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Lessons from one future of work: opportunities to flip the gig economy

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***Abstract*—Pervasive technologies are already transforming "The Future of Work". Mobile technologies, IoT, and data promise efficient and convenient work 'on-demand'. They are convenient too for for platform providers whose clean and efficient interfaces for consumers disrupt marketplaces, offering digitally mediated access to services at a click. These same technologies provide access to work and labour markets whilst undermining promising flexible work and access to sufficient work. The global gig economy is expanding. Increasing numbers of workers see gig economy work as their main form of employment, yet have little voice in the construction of systems on which they depend. We argue that technologists must work with gig workers, policy makers and other stakeholders to address the adverse effects of technologies on gig workers. To better understand relationships between workers and the technologies they use, we describe insights from research carried out with UK cycle couriers. We reflect on technology's role in giving these workers' agency, rights and equity *by design*.**

***Index Terms*—Gig economy, future of work, smart cities, IoT, algorithmic control, AI management, worker empowerment, big data, sustainability, co-design**

I. Introduction and Related Work

Millions of jobs have now been outsourced or automated through digital platforms connecting consumers to services in the gig economy [1]. Workers are paid per task (/ 'gigs'), in diverse and growing forms of gig work, including delivery, taxi driving, domestic and care work, microwork, and online freelancing [2] through platforms such as Deliveroo, Amazon Mechanical Turk, and Uber. Gig workers access their next job on-demand via their smartphone, receiving real-time feedback from clients. Work is apportioned by hidden algorithms driven by data collected through the mobile and platform apps. For the platforms, this data drives analytics, spotting lucrative trends and service opportunities [1]. It also feeds algorithmic management which decides when and how to offer workers gigs [3], ensuring services run smoothly. A growing number of workers use on-demand platforms as full-time employment, or in combination with other sources of low-paid employment [4] shaping their time, tasks and income as they see fit [5]. These workers are "dependent contractors" [6], reliant on the platforms to access work that can be irregular depending on levels of demand and supply.

Kellogg et al. argue that a largely positive view of algorithms at work is problematic due to forms of algorithmic control (direction, evaluation, and discipline) which negatively impacts the worker [7]. Costs are shifted onto workers rather than eliminated from work (e.g. quick and cheap on-boarding processes, lack of training and development), providing few benefits or safety nets [3], [8]. Whilst there are processes for reporting and flagging, feedback is standardised and automated in such a way where it is unable to address the challenges and risks that gig-workers face day-to-day [9]. Instead, workers gather in online forums, sharing screenshots, and building a common sense of inequities [9]. This leads to workers resisting algorithmic control through various forms of what Kellogg et al. describe as "algoactivism" [7]. Such algoactivism is leading to a growth of forums and apps, that aim to protect and support workers (cf. Turkopticon [10]).

Inspired by the potential for technology to support gig workers, we reflect on our recent fieldwork with gig food couriers, highlighting the perceived inequities experienced at the 'hands' of algorithms. Our study contributes a novel co-design approach that explores how: the community can empower workers through discussions of algorithms and technology; key stakeholder groups can better cooperate with gig couriers; and, to mobilise worker expertise in the development of technology that works towards a better future of work. We conclude by pointing towards a set of opportunities and lessons on how to design more equitable future enabling technologies for gig workers.

II. Background

We focus on gig economy couriers working for platforms such as UberEats. We are interested in exploring and understanding couriers' current work experiences, the role of technology in this, as well as how digital technology can better support the workers themselves in the future of work.

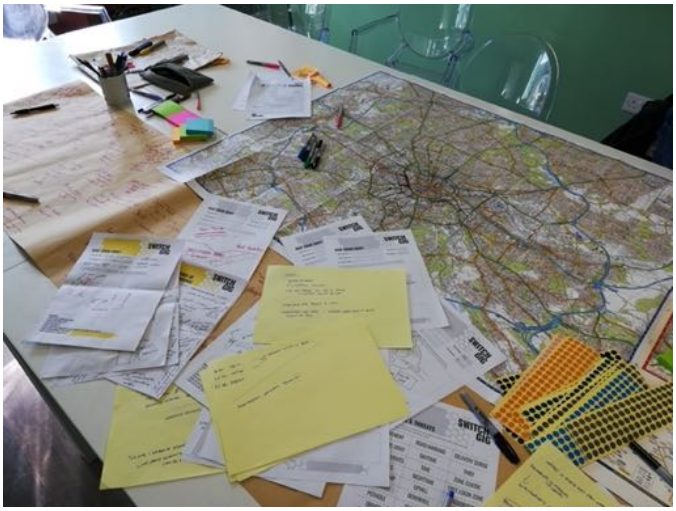

Fig. 1. Workshops were rich and creative sharing spaces, lead to lots of interactions, data, new methods for engaging with riders, and design briefs

Fig. 2. Annotating maps was effective for sharing tacit knowledge about the city and the work

Gig economy couriers (like many other forms of gig worker) are drawn in by the promise of flexibility and the idea of making money riding their bicycles [2]. Due to the nature of food delivery work, mealtimes provide a peak in demand with riders chasing jobs, competing with one another as adversaries in attempting to increase resulting earnings [2], [11]. This competition drives down pay and creates an incentive that forces workers to work harder for the same pay, exposing themselves to risks to get an edge [2], [12]. Reviews and ratings play a significant role in a gig worker's access to work; leading to reduced availabilities in work and even dismissal [11]. But couriers are savvy, smart experts, who enjoy their work and are happy there is no boss standing over their shoulder [2], [11]. They use technology and data to protect themselves, communicate and build solidarity with others, and resist injustice [11].

III. CO-DESIGNING WITH GIG ECONOMY COURIERS

Building on our previous inquiries into workers' experiences in sustainable last mile logistics [13], the Switch-Gig project aimed to work with gig cycle couriers to identify key challenges in their experiences with the technologies and environments of work, and to propose alternatives. We hosted two co-design workshops in early March 2020, in Manchester, and York, UK, with 8 gig economy cycle couriers ("riders") who delivered food and groceries. Riders were recruited on the city streets as well as via snowballing through WhatsApp riders groups. Unions and local government were engaged to increase recruitment. These avenues were unsuccessful as the local government had no point of contact for riders (or gig workers in general) and the limited time frame of the pilot study was insufficient to build a relationships with worker unions. Riders were paid the living wage for their participation. These workshops took place shortly before the COVID-19 lockdown began in the UK, with several participants withdrawing before the workshops due to travel and exposure concerns[1]. The workshops were structured in two parts, with the first focusing on structured elicitation around themes of courier work exposed by Cant [11]; including their day-to-day experiences of work, the costs of courier work, their relationship with the city, worker communities, and the role of technology. In the second half, riders were presented with potential future scenarios of gig work (cf. [11, Ch.7]), and then tasked with developing a series of design briefs that centred their perspectives and future needs. These themes were explored using a range of probes, mind-maps, sketches, annotations of city maps, and storyboards, each which worked toward answering a specific question (see Figure 1 and 2).

IV. EXPOSING CHALLENGES IN GIG ECONOMY COURIER WORK

In the first half of the workshop we found that couriers faced a number of specific challenges that the public might not expect:

A. Ratings and reviews: Delays, unpaid waiting time, and emotional labour

Food quality depends on efficient collection and delivery, so it is common for riders to be summoned to collect an order before the food is ready. They wait, unpaid, while customers are told the food is en route. While riders can complain, so can the restaurant, and their complaints could result in rider dismissal. Riders are fixed into an awkward power relationship due to the asymmetrical rating systems used by platforms, providing restaurants and customers power over riders. There exists a tension in which the restaurant wants to ensure riders are ready, but the added time of waiting at a restaurant by the rider leads to a loss of income. Customers blame perceived delays on riders, which can lead to poor

[1]Whilst COVID-19 wasn't a theme explored at the workshop, riders expressed concerns about a reduction in available work and a lack of health and safety support from the platforms in light of the COVID-19 pandemic.

Fig. 3. York has complex time-restricted pedestrian zones, and being caught out is a £50 fine.

ratings. Some riders have lists of restaurants from which they reject work because of how long they are made to wait. Poor ratings and complaints can lead to workers becoming deprioritised which impacts available shifts, and could lead to eventual dismissal. The constant need to please restaurant workers and customers creates additional stresses and is a form of emotional labour. Concerns around ratings leads to suspicion around every interaction and how it might affect their future work.

B. Taking risks on the job

Reasonable hourly pay rates are dependent on riders reducing delivery times as well as the time they spend waiting between orders. This pressure means workers rush from job to job, and are incentivised to disobey traffic laws; though this was highlighted as poor rider etiquette by many at the workshops.

C. Worker trust in platforms and their other users

The lack of transparency of the platform, compounded by frequent changes to the underlying systems, contributes to a lack of trust. Riders develop folk theories about how platforms work, and try to divine meaning and patterns in how work is allocated, viewing official explanations with suspicion. Riders feel under prioritised and disposable compared to restaurants and customers, and this is reinforced by the opacity of systems, and the lack of meaningful feedback.

D. Relationships with platform users and people in the city

Deliveries are not always smooth, and the contact details of riders are shared with customers, via the app, in moments where riders have to inform customers that their food is late or that they are unable to find the address. This provides avenues for harassment, coercion and threats from restaurant workers and customers. Riders get harassed when wearing branded gear (e.g. shouts of "DELIVERPOO!"), and by the police due to complex traffic laws (e.g. Figure 3). There exists a complex relationship with other road-using gig workers too. For example, taxi drivers in York would use dashcams to report moped couriers going the wrong way down one-way streets, though their help was provided to a courier who was knocked off their bike by a pedestrian, in handing over dashcam footage.

E. Collecting data in one place

Platforms have all the data, whilst riders have very little. They do, however, have many questions that could be answered through the platform's data. In its aggregate form, it can tell stories of how work is distributed (fairly or otherwise), how certain modes of transport or workers are prioritised, etc. It is difficult to compare how much workers are paid in relation to living and national wages without access to disparate datasets, contained in the individual apps and inboxes of each worker.

F. Challenging unfair dismissals

Riders are suspicious of the potential automation behind dismissal systems, as communications (e.g. emails) are standardised and contain little information on the actual infringement made by riders. This contributes to beliefs that it is the AI bosses that are doing the firing, with dismissed workers spending time agonising over past interactions with restaurants and customers to better understand dismissals.

V. How do riders use data and technology?

Three key sub-themes emerged from discussions that centred around how the riders were using the data and technology. Riders leverage agency both individually and in concert with co-workers, defending themselves against what they experienced as an adversarial system.

Data [ridden] insights

Platform apps provide riders with breakdowns of work, but obscure the reality of that work (i.e., duration of a 'shift', distance travelled) meaning income is unclear. In response, riders use whatever data they can access to bring transparency to these transactions. They run activity tracking apps like Strava, assembling auxiliary information for tax returns (e.g. mileage ridden), helping calculate pay, costs and overheads. Some riders use this auxiliary data strategically to informally analyse the cost-benefits of each job, rejecting or accepting them accordingly.

Defensive data collection

Riders are treated like perpetual beta testers. As new app features are implemented, problems can emerge up or down stream but they are rarely communicated in advance. Jobs can 'disappear' as a result of riders reporting issues to the platform, leaving them with little evidence that they were on a job in the first place. Platform helplines cannot help riders when this happens, but neither will they support riders who consequently suffer earnings losses. In response, riders learn to defensively gather evidence of each gig. They take screenshots

of orders and notifications, to help document changes in work. This evidence base helps them claim for any losses incurred.

Communicating and socialising

There are no official break rooms, shared bulletin boards, or spaces provided for riders to congregate and exchange information. Riders only learn about changes to the city, such as roadworks, or bike racks being removed for seasonal markets (e.g. Figure 4), on-the-go. This risks their safety at work and can slow them down. Riders use WhatsApp groups to ask for help (for example, with spare parts for their bikes), share up-to-date knowledge about the roads, and socialize. Whilst many riders actively communicate through these channels there seems to be a lack of channels between the riders and the city about the infrastructure that they rely upon.

VI. KEY OPPORTUNITIES IDENTIFIED BY RIDERS

The second half of the workshop tasked the riders with developing design briefs with the researchers. These briefs focused on technologies and features that could benefit riders.

Data and integration

We must provide better and more suitable methods for data capture by building tools that help riders get the data they need. This would help them to better understand their data as well as make visible their experiences while moving them away from DIY forms of data gathering that are – at times – unsuited, and in others, fail.

Shared rider knowledge

More suitable methods of data capture does not mean that riders do not have expertise. Riders build up tacit knowledge through their work of a range of topics including: experiences with customers and restaurants, city officials, and infrastructure. This rich knowledge (e.g. Figure 1) could be harnessed to support other riders, in similar ways Turkopticon does for mturk workers [10].

Communicating day-to-day gig worker life

This tacit knowledge, however, is of use to more than just gig workers. We must improve lines of communication with cities and platforms. Communicating the experiences of these workers with municipalities and platforms, who make decisions that directly impact workers, to make their experiences more transparent would lead to better and more sustainable planning and provisions for the growing number of gig economy workers.

Mapping services for riders

Riders have different requirements when it comes to routing applications and navigating cities. They are able to traverse cities in different ways to cars and vans. Navigation apps such as Google maps are not seen as particularly useful when it comes to safe and quick city navigation for riders.

Consolidation Platforms

Gig riders are working across platforms in order to make sufficient income. Platforms designed with consolidation and aggregation in mind (cf. [14]) could reduce unpaid waiting times, foreground the needs of the workers (i.e., better flexibility and agency over their working day), and lead to increased income.

VII. REFLECTIONS AND LESSONS LEARNT

Despite the global efforts of unions, mutual aid groups, policy makers, co-operatives, solidarity organisations and workers themselves, the challenge of changing the gig economy landscape remains. This is in part due to how this growing form of work cross-cuts stakeholders and users, municipalities, (inter)national legal frameworks and forms an invisible part of the convenient on-demand lives of people across the globe.

As more workers find themselves in gig economy working arrangements, it is unclear whether such arrangements are sustainable. Can workers afford to be in these arrangements long-term? Are environmentally friendly deliveries being prioritised as the platforms claim? What costs are being pushed onto workers and other stakeholders? The environmental, economical and social aspects of the work must be considered in tandem. While we present difficult lessons from the gig economy as one future of work, we remain optimistic that the creation of new areas of research, tools, methods and technology can still drive positive futures for workers around the globe. We highlight key reflections when considering impacts of future of work innovations.

A. Focusing on workers not technology

It is necessary to better consider how platforms reinforce and deepen the social and economic inequities experienced by gig workers. As part of this, it is critical to engage with worker communities, particularly those who are difficult to access or who have no direct, obvious or employer representative. Complimenting prior work [8], [9], we call for the amplification of worker voices and perspectives when designing for the future of work, where researchers and practitioners design with workers, not for them. There is evidence that this is now underway: in (e.g.) Uber's hiring of critic Alex Rosenblat to work on treatment of drivers [15] building upon her ethnographic study of the impacts of algorithms on Uber drivers [9].

Worker voices are highly valuable to advocates and technology designers alike. They hold tremendous expertise, are the ones who know customers, restaurants, and who have complex understanding of cities and spaces, which can be invaluable for innovation. Like Rosenblat's ethnographic approaches to understanding gig worker's experiences [9], co-design methods lead to better and more meaningful engagement with workers, where researchers can utilise these methods, develop a rapport with workers and consider the nuance and detail of their work in designs of technology.

Although we have advocated for the sharing of knowledge, there is a tension still. This knowledge is valuable to individual

riders and their resulting income (e.g. keeping good tippers secret), and any collective gain in efficiency in the eyes of the platform may drive down average worker pay due to more workers competing for work. This act of crowdsourcing is perhaps best used as a virtual proxy for the break rooms that exist in other forms of work, and not as a tool for delivering value to platforms.

B. Supporting essential independent workers

Being an independent worker means covering your own back and taking care of responsibilities such as tax returns, pension contributions and expense forms: all additional costs. Though there are existing services designed to help with expenses, tax returns, invoice management and pensions, worker protections are still lacking. And when it comes to dismissal by an employer who you are dependent on, and who is exercising algorithmic control to direct, evaluate, and discipline workers [7], there is little an individual worker can do.

In the context of COVID-19, gig economy workers are putting their lives and the lives of their families at risk, working in public places, yet still face the same uncertainties in their work. This is on top of issues such as poor access to PPE, no access to toilet facilities in restaurants that shift to delivery-only, dealing with no-contact delivery and the constant sanitisation of bags and equipment.

This extra work to defend from platforms and access support and benefits from the state is an opportunity to support workers through the design of new technologies that helps self-track and report their work and capture useful data (e.g. location data, photos) that can be owned by the worker themselves, supporting increasing gig worker literacy (cf. [16]).

C. Challenges engaging with gig workers

It is challenging to engage riders in research, particularly on short term projects. The structure of their work means that there are no set places and times to engage with them, and they are obviously focused on work when seen in city centres. During recruitment we contacted local governments, walked around areas in Manchester and York, engaged with unions representing riders, and engaged with local community groups on social media.

It is not clear that local governance is equipped to engage with workforces made up of a growing number of independent workers. Unions are busy, fighting for the rights of the workers they represent. Workers are suspicious of researchers in on- and offline space [17]. Their experiences with researchers tend to be an exchange where researchers capitalise on their experience and knowledge, compensating them with little financially, with limited value being returned to the community either. Due to the nature of the work, workers are often transient, moving between jobs, taking their experiences and skills with them, so long term relationships are difficult to maintain. As demonstrated by Rosenblat [9], longer term projects provide better opportunities to build relationships with workers and relevant stakeholders whilst exploring the physical and virtual spaces in which they work.

D. Regulation and government support is failing gig workers

To support self employed workers, like those in the gig economy, the UK government Self Employment Income Support Scheme (SEISS) aimed to provide workers with 80% of their wage based on their income for the last 2 years. In the UK only 14% of gig economy workers have been working for 2 or more years [4]. Platforms and government initiatives proved insufficient to support gig workers had COVID-19 symptoms or who had to isolate for shielding.

Throughout the pandemic new workers continued to be onboarded by platforms globally (only 2 stopped from 191 surveyed) [18]. The Fairwork Foundation has found that platforms have focused on developing protections for customers and not workers [18]. Workers already experiencing risk [12] have essentially been forced into even higher risk environments during the COVID-19 with platforms offering limited compensation for lost work and insufficient access to PPE. The same platforms have capitalised on consumer demand during the pandemic, expanding their services and sectors, leading to growth in market share, all whilst introducing more workers into their platforms [18].

In the face of such responses it is clear that the current system is inadequate to support gig workers. Through the pandemic a range of mutual aid networks, unions and solidarity platforms have sprung into action to support gig economy workers who are losing income or work.

E. Being sensitive to the makeup of the workforce

Gig workers have many reasons to be suspicious of platforms and technologists, and it is critical that this is recognised when doing any work in this space. In speaking to workers, we must appreciate that they are taking a risk in speaking at all, and also that the ones who do speak are not representative of every worker. In particular, Cant notes gig work suits some undocumented people, people claiming asylum or with otherwise limited legal status [11], and others may break the terms and conditions of the platforms (e.g. by borrowing or renting accounts) for whatever reason.

For all of these reasons and more, it is critical to be sensitive to the diversity of the gig working community in, for example, language, culture, reasons for working, legal status; understanding that the risks of participation are not evenly shared.

F. Fair Work and Sustainability in the Smart City

When thinking about (economical, social, and environmental) sustainability in urban areas, smart cities come to mind. What if there were a way to protect and support gig economy couriers through the leveraging of cameras, sensors and dynamic infrastructure systems? We envision a 'Fair Work Zone', that is developed utilising methods similar to ours for engagement of couriers. This could lead to opportunities for more fulfilling civic engagement with workers, improving trust (e.g. [19]) and helping utilising technology for worker justice in civic contexts (e.g. [20]). Riders believe that cars and mopeds are prioritised over them, even though platforms state

Fig. 4. Bicycle racks were removed for a Christmas Market and were not replaced till March.

their preference for low carbon transport. Such a zone could monitor whether certain vehicle types are being prioritised fairly and in accordance with environmental commitments. A Smart City environment could enable support for smart support stations for gig economy workers, and help city planners and policy makers use real world data to consider the growing gig economy in future cities.

G. Flipping the gig economy

But what if we turned it all on its head? What if the platforms were about providing fairer work to as many people as needed? What would that look like? There is an opportunity for such systems to give workers power over their working lives. Technology can be designed to give workers agency over the work they choose to do, potentially allowing for more diverse and inclusive forms of work.

The 'right' technology is only one precondition that has enabled the rapid expansion of the gig economy workforce as a social norm. Technology alongside the 'right' social factors (e.g. consumer attitudes) and political economy are what have led to the current configuration of the gig economy [2]. The technology itself is not inherently bad, but it is entangled with social and political factors. In this context, it is not possible to offer a technology alone to solve the issues we have highlighted here. Instead, we point to socio-technical developments that are already underway.

In the face of large platforms that prioritise profits over workers, and do not consider the human impact of their design decisions, there is a space for worker owned organisations (e.g. co-operatives) to provide fairer work [2], [11]. Whilst these organisations cannot compete with the scale and funding of large platforms, they are able to grow more sustainably, use just enough tech, and treat their workforces more fairly. Such success can be seen already at a small scale with CoopCycle [https://coopcycle.org] providing a platform for worker-owned cooperatives who provide logistics services in cities across Europe.

If we are to flip the gig economy to be for the workers, we must think about technologies that give more power to workers, whilst also challenging customer expectations, and rebuking the politics that allows for the unimpeded growth of platforms that treat workers as computational resources, rather than humans.

VIII. Conclusion

In this article we have described and reflected on the experiences of existing gig economy workers and how they may serve as a demonstration of the impact of one technology-led "Future of Work" on human workers themselves. In this future, innovative technologies, disruptive business practices, and complex algorithms create a dynamic and agile industry that seems almost magical to customers and suppliers, but relies on a precarious and transitory workforce in the middle.

Using cycle couriers as a case study, we argue that the gig economy demonstrates both a positive future in terms of potential applications of innovative technology, but also a profound failure in protecting the needs of the humans that these systems rely on. As such, there are many lessons to be learnt in order to fully understand the roles of technology in alternative futures of work. We argue that technologists and designers in this space can better consider how on-demand platforms reinforce and deepen the social and economic inequities experienced by gig workers and present our recommendations for approaches that can help bring about futures for gig workers that are more fair and just.

As demonstrated through our case study of local delivery workers, these are real problems that workers are facing due to the implementation of disruptive digital technologies and the structure of this form of work. Riders are putting themselves in harm's way, algorithms are opaque, pay is deteriorating, employee rights are denied, and they face increased risks of death [2], [12].

Through our reflections we foreshadow areas in which technology can protect and empower gig working couriers. To help these and other workers, now and in the future, technologists could mine data traces to understand how urban infrastructure needs to change for these workers, design Smart Cities that inspect and leverage data to better account for fairer and more-just work, or develops context-aware tools that protect cycle couriers from excessive risks.

Although the current paper focuses on the experiences of cycle couriers, there are insights that may be useful in the wider gig economy space. Technologists cannot innovate others out of these problems. We must reckon with the wider disruptions of gig work, socially and economically. It is essential that we increase opportunities for workers to share their voices, during and after the design of apps and platforms, but also beyond, in helping them to challenge inequitable and unfair arrangements of work.

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