Designing for Labour:
Uber and the On-Demand Mobile Workforce

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ABSTRACT
Apps allowing passengers to hail and pay for taxi service on their phone– such as Uber and Lyft–have affected the livelihood of thousands of workers worldwide. In this paper we draw on interviews with traditional taxi drivers, rideshare drivers and passengers in London and San Francisco to understand how "ride-sharing" transforms the taxi business. With Uber, the app not only manages the allocation of work, but is directly involved in 'labour issues': changing the labour conditions of the work itself. We document how Uber driving demands new skills such as emotional labour, while increasing worker flexibility. We discuss how the design of new technology is also about creating new labour opportunities – jobs – and how we might think about our responsibilities in designing these labour relations.

Author Keywords
On demand labour; sharing economy; uber; ridesharing; on-demand labour; transport; labour issues

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

INTRODUCTION
When Apple launched their App Store for the iPhone in 2006, few could have predicted the impact that apps would have on different industries and occupations. Indeed, the hiring of private cars and taxis would seem to be a world away from Apple products. Yet in summer 2014, four thousand traditional London taxis brought the centre of London to a standstill, following similar protests in Paris, Madrid, Rome, Milan and Berlin [16]. These protests targeted the smartphone app Uber, a 'ridesharing' app that allows users to hail private cars for travel, as well as allowing drivers to earn money from

picking up rides. Some argue that Uber, and similar apps such as Lyft and Sidecar, are part of an emergent 'sharing economy', where forms of consumption around shared goods and activities rival private, state and public consumption [1, 6] or more critically, provide new low-benefits and insecure work [31].

In this paper we scrutinise Uber in regards to its potential to change work practices and labour conditions, what we can understand and learn from Uber, for technology design and the sharing economy more broadly. The paper presents results from 32 interviews with both drivers and users of Uber, interviews with traditional taxi drivers, alongside ethnographic observations from over fifty rides in ridesharing and traditional taxis. Interviews were conducted in San Francisco and London, two cities with very different legislative and commercial history for taxi driving, as well as ridesharing app use.

With Uber, the app manages not just ride allocation–the work–but it also processes payments, tracks distance, sets fare rates and mediates the relationship between the company and its drivers. Uber–the company–has produced 'on-demand labour' [49]; labour managed, compensated, allocated, and produced from an app. While much of the tradition of design-focused workplace studies has focused on *work practice,* with applications such as Uber, technology is directly involved in labour issues. That is, pay, flexibility and work conditions – not only in how the work is done but also the conditions under which it is done. We explore how HCI can study labour impacts, but also the potential for thinking about 'pro-social' technology and labour design [23].

To do this we document how Uber changes and produces a new form of taxi driving. This refers to the intensification of work, de-skilling and re-skilling, the flexibility and new control of work; all resulting from this introduction of technology. This does not mean that we need to abandon the close attention to work practice that has been rightly emblematic of workplace studies, the "moment-by-moment flow of activity […] the situated integration of tools, documents, action, and interaction" [4]. This is a call to expand, not abandon, looking at the integration of tools and action. We thus maintain a focus

on the everyday work experience of traditional taxi drivers, Uber drivers and passengers. Taking a taxi ride has radically changed in quality and reliability, while at the same time for drivers, the work has become more flexible but also more demanding. Uber has also changed the skills required of drivers as the work of hunting for fares is being replaced by the demands of 'emotional labour'. The new economic opportunities presented by lowering barriers to entry are also tempered by new financial risks for Uber drivers. In the discussion we reflect upon opportunities to apply existing methods to understanding how technology mediates new labour relations, and how we might go about designing technology with labour issues in mind.

LITERATURE

Reviewing previous work we identified three aspects that are central to the issue at hand: taxi driving and the sharing economy in a broader sense as well as prior work on labour aspects of technology in use.

Taxi driving

The classic study of taxi driving by Fred Davis in 1952 [13] describes the anonymity of the taxi. A cabbie in a large city will probably never meet a passengers more than once; thus, "to a striking degree he is a practitioner *without reputation* because those who ride in his cab do not comprise, except perhaps in the most abstract sense, anything approximating a social group". More recent work echoes this, discussing taxi drivers' low mutual dependence and high mobility [14]. Perhaps the largest issue addressed by the academic literature on taxis is the role of government regulation [22]. Economists have argued for deregulating taxi markets (as operating in Sweden and Ireland), drawing attention to regulated markets like New York - where there are *fewer* taxis on the road now than in 1937 [37]. As Moore and Balaker [ibid] point out, regulatory regimes are frequently 'captured' by incumbents who manipulate the market for their benefit, to the cost of passenger and drivers. Long-term affect of regulatory measures to control the supply of taxi licenses can have unintended consequences. In London, a tough route-finding test–"The Knowledge"– has been used since 1865, to limit the supply of taxis, resulting in an ageing driver workforce and a shortage of cabs during anti-social hours at night and weekends.

Yet deregulation also has its shortcomings: [36] describes in detail the Irish experience of taxi industry deregulation, which began in 2000 with an overnight lifting of regulation resulting in the taxi market being flooded with drivers, lowering the reliability of the taxi market and tensions between drivers. These issues affect the role of taxis as a transport method of last resort for many groups [12]. For the US, Hodges [29] relates the history of New York drivers. In many US cities, New York included, tradable 'medallions', issued by the

municipality give the right to drive taxi. While the medallion system was originally implemented to constrain supply and maintain a decent living standard for taxi drivers, the current medallions owners seldom drive taxi themselves. Instead, self-employed drivers pay the owners for the right to drive, and these drivers enjoy no worker benefits and endure difficult conditions with low returns [ibid]. By 2004, Hodges notes that in New York the number of medallion owning-drivers was only 29%. Sharma's ethnographic work on taxi drivers illustrates not only the financially tough situation of cab drivers, but how their lives can become compacted under the demands of working long unsociable hours. As one of Sharma's drivers puts it: "It is a dog-eat-dog world for us drivers" [46, p66]

The sharing economy

With the advent of Uber the history of taxis comes to be connected to the growth of the 'sharing economy', a topic of growing interest. Ikkala and Lampinen [30] have discussed the AirBnB home rental service and in particular the role of homogeneity between host and guests. In a related way, the work of 'turkers' and Amazon's Mechanical Turk sharing exchange has also been extensively studied [26], with authors exploring the lack of balance between task providers and workers, as well as the design of crowd work [33], and of on-demand crowd work applications more specifically [49]. Hearn [24] is one critical voice that questions who profits from the work done to maintain a 'digital reputation'– highlighting the role played by workers in building company profitability but without sharing the benefits.

Uber is frequently included in discussions of the sharing economy [2, 38], although this designation is controversial. In contrast with traditional 'ride-sharing' the Uber ride is not shared as such, since the driver has to invest his time and labour to make the requested journey [10]. So far there is little academic literature specifically on Uber. Some exceptions include ridership surveys by Rayle et al [43], and Anderson's ethnographic studies of Uber drivers [2]. One recent CHI paper discusses the relationship of Uber drivers to the algorithms that Uber uses to allocate rides, arguing for greater transparency in how Uber's algorithms work to support drivers [34]. Alternatively, market reports, such as Sherpa Venture's [52] report based on the use of their 'sherpa' payment management tool, provide insight into complex issues such as driver payment. Two Uber commissioned reports also help to give a broad overview of drivers and their income [21, 50] arguing that Uber drivers, even after costs, are making more per hour than conventional taxi drivers. In this analysis, 59% of Uber's Chicago drivers make more than their community's median hourly wage ($16/hour net of costs).

In terms of media attention Uber has been the subject of extensive discussion; while initial discussion was overwhelmingly positive [9, 54], recent negative coverage has focused on the predatory actions of Uber itself [20], surge pricing, workers unionising and Uber's lowering of rates and drivers salaries [5, 10, 47]. This work provides a strong antidote to the overly positive renditions of the mainstream business press. This said, media reports frequently take either a strong pro- or anti-Uber perspective–with little empirical data on the experiences of drivers or passengers. There are both positive and negative elements, and it is worth describing both. Moreover, media reports seldomly discuss the taxi business before ride-sharing. Academic work can contribute in a way that media reports cannot; drawing lessons from the changes taking place.

Labour and Uber

To understand Uber we argue here for moving beyond work practice alone, to include looking at *labour*. If we turn to workplace study literature in CSCW, the main focus has been on work practice, in response to the early challenge in designing software to support collaborative work practice. Yet here there was also engagement with labour relations; Greenbaum's 1996 piece "Back to Labor" [19] drew on labour process discussions to support claims regarding the impact of technology on issues such as job security, promotion, work intensity, pay range, unemployment, skill and wages. Greenbaum talks about how a labour-oriented economic frame would study, "questions of wages, working conditions and contractual agreements (or lack of), as well as intensity of work. They also include issues of division of labour [and] the social relations surrounding the conditions under which people work." These thorny issues have not been a direct focus for studies of work at CSCW–perhaps because of the difficulty in directly connecting design with labour conditions *per se*. One exception is Pitchard *et al's* London bus driving studies [41, 42]. This said, labour issues have been more central in participatory design, and value centred design. More recently Hochheiser and Lazar have called on researchers "to move beyond interface design questions toward the consideration of larger contextual issues, societal and political questions [to] provide the context that informs efforts to proactively contribute to our collective understanding of appropriate design and use[s]" [27]. 'Sharing economy' apps like Uber, Taskrabbit, Mechanical Turk and Airbnb return labour issues to relevance, since the apps are involved in payment income, rates, productivity and conditions of the work being completed through them. This also connects with interest in the labour involved in systems such as Mechanical Turk, Wikipedia and the like [45, 49].

Labour–human exertion as part of production–has, of course, been a central concept in economics with a focus on the labour market [3], covering issues such as wage levels and inequality (with various work discussing two tier labour market models [40]), discrimination, market rigidities, job-employer matching (and mismatch) [3], and especially active government policies to support those who are absent from the labour market [25]. These investigations take a macro-perspective on labour, explaining econometric variables, rather than considering the practice aspects of labour, (exceptions to this include ethnographic work on experiences of low-wage work e.g. [48, 51], and the 'pragmatic turn' in socioeconomics [38]). One point relevant to our study here has been discussions of the mixed impact of flexibility on work. Research has suggested that flexibility can in turn lead to intensification of work effort. While employees may themselves report a preference for more flexible work arrangements, this can still come at personal cost such as reduced leisure time [39]. 'Flexicurity' is one concept which has been discussed as a route for governments to take an increased role supporting the security of income in a more flexible labour market [53]. This connects to discussions of peer-production and analysis of work in terms of flexible specialisation [17].

METHODS

Our goal was to study Uber driving, understand the changing practices and labour conditions, and how rideshare driving contrasted with traditional cab driving. The co-existence of traditional cab driving and ridesharing also presented the opportunity to contrast how Uber taxi services are changing a longstanding form of employment and transport. Taxi services also vary considerably from city to city–we wanted to contrast a 'mature' ridesharing city with another city.

Taxi driving is a diverse occupation–our sample aimed to reflect that diversity. We conducted 32 interviews with a mix of taxi drivers, Uber drivers and passengers, and two additional interviews with a taxi union and Uber representative. Drivers were recruited by requesting a ride via the Uber app, phoning to book a minicab, as well as traditional hailing on the street. The interviews started during the ride and were then continued at the end of the journey. Our status as passengers obviously impacted the interviews, although this did not appear to prevent drivers from being critical of their employers or the job. For passengers we recruited using social media, and an email list sent around a US-based internet company.

The interviews ranged from 20 to 70 mins in length (average 32 mins). We interviewed 8 traditional taxi drivers (2 SF taxis, 2 London mini cab, 4 London black cab), 17 Uber drivers (10 in London, 7 in SF), 7 Uber users (6 SF Users and 1 London user), a taxi drivers' union official and the general manager of Uber London. One of our London black cab drivers picked up for Uber ,and one of our Uber drivers was also a Lyft driver. While our passengers were balanced in terms of gender, the drivers recruited were all male (only 2% of taxi

drivers in the US are female [22]). For diversity and in part due to media reports questioning the safety of Uber for female passengers, we recruited one female Uber driver via social media, and interviewed over Skype. For the drivers, we took a two stage approach with verbal consent, followed by a short discussion about each driver's position to ensure they were comfortable with taking part, followed by the formal signed consent document and the interview itself (two drivers gave verbal but not written consent and were not included in the study). As a semi structured interview, we drew on an interview protocol covering the following topics – learning to become a driver, navigation, previous driving experience, comparing Uber, describe last fare and interactions with customers, these were combined with questions responding to topics that drivers introduced. Passenger interviews followed a similar pattern. Additional observations and analysis of driver forums, and discussions with Uber and Drivers Union personnel were formative in nature, and conducted at the beginning of the study.

All interviews were fully transcribed, and qualitative textual analysis deployed, giving close attention to the different perspectives represented within the interviews. Our approach draws upon an interpretivist stance, with the development of an understanding of the problems and practices of those being studied. The analysis involved coding the transcribed interviews using NVivo software, and the subsequent development of themes through an iterative process of concept development.

THE TAXIS TRADE: LONDON AND SAN FRANCISCO
The drivers are scared of the customers but also the customers are scared of the drivers

To understand some of the labour conditions of taxi driving it is worth outlining some features of existing cab and taxi work, and the role of Uber in changing these relationships. Cab driving is a dangerous job which, while low-paid, does offer opportunities for those excluded from other labour markets [12].

In London, the incumbent taxi business is segmented into black cabs, which can pick up passengers on the street, and mini-cabs, which cannot pickup and can only be allocated jobs by despatch companies. Black cabs charge higher fares, are regulated by city authorities, and the drivers need to pass a very difficult route-finding exam ('the knowledge'), which typically takes three or four years to complete.

In contrast, the San Francisco cab business is less segmented, although cab driving has an equally complex history and cab drivers must pass an exam and work with 'a medallion'–a city license. Historically medallions have changed hands for hundreds of thousands of dollars. In both cities there exist 'bandit' cabs (drivers working illegally) and a luxury limousine business. While entry to

this regulated market is not easy for new drivers, taxi driving has long been one job available to those with limited formal education.

As a low paid occupation, drivers are often badly treated by cab companies and frequently work long and unsociable hours. One feature of the job is that there is almost no limit on the hours one can work - indeed, some cars are shared between drivers so that the vehicle can be on the road continuously, but studies suggest that drivers average around 50 hours of work per week [29]. Regulation has a large impact on drivers' experiences. In de-regulated taxis markets (e.g. Stockholm, Dublin, San Diego) there are more drivers, pushing down the amount of passengers available per driver. In regulated US cities, drivers often must pay for rental and access to the 'medallion', which allows them to drive. The SF taxi organisation statistics suggest an income of around $11 an hour for drivers and US Labour Statistics calculate an average salary of $14.52 per hour [22]. This large variation is in part because of the difference in ownership of the car and medallion, but there is also chronic underreporting of salaries for tax avoidance purposes. One Australian study claimed 75% of drivers underreported income [22]. There are also considerable differences in drivers' ability to get fares, and in the hours they work, making the 'average' driver income elusive. Whatever the exact figure, it is clear that taxi driving is low paid - but above minimum wage - with opportunities to work long hours.

It was to these markets that Uber entered, first with its launch in San Francisco in 2009, and internationally into over 200 cities worldwide, entering the London market in 2012. With Uber, a potential driver with a suitable vehicle can sign up online and submit details for a background check. If they are approved they are sent a phone, and are ready to work when logged into the app. For users, downloading the app allows them (after entering credit card details) to hail cabs using the app, which then come to the location they select on the app. The app manages all communication between customer and driver before they meet, payment and then offers a star-rating 'review' where both passenger and driver can review each other.

The terms used to describe Uber, and rideshare apps more generally, can display different orientations towards these apps. The market leaders Uber and Lyft prefer 'ridesharing', in part to avoid some of the legislative issues around taxis. While this nominally connects these services to the sharing economy there are significant differences: specifically, for many, driving is their livelihood. Those from the taxi business sometimes refer to these apps as 'e-hail' and some analysts use the term 'on demand labour' (this term at least acknowledges the importance of drivers as providers of the service). While as a term 'ridesharing' has some limitations it is the most

common term so we will use that term here. Uber is by far the market leader, all our drivers worked for Uber, and all our passengers used Uber almost exclusively.

FINDINGS

We organize our findings in terms of three stakeholders involved here and begin by looking at the work practices of each: Firstly, traditional taxi drivers then contrasting this with those of Uber drivers. Lastly, we examine how passengers experience the changes in taxi business since their motivations and decisions influence how taxi driving develops.

TRADITIONAL TAXI DRIVERS

An impact of city regulation is that taxis are significantly more expensive to own and operate than regular cars. Combined with the need to have a city licence to drive, drivers start the day owing money. One SF driver picked up his car at 5am and complained that he didn't earn anything for the first three hours of his nine hour shift.

Getting rides

Most cab drivers are only paid if they get rides–so one of the first demands of the job is to find passengers. Both London black cab drivers and SF yellow cab drivers relied largely on watching for passengers hailing them on the street. Some London drivers talked about how they did not take just any ride, but 'interviewed' passengers to gauge if the ride was worthwhile or 'troublesome':

Yeah, you have an interview at the door, you don't just get in. I always speak to ya before you get in. (L2, London Black Cab Driver)

You get this sixth sense about people straight away. Whenever I've ignored it, I've paid for it. Sometimes I just drive past people. On a look, on a view. May not be able to sort of put into words very easily, but my eyes and my brain say, "Don't take this person." (L1, London Black Cab Driver)

With a job as dangerous as taxi driving some caution about passengers may be reasonable - in Northern Ireland many taxi drivers lost their lives due to sectarian killings [29]. Yet the 'interview' can cause issues for passengers - one study suggested that taxis are around 11% less likely to stop for an African American passenger [12].

The ride

Once a passenger is in the cab, the driver needs to navigate to the destination requested by the passenger. The London black taxi drivers made the least use of technology, relying upon their expert knowledge of the city obtained as part of their qualification process, yet they did make some use of GPS and mapping systems:

Yeah. That thing now, it makes me lazy…I've got to be honest. Within that machine, you've probably got most of "The Knowledge" in it. (L1, London Black Cab Driver)

Overall, however black cab drivers were quick to defend their hard earned knowledge of the city. As one driver put it, *"Many times in recent years, sat navs have gone against [black cab] drivers in London and they've never been able to beat us"*. For London mini-cab and SF drivers there was a mix of their own route knowledge and use of GPS if it was an unfamiliar destination. Clearly the GPS has become an established part of taxi driving.

The interaction with the customer is one part of the drivers' job that requires constant assessment and flexibility. One SF driver talked about how in cases where a passenger seemed in some difficulty, they would give the passenger a free fare:

I had a man get in the car. He's in a suit and he's got a bouquet. He says, "I'm in a hurry. I'm getting married." I said, "Dude, I'm giving you this ride free." He's like, "Oh, you're awesome." I said, "Listen, you buy one more bottle of champagne and you toast that bride and here's to the cabbie." (SF1, SF Yellow Cab Driver)

There was also a darker side of the relationship with passengers, with passengers behaving inappropriately in the car and causing additional time and cost for the driver but also adding potential risk. Working the night shift causes particular problems in that passengers are frequently inebriated, with resulting problems of behaviour, violence and even issues with passengers vomiting in the car, putting a car off the road and causing considerable financial hardship for the driver. Other threats include passengers running from a cab without paying or even attempting to rob the driver. Indeed, cab driving is a dangerous business, more dangerous than firefighting or law enforcement [18].

Payment

How many rides, and who they pick up, has a big impact on drivers salaries. Amongst traditional taxi drivers there was considerable competition over passengers and turning fares quickly enough. One driver spoke about how his skills let him grab good fares over other drivers:

It makes me more money than the other cab drivers. They're not smart enough or they're stubborn… why give away the secrets? Let them learn them themselves. (SF1, SF Yellow Cab driver)

Davis' classic paper, "The cab driver and their fare" talks at length about the importance of tipping for drivers, and the lengths to which drivers went to maximise their tips, including 'the hard luck story', 'fumbling for change', classifying passengers by their propensity to tip and at times even passing over passengers who seemed unlikely to tip the driver. Yet the drivers we spoke to seem less concerned about tips, seeing them as something they had little control over. For payment, the traditional taxi drivers talked about the popularity of cash over cards for taxis, two drivers put this down to tax avoidance:

We're talking about tax evasion. That's what you're talking about. Even if you only even declare that which you take there [via credit cards] and then you take a syphon of a certain amount of cash. You've got to declare something. (L1, London Black Cab Driver)

UBER DRIVERS
Compared with taxi driving Uber driving has significant differences and in addition each city context has unique features. For example, in London, a prospective Uber driver must acquire a Private Hire Vehicle regulatory license (PHV) to confirm their vehicle's complies with European standards emissions - determining the vehicle will be less than 5 years old. Since they need no previous knowledge in navigating through the city, the entry requirements focus on the driver background, such as scanning for criminal records and confirming duration of driving experience. In San Francisco, a normal driving licence is sufficient, and access to the rideshare app is remarkably streamlined; the driver, their documentation and vehicle are scrutinised and approved if found suitable by Uber. This procedure requires little contact between driver and company and was described by most drivers as rather effortless. Subsequently, the relationship between Uber and their drivers is managed almost entirely though the app:

Basically I started with them, and that was it. I don't think I've ever spoken to anyone from Uber after that. (SF4, SF Uber driver)

For Uber drivers the app supports a much greater flexibility in when they work. Many of our drivers studied or worked on other jobs (e.g. paramedic, video editor). Working with Uber could be switched on and off with no need to fit into a schedule:

I'm a paramedic, so we have weird schedules. When I was looking for a part time job, it was difficult finding something that would fit with my schedule. This was very flexible and can work whenever I want on the days off. If I don't want to work, I don't have to, so it's great. (SF4, SF Uber driver)

Survey work documents that Uber drivers on the whole worked fewer hours than cab drivers – with Uber often supplementing an income from other jobs or fitted around other commitments [21, 50].

Getting rides
The working routine of the Uber driver is similar in some regards to that of the traditional driver. While they do not have to pick up the cab, they still have to acquire customers, navigate to their destination and get paid. The Uber app is central to this, amalgamating the ride despatch function of a traditional cab firm, along with 'innovations' such as review ratings, navigation and payment. To obtain fares a driver logs into the app and indicates they are ready to drive, (these and other features can be viewed in online videos posted online as part of

Uber's training program). After dropping a passenger off, drivers waited to pick up another fare, sometimes 'dead-heading' (driving back empty to busy spots for next ride):

It's good for drivers too. Anywhere I drop... there's a job. Anywhere in London. Even the other day I went to eh, where's the tennis, Wimbledon. I drove somebody there. I was thinking of, oh my god, now have to drive all the way back into town. As soon as I cleared the job there was a job. And I go there [Wimbledon] for maybe one hour, you know, up and down there and in there. (L12, London Uber driver)

According to Uber, jobs are allocated to cars that are closest to the fare, although some drivers queried this since at times they would be allocated jobs that appeared far away. While drivers can decide whether to accept a ride, they are only given a name, distance, address and passenger rating, and they are penalised by Uber if they reject too many rides. Once allocated a ride, the driver then needs to drive to where the passenger is and find them. This can involve some searching or calling the potential passenger. The information provided via the app to both driver and passenger can be ambiguous:

Sometimes there's five or six cars and you see them asking are you for so-and-so? But you can look for the registration number and to match the driver's face. Then they get into the car and go. (L18, London Uber driver)

During the ride
Another aspect of taxi driving which has radically changed is the importance of navigation knowledge. Although some of the Uber drivers took pride in knowing 'their' city, most of them had not undergone any formal training in terms of routes or maps and relied heavily on the use of GPS systems. While the Uber application provides an in-built map, this was often considered unreliable and navigation was conducted instead using Google maps, and Waze because of their ability to provide real-time traffic information.

Compared to traditional taxis social interaction plays a more central role. Some drivers saw the interaction with their customers as a positive job experience: *So the interaction is fabulous... I really enjoy it a lot. Not being from the city I get a lot of great information about things, about the city, places to eat, places to go, different things of that nature. (SF14, SF Uber driver, female)*

Indeed some drivers are motivated by the social experience as much as the income, with some of our drivers claiming that they only drove occasionally, and did so for social interaction with others. This touches on the distinctive self-image Uber drivers have compared to that of incumbent taxi drivers. As we have described earlier, the importance of navigation, finding customers as well as payment processing have been deprioritised by the Uber app, whereas skills of engaging with passengers shape the self-image of the Uber driver. Several drivers,

in particular in San Francisco, underline that they would not want to be associated with taxi drivers:

I actually… took the classes of being a taxi driver. I passed, I got my license, but I never started … it didn't seem like something I wanted to do for work. With Uber, you work on your time... It's very flexible, so when you're free, when you have free time, you actually are not tired. To start up in a taxi, they've been driving since 3:00 in the morning. They may feel all tired. Just like when we're tired, we don't try to talk to nobody or social. So it's understandable in a way. (SF6, SF Uber Driver)

This is perhaps not accidental: in their advertising, Uber themselves have emphasized the "luxury" nature of their service, and indeed launched first as a limousine service. Perhaps then one of the biggest achievements of Uber's marketing is to create the brand to be seen as something distinct and superior to the existing world of taxis, even though in many cases they are cheaper and less regulated.

Ratings

Another aspect of the app that differs from traditional cab driving is the use of *ratings*. Drivers are rated by passengers, between 1 and 5, and drivers receiving reliably low scores are suspended from the Uber service. This acts as a form of surveillance and performance rating on drivers, forcing them to attend to passengers, and causing considerable anguish when their rating falls: *"...we really work hard to have those stars."*

This adds a form of 'emotional labour' [28] to the job– alongside the responsibility of driving safely and efficiently, the driver is now required to adapt to customers' social and emotional needs. Further, minority drivers may be additionally burdened to overcome discriminatory preconceptions involving 'identity work' in order to conform with passenger expectations [44]. Unlike traffic rules or navigation, there is no direct form of measurement or set of rules. Thus the driver might feel rather dependent on the customer's arbitrary rating:

Sometimes I just think the people, they either don't pay attention to the ratings are, some people are on it, some people definitely recognise that it holds stature – but some people I think are just kind of willy nilly with it. (SF7, SF Uber driver)

This said, the rating system has increased the drivers' sense of control and security when it comes to the passengers they pick up. Because customers are registered and rated, Uber creates a stronger perceived connectedness between driver and customer:

It's a huge, huge difference in the technology that's applied to Uber versus taxis… all of the things that are involved with the car and Uber to really make it solidly safe. What I mean by that is that we know who's getting into the car when they are getting in, everything's

connected to their credit card, we don't carry cash, If anything were to happen to us the vehicle has a tracker… I wouldn't recommend being a woman taxi driver because anything could happen (SF14, SF Uber driver, female)

Getting paid

The customer preregistration payment system has made Uber taxi payment easier, and drivers no longer are required to process transactions in the car, or to carry cash. Uber collects payment through the app directly at the time of the journey completion, and pays the driver on a weekly basis. Although we recruited drivers by taking rides we were surprised about how critical drivers were of Uber - in terms of their controlling policy. Even though the company defines the relationship with its drivers as a 'partnership', drivers suspect they carry the risks alone:

Of course they make a lot of money with me, and they don't spend nothing… They don't spend the gas, they don't spend the maintenance for the car, they don't do nothing. How do you think they're worth $15 billion? Do you think they make it from the customer? No...They make it from the drivers. (SF7, SF Uber driver)

Uber alone sets the rates and has driven rates down in many markets. This means that drivers have a falling income, and their have also been recent legal actions concerning the potential status of Uber drivers as employees and not contractors. Still drivers have mixed feelings about unionisation – rates of unionisation in the taxi business overall have always been low [29]:

So as far as joining a union they don't have any, nor would I probably even join it. As far as being self-employed I've done other stints as working as a freelancer so I kind of equate in some aspects to being self-employed. (SF6, SF Uber driver)

UBER PASSENGERS

Being a passenger in a traditional cab is an experience familiar to many around the world, with taxis filling important gaps in public transporting, supporting transport for those with disabilities, alongside participants and workers in the night-time economy. When discussing the use of Uber amongst passengers, the traditional taxi was a common point of comparison. Due to the fact that our sample was skewed, in that we recruited self-declared Uber users, our Uber passengers were at times hostile and dismissive of taxi drivers and the taxi experience. Nevertheless, drawing on their experience of both Uber and traditional taxis, their views on the differences between the two services provided important observations regarding changing labour conditions:

The vast majority of them are not nice people. They're grumpy and it's like, why on earth would I want to ride with you. (SF11, SF Uber passenger)

Getting rides

For a passenger, before using the Uber app they must obtain an Uber account and registration requires the customer hold a valid credit card, and a valid billing address. This means that Uber cannot be used by the 10% or so of the American population without a bank account, and other 'unbanked' passengers around the world. Indeed, some of the Uber drivers talked about problems with users 'borrowing' other Uber accounts. Deciding whether to take a taxi, or an Uber, involves making judgements about time, distance and cost. One survey of Uber users in San Francisco, for example, found that if Uber was not available, around 8% would not have made the trip, 39% would have taken a taxi, 33% would have used public transit and 6% would have driven [43]. For the passengers we spoke to they found the app preferable to the somewhat unpredictable experience of hailing a cab on the street, with Uber giving more information before and during the ride:

In the city to get to the airport I found it much more reliable to get an Uber than a taxi just because in San Francisco... It's just difficult, especially if you don't live on the main streets. If you live off the (main) streets, cabs are so hard to come by. Uber was guaranteed because they knew who had called them, they had my credit card. (SF10, SF Uber Passenger)

For some, Uber had even become an established part of their routine, used in preference to mass transit:

I don't use public transit. I use Uber. I was just like, if I'm going to go to Berkeley, instead of taking the BART, and having to find the times, and getting the tickets, and getting there prior, I might as well just take my own car. [...] I find using Uber is so much easier since you can see where the cars are. You can know the exact arrival time. Usually it's 5 minutes or less. (SF12, SFUber Passenger)

Practicalities of parking and issues around alcohol consumption were motivators for Uber use, with passengers using Uber, "when I'm drinking" or, "if I know that there's going to be no parking." Questions of whether to take a Uber are not simply practical, but involves judgments about whether it is a journey one can "reasonably" take by taxi, or whether a certain journey is too extravagant to take by taxi. Journeys that took place as part of nights out eating or drinking, for example, were more 'taxi-able' than routine trips to work. Regardless of the cheaper price of Uber, these rides were still considered 'a treat'. Overall the passengers we interviewed had integrated the use of Uber into their transportation routines; convenience and price being major factors of this less disruptive experience.

Once an Uber has been ordered the application shows a countdown until the driver arrives, alongside a picture of the driver and some details of the vehicle. When using the Uber service, a passenger is essentially getting into a stranger's car yet our Uber passengers described this as preferable to getting into a taxi, claiming that as a private car it would be better maintained than a taxi cab. Being in the driver's own car seemed to create something of a more direct relationship between passenger and driver, whereas the relationship between traditional taxi driver and a fleet cab is much more loose, and less accountable.

They'll keep the uptake of it better because they know, again, it's creating that relationship and that comfortness and that safety and secure. You don't want to get in a car and have a half a sandwich in the back or somebody's shoe, all the scenarios that you get in a cab in New York City or San Francisco…

Yet there was also some acknowledgement of the unusual situation of getting into a stranger's car:

…I have a buddy [...] he ordered a car and a Prius pulled upon the corner and he just got in the back seat and he goes "Hi, Raoul" The driver turns around and goes, "Who in the hell is Raoul and why are you in my car?" It wasn't an Uber car and he just jumped in it. I said dude, that's how you can get shot. (SF9, SF Uber passenger)

Security of the ride

When actually in the car and on route it seemed that the security of the ride came to the fore. There was a concern for not being 'ripped off' by the driver, something that was lamented as being a challenge of taking a taxi. The ability with Uber to see the ride on the receipt afterwards, as well as the rating system, all contributed to the perception of Uber's reliability:

In all honesty, I keep Google maps open and I will comment if they go off course. You just want to keep an eye that there is an understanding of where it is we want to go to. Also, just I keep the map open from a security consideration. I want to know we are going where we are meant to be going. (L13, London Uber Passenger)

Here security can also take on a stronger meaning, in the sense of the driver not harming the passenger:

If you're in transit the app will show you where your car is. It gives me that extra sense of comfort and safety that someone is tracking where the car was if for any reason I had an issue to be concerned about. (SF10, SF Uber Passenger)

Security is an important aspect for customers. While traditional drivers have to go through checks that are at least as strenuous as those for Uber, our passengers perceived Uber drivers as more trustworthy. Yet this might have been more about the ways in which the drivers themselves were perceived. Certainly in terms of the journey itself our Uber customers talked at length about the level of service, that Uber drivers were friendlier, and that they were more similar to themselves.

Our passengers also talked extensively about the social aspects of the journey experience. In this, the perceived insociability of the taxi driver was to be taken for granted: *"I feel like cabdrivers are just very like cabdrivers, like they're focused on just driving the car."* However, there were much higher expectations with Uber drivers - small talk seems to be an expected part of the Uber journey. The passenger could decide whether to engage with the social interaction, but passengers had extra rights to be critical of drivers' conversations. Earlier work discusses the 'homophily' of the sharing economy, in that often similar 'types' of people use these services (in terms of class, education and race). From our Uber passengers' point of view, this was presented less problematically as, "Uber drivers are like me":

They're more like people I would, just seem probably even people that I work with, that I know. My friend drives for Lyft, although he doesn't want anyone to know he's actually doing it. (SF11, SF Uber Passenger)

Ratings
At the end of the journey drivers are rated by passengers, and vice versa. Many of our passengers did not know that they were rated by drivers, and could be refused rides if they had low ratings. As for rating drivers, most passengers would give stars, although would drop stars on a perhaps rather harsh basis. Some passengers even saw giving low ratings as a 'service' to drivers, to inform them of problems with their service:

I gave him 2 stars, but then they make you write why you're giving it and what they could've done better. I left a little note, and say he didn't have a GPS and so I had to do it. (SF12, SF Uber Passenger)

The rating system was viewed positively by passengers as contributing to a feeling of enhanced quality and control within the social interaction of the Uber ride.

You're like a waiter, so you have to build that relationship at the table. (SF9, SF Uber Passenger)

Payment
Ultimately the Uber ride closes with payment. The automatic nature of the payment through the app, and the emailed receipt were much appreciated by the customers, again in contrast to traditional taxis who would refuse payment by credit card, and the need to tip a taxi driver:

With tips sometimes I feel this pressure because I'm handing them cash, but I actually have to tip them otherwise they'll say something or they'll give you a dirty look, things like that. It's nice with Uber, it's like, okay, I know you're just going to charge my credit card, I don't have to worry about any of that stuff. (SF11, SF Uber passenger)

The automated payment had unexpected ramifications. One was the possibility of someone else paying for an account - in particular parents paying for their children's Uber rides, and then being able to track their location via the receipts:

Maybe because it's not my credit card, it's my parent's. That's always great. I know a ton of parents in LA who aren't getting their kids cars for their 16th birthday anymore. They're just getting them their own Uber account, and they can just take Uber whenever they want. [...] Everybody stays out until 4 in the morning on school nights. It's not great. It's a way for parents to track through the receipts, what their kids are doing, where they're taking the cars, where they're going. (SF12, SF Uber passenger)

DISCUSSION
Uber is a distributed mobile system that enables a new form of co-ordination between drivers and passengers, producing a labour relationship between driver, passenger and Uber. While not a 'classic' CSCW system, it does have some similarities to classic workflow systems, managing the allocation of work, and monitoring its completion. Yet the Uber app is much more than just job allocation - it affects drivers' livelihoods, jobs and employment. In this discussion there are three main points we will touch on. First, we explore how on-demand labour systems Uber could be better designed. Second, we discuss understanding Uber in the context of the workplace studies program - and the opportunities from drawing on workplace studies to understand distributed labour markets and their impact on workers. But lastly we attempt to go slightly broader and engage with the issue of *designing for labour* – taking labour more directly into our concerns in HCI.

Designing for passengers and drivers
The interaction between passenger and driver, although fleeting, is an interesting one to reflect upon for design. Uber themselves have collaborated with Spotify to allow passengers to choose what music to play in the car. Other concepts might include sharing information about drivers to passengers, allowing passengers to request a 'quiet ride' or to request particular routes. Indeed, specific requests made prior to the ride might have a different meaning to those made during the ride. One current (potentially problematic) method of driver/passenger interaction is the 5-star rating system. As discussed above, this can be fraught for drivers, in that some passengers might calibrate their rating differently (such as never giving a 5). An alternative rating system might be simpler - thumbs up or thumbs down, or use a word cloud to give a qualitative rather than a numerical rating. Another issue discussed by both passengers and drivers concerns payment. There are legitimately cases where passengers might use another person's Uber account – not currently supported by Uber or Lyft. Perhaps more seriously the reliance on a credit card for payment excludes the 'unbanked' – the around 7% of US

households that do not hold a bank account [15]. Gift cards purchased in shops could be one way of addressing this group. Indeed, more broadly there are potential ways these services could be used to support the mobility of groups who suffer from low-access to public transport.

Extending Workplace Studies

A related goal of this paper has been to extend the workplace studies tradition to consider changing labour conditions. In this study we have taken classic CSCW concerns such as skills, practice and reputation, and combined them with new issues such as payment, work flexibility and intensification. Workplace studies, with a focus on understanding the details of practice, let us understand how the experiences of drivers and passengers are changing and how the skills of taxi driving are changing alongside the role of customer reviews. Taking this further we see two new issues for workplace studies.

First, money and remuneration have been neglected topics in CSCW, and HCI more broadly [32], despite their importance in technology and everyday life. With Uber, work is not simply allocated; drivers take jobs because they will be paid for them. This means that the livelihood of those involved is an important element of the system. The review-based system can push out drivers who do not gain good reviews, and passengers without credit cards cannot even use the service. Uber thus demonstrates how issues around collaboration are intermingled with those around money - the relationship between driver and passenger is hardly one of ride-sharing [8], but rather service provision.

A second point concerns the disruption of existing work arrangements by collaborative technologies. Uber is clearly a disruptive system in that it is radically changing the market for taxi operations in many parts of the world. Here we have discussed the connections and contrasts between the existing taxi business and Uber, and how Uber is different for both drivers and passengers. How can we study CSCW technologies and the potential disruption they may bring to existing work situations? In the case of Uber, existing drivers and taxi firms clearly lose, yet passengers gain a better service, (at least initially). While discussions of technology and disruption have been dominated by entrepreneurial positions (e.g. [11]), these do not provide the analytical frame for novel work relations. Workplace studies has new potential to study labour concerns and technology-driven change.

Designing for labour

A more general point from this work concerns the question of Uber and its business objectives. Uber is a for profit entity, as it is for other on-demand labour providers. At times there can be a direct conflict between the needs of users, and the profit motive of the host company. Uber claims to have created over 162,000 new jobs in the US since they were founded [50]. While there is an on-going debate concerning drivers' employment

status [35], Uber is clearly responsible for creating considerable new economic activity. While we might not think of the HCI role in creating new earning opportunities, clearly our apps are having an impact on the labour market. Indeed, as Harvey *et al* [23] point out, "HCI researchers are in a novel position to positively intervene in a bid to create a stronger, fairer economy". One future avenue for research is to explore the *labour relations* enabled in our designs: who has control, and what is required in making not just successful apps but sites for equitable exchange. Engaging with payment and employment more fully could also help us understanding more the range of motivations for, and consequences of using technology - as Bellotti *et al* [7] point out, peer-to-peer systems involving money are often more successful than those based on more idealistic motivations.

A related avenue is to explore creating new types of collaborative systems that are online on-demand labour markets [44], like Uber. While we may worry about the possibility of creating low-value or insecure jobs, as Uber shows, the benefits and costs can be more complex. On-demand labour is not without the dangers of casualization, but the flexibility it provides can provide real benefits to those who desire short or lightweight work commitments. We might even consider the role of researchers to influence, and even subvert labour-related intricacies and inequalities embedded in existing technological systems. One example of this is Irani *et al*'s "Turkopticon" browser plug-in to let Mechanical Turk workers review employment providers, to balance out the original one-sided rating system [31]. Sherpashare is a similar attempt involving an app that tracks car movement and uses this to help drivers manage and track their expenses. Experimenting with these systems may allow us to understand better the nature of on-demand labour, as well as support more equitable exchanges between workers and marketplace organisers.

CONCLUSIONS

We have started here to outline some new opportunities for design and research in understanding the intersection between technology, labour and design. Yet this also generates new responsibilities: Recognising our potential role in designing on-demand labour markets and working with the ecology surrounding these new markets. This requires taking the benefits and dangers that systems like Uber bring seriously, in particular, for those who rely on them for their livelihood. Our goal has been to outline not only how technology is changing labour, but also to understand the complex relationships between markets, technology and those who labour. It is here we see interesting potential for future research.

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