allocated their time between different work-related tasks. However, the degree of control that the workers enjoyed in practice varied significantly between platforms and individuals. Both structural constraints and cultural-cognitive constraints diminished online pieceworkers' ability to manage their time.

*Structural constraints on worker-controlled flexibility*

The two main structural factors that constrained online pieceworkers' ability to manage their time were the availability of work and the worker's dependence on income from the work. When work was plentiful and workers also had other sources of income, workers were able to schedule their piecework freely. But when the availability of work was limited, those workers who depended on it for their living ended up being constantly on call. Workers with other income sources could afford to retain more control and only engage with piecework when it coincided with their needs. These effects of structural factors are summarised in Table 1.

Table 1. Effects of structural factors on the scheduling of temporally flexible work

| | Plentiful availability of work | Limited availability of work |
|---|---|---|
| Weak dependence on the work | Worker-controlled flexible scheduling | Scheduling by coincidence of needs |
| Strong dependence on the work | Mixed worker/manager scheduling | Manager-controlled flexible scheduling |

The availability of work was influenced not only by client demand but also by how the platform allocated the work. On MTurk, workers were free to complete as many tasks as they could. This resulted in competition between workers to grab the best tasks. In contrast, CF instituted minimum and maximum weekly earnings, with the consequence that some work was always available without workers having to compete or be constantly on call to obtain it. To some extent, MTurk's workers had managed to mitigate the effects of competition with social practices that instituted a modicum of task sharing between in-group members (see also Kingsley et al. 2015),

and with alert software that freed workers from being tethered to their computers in search of work. But those who depended on MTurk income still found it necessary to remain almost constantly on call.

*Cultural-cognitive constraints on worker-controlled flexibility*

Online pieceworkers' ability to manage their time was also constrained in ways not readily understood in structural terms. Workers sometimes found it hard to summon the motivation to start working. Sometimes they spent what they considered excessive amounts of time on activities of ambiguous value. Some MTurk workers also frequently found themselves spending more time on the platform than they had intended, even when not financially dependent on it. These failures of worker-controlled scheduling are more readily understood through the lens of the individual's limitations as a decision maker, or what we termed cultural-cognitive constraints.

Both procrastination and presenteeism were most evident in MTurk, which gave workers the greatest formal freedoms, and least evident in CF, which maintained a set of workplace institutions regulating workers' time use. These findings support the notion that formal workplace institutions function as supporting structures, and that taking them away creates new burdens to individuals, burdens that they are not always equipped to bear.

*Coping with the lack of supporting structures*

Our second research question asked how workers managed their time in the absence of conventional supporting structures. Across all three platforms, workers had developed personal practices such as daily routines and quota setting to manage their time. Workers from MW and MTurk had also organized into online groups and

networks in which participants traded advice and spurred each other on. MTurk workers had also developed software solutions that enabled new time management practices, considered important for succeeding in the work. An inverse relationship between the presence of formal workplace institutions and the variety of such informal time management practices is apparent in the findings, depicted in Table 2. This is consistent with the notion that workers use these practices to compensate for the lack of formal supporting structures.

Table 2. Formal workplace institutions and informal time management practices characteristic to each platform

| | CloudFactory | MobileWorks | Mechanical Turk |
|---|---|---|---|
| Formal workplace institutions | Demand management<br>Team structure<br>Team rankings | Task assignment<br>Chat channel | |
| Informal group-level practices | | Online communities of practice | Online communities of practice |
| Informal individual practices | | | Bespoke software (work alerts, real-time earnings tracking, distraction elimination) |

*Decreasing workplace institutions / increasing informal practices*

**Conclusions and discussion**

Gig workers no longer face the 'tyranny of the clock' that set the pace of work in industrial society. Does this mean that they enjoy significant temporal flexibility in their work, and with what implications to our understanding of working time and technology more generally?

*Effects of structural pressures on scheduling*

We saw that online pieceworkers enjoyed considerable formal freedom in scheduling their work, and valued this freedom as a means to satisfy individual needs and combine work with other activities. This finding is in line with expectations expressed in some previous literature on the gig economy (Malone 2004, Horton 2010, Sundararajan 2016) and on flexible scheduling (Baltes et al. 1999). However, we also saw that workers' ability to control their time was often curtailed by structural constraints. The removal of formal constraints sometimes exacerbated structural constraints, causing nominally self-sovereign workers to be *more* dependent on their employers' scheduling decisions.

Much previous research has focused on the effects of structural pressures on the *quantity* of working time (Simpson 1998). Our findings instead highlight the effects of structural pressures on how working time is *scheduled*. Similar to Gold and Mustafa's (2013) "connected freelancers", even the most distressed online pieceworkers did not necessarily work extensively long hours as such, but the temporal structures of their days were largely determined by the employers' requirements. This also echoes Wood's (2016) finding that for workers with little bargaining power, what is formally worker-controlled flexibility will in practice turn into manager-controlled flexibility, negating flexibility's expected benefits to the worker.

*Moving beyond the question of who is 'in control'*

Optimistic texts on flexibilization enthuse about the way it liberates workers to set their own schedules, while pessimistic texts point out structural reasons why it may not; what both have in common is that they implicitly adopt worker-controlled

flexible scheduling as the ideal. Our findings on cultural-cognitive constraints offer a gentle challenge to this ideal, reminding us that the individual is not the perfect atomistic chooser of neoclassical theory, held back only by external constraints. The individual is a decision maker prone to missteps, who frequently relies on society's supporting structures to stay on their chosen track – including time structures provided by the workplace (Jahoda 1982, Warr 1987). In the absence of such supports, worker-controlled flexible scheduling can fail in banal ways that benefit neither the worker nor the employer, such as when procrastination causes both low productivity and diminished free time.

Instead of worker-controlled flexible scheduling, we might thus perhaps wish to pursue a notion of worker-centric flexible scheduling: rather than focusing on the somewhat elusive question of who is ultimately 'in control', we should return to the question of how well the flexible working arrangement meets the worker's needs and goals. This probably includes how successfully workers are able to coordinate their time with others in social practices, and how they subjectively experience time (Warr 1987, Wajcman 2015). The ability to coordinate time with others depends on the individual but crucially also on others' schedules; and constant control and therefore responsibility over scheduling can diminish subjective experiences of time. Some level of time structure outside the worker's direct control, shared with others, might thus be more desirable to workers than the fully individualized control over scheduling envisioned in an electronic freelancer economy (Malone 2004).

*New structures of working life*

We saw that online pieceworkers had already started to develop new sociomaterial practices and online communities to adapt to the lack of conventional workplace

institutions. It is possible to identify similar practices and communities emerging among other nonstandard digital workers, including Uber drivers' online communities (Rosenblat & Stark 2016), online freelancers' urban co-working spaces (Gratton & Johns 2013), social entrepreneurs' physical and virtual 'hubs' (Toivonen & Friederici 2015), and independent game developers' online networks (Wright 2015). A certain isomorphism seems apparent in responses to less structured working arrangements. These new practices and supporting structures could be termed 'new structures of working life', to distinguish them from standard 'old' workplace institutions such as regular working hours. In a certain sense, the earnings goal is the new 9-to-5 and the online community is the new shopfloor when it comes to structuring one's time in these occupations.

But the online community does not offer quite the same affordances as a shopfloor, for better and for worse. For instance, the competitive nature of the personal bests and daily goals shared by some online workers resembles the workplace games described by Burawoy (1979), but unlike in Burawoy's case, there is no socially enforced maximum limit to which output is restricted. Online groups, unlike shopfloors, are probably too fragmented to agree on output restrictions (Lehdonvirta 2016), and monitoring virtual coworkers' behaviours is difficult. Thanks to the self-organized nature of these new structures of working life, there is a temptation to celebrate them as more democratic and inclusive than 'old' workplace institutions (Sundararajan 2016), but we saw that access to online pieceworkers' communities was sometimes controlled by gatekeepers, and that communities could be stratified (echoing Baines 2002, Neff 2012). In practice, the 'old'-style top-down rules instituted by CF were more effective in equalizing opportunities.

*'Hacking' flexibility*

What does online piecework suggest about the role of technology in shaping the temporal demands of working life? We saw that platforms incorporated different institutional rules into their technological architectures. On MTurk, the absence of formal constraints on worker-controlled scheduling resulted in a competitive zero-sum game where one worker's flexibility was another's structural constraint (similar to Lambert et al. 2012). In contrast, CF's design incorporated rules that limited competition and supported flexibility for those admitted into the platform. This shows that technology by itself does not inexorably lead to a specific type of institutional arrangement. The design choices that these platforms adopted could instead be traced back to their creators' goals and ideologies, from MTurk's "artificial artificial intelligence" that can be invoked and dismissed at will, to CF's more orderly "assembly line".

We saw that some workers used their own technologies or 'bespoke code' (Geiger 2014) to attempt to alter the rules of the game. This echoes a contemporary idea of civil society 'hacking' (in the sense of appropriating and tinkering with rather than breaking into) corporate technological architectures to win back power (Irani & Silberman 2013). In our study, bespoke code was able to address some cultural-cognitive constraints in online piecework, by for instance removing distractions from the platform's user interface. But it did little to ease structural constraints. Work alert algorithms helped to beat competition that did not yet use the same algorithms, but they did not alleviate competition as such. By using automated work alerts, workers in effect handed the day-to-day (and night-to-night) scheduling of their work to

employers. Though ostensibly a voluntary and even subversive act, in practice it amounted to capitulating to structural pressures.

ICTs are opening up new options in how work is organized in society. How these technologies are currently being used to construct many gig platforms removes ceilings, but in many cases unfortunately also pulls away floors that some people have depended on. This leads to increasing divergence in outcomes, including divergence in the temporal structures of working life. Some win greater temporal sovereignty for themselves, while others find the constant tyranny of the clock replaced by a fickle tyranny of the app.

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