Peer-to-peer in the Workplace: A View from the Road

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ABSTRACT
This paper contributes to the growing literature on peer-to-peer (P2P) applications through an ethnographic study of auto-rickshaw drivers in Bengaluru, India. We describe how the adoption of a P2P application, Ola, which connects passengers to rickshaws, changes drivers work practices. Ola is part of the 'peer services' phenomenon which enable new types of ad-hoc trade in labour, skills and goods. Auto-rickshaw drivers present an interesting case because prior to Ola few had used Smartphones or the Internet. Furthermore, as financially vulnerable workers in the informal sector, concerns about driver welfare become prominent. Whilst technologies may promise to improve livelihoods, they do not necessarily deliver [57]. We describe how Ola does little to change the uncertainty which characterizes an auto drivers' day. This leads us to consider how a more equitable and inclusive system might be designed.

Author Keywords
Workplace studies; ethnography; P2P technology; auto-rickshaws; peer services; peer economy; ridesharing, ICTD

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI), H.5.3 Group and Organization Interfaces, Collaborative Computing, K.4.3 Organizational Impacts

INTRODUCTION
The recent proliferation of 'peer services' has enabled new types of ad-hoc trade in labour, skills, knowledge and material goods [e.g. 26,53,31,2] using web and mobile technologies with peer-to-peer (P2P) architectures. Services range from hospitality [26] to lending a helping hand [53] to transportation [34,32] and are often, collectively, called the 'gig', 'alternative', 'collaborative', 'peer' or 'sharing' economy [2,38,58]. Whilst all use P2P architectures, these groups include diverse sets of practices involving exchanging varied resources, for monetary or non-monetary gain, and for employment or not. We are interested in the use of peer services in the workplace and in this paper examine Ola Auto, an implementation to connect customers and auto-rickshaw (auto) drivers. Olacabs, an Indian start-up, added Ola Auto (or Ola) to its taxi-booking services in November 2014. Like Uber its closest competitor, Olacabs does not own taxis or autos but links customers to owner-drivers for specific trips with P2P technology, similar to apps that enable ride-sharing.

We conducted an ethnographic study of auto drivers in Bengaluru, India. By focusing on their adoption of Ola, we aim to understand where and how the app impacts auto-driving for the purposes of design. HCI has long been interested in the impact of new technologies on work-practices [7,8,25,54]. Introducing technology changes existing practices and typically brings both benefits and disruptions [e.g. 7,10,25]. By examining in detail how the work is achieved in, and through, people's actions and interactions with technology and one another, workplace studies draw attention to the knowledge and skills of workers [49,50,55]. Such studies open up spaces for (re)designing technology to better support that work [9,5,15,45].

We focus on how drivers use P2P technology as part of their work. What makes this setting unique is that auto-rickshaw drivers in India have had little exposure to computing technologies, such as the smartphones on which Ola runs. For most drivers using Ola was their first use of smartphones and the first and only way they accessed the Internet. Furthermore drivers are classified as urban poor [40], working in the informal sector [13], which means their welfare is an important concern when introducing new technologies. Autos provide 13% of the city's total trips [59], and auto-driving is the source of livelihood for approximately 125,000 drivers and their families in Bengaluru alone. Many people who travel by auto also do not use smartphones, that is the technology is not yet pervasive among drivers or their passengers. In this study we observed both drivers who had and had not adopted Ola to understand how Ola was changing existing practice. As far

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as we are aware this is the first study of this type of peer service for work outside of the Global North.

Olacabs, like Uber, acts as a 'Digital Middleman' [28] to connect customers and drivers through the algorithms, networks and data they control. They set fares, receive ride requests, offer and assign rides to drivers, and use real-time and historical data to manage assignment and, possibly, payment rates. The distribution of computing at the driver and customer ends of the P2P architecture is limited to requesting, accepting, paying for and rating rides. Whilst the introduction of new technology into such a setting might offer hope in improving livelihoods, it also brings concerns. New technology can create new poorly paid and unregulated markets [20,27,6,11] and various ICTD studies show that technology deployments in developing countries often fail to produce sustained positive changes in the life of vulnerable populations (see [57] for an extensive list). Our study enables examining the impact of a P2P transportation platform on the auto drivers' work. We found that drivers use Ola alongside their usual methods to find passengers and, despite incentives, do not prioritize Ola over traditional passengers. Ola introduces new elements of competition and evaluation, but does little to change the uncertainty characterizing an auto drivers' day. These insights prompted us to consider redesign of the system, to better support drivers' expertise, literacies and skills, and how P2P architectures might be used in optimal mediation to benefit all actors - drivers, customers and digital middlemen. We are motivated by a view, held by the original P2P movement, that superior solutions involving diverse peers can be achieved provided there is a sense of fairness in distributing resources [41]. Here, we orient our in-depth understanding of work practices, with and without Ola, towards new design ideas for a more equitable and inclusive system.

RELATED WORK

Workplace technologies in the transportation sector

Peer services that link passengers to drivers join a range of computer technologies in the transport industry, and add to debates about their effects on skills and freedoms in workplaces. Automated dispatch systems, that remotely monitor pickup and drop-off and use optimisation algorithms, became prevalent in taxis in many countries in the 1990s and GPS a decade later [47]. Debate about the effects of such systems becomes more complex for a peer economy involving financially vulnerable workers in developing regions.

Analysis of US vehicle ownership in taxi firms suggests that computerised dispatch systems promote central organisation and unskilled labour because key routines are more efficient and firms can lease more cars to drivers who are unfamiliar with the spatial and temporal patterns of the business [47]. However, several extensive ethnographic studies suggest transformations are more nuanced and GPS-enabled systems do not change jobs from skilled to unskilled [24,22]. Contrary to studies on London's taxi drivers [19] and the opinions of some experienced local drivers [24], technologies can induce various innovative practices amongst drivers. Drivers in Barcelona, for instance, acquired a "Satnav literacy" in mastering skills to interpret, assess and tackle the varying accuracy of GPS information [22]. GPS modified only part of drivers' practices and, while transforming practices in learning, lost usefulness when drivers were familiar with areas [22]. Indeed, in New York drivers tuned their use of Uber and Lyft's ridesharing apps to accommodate their local knowledge [32]. Meanwhile, in Singapore, a GPS-enabled taxi-dispatch system obliged drivers to move beyond their former geographic haunts and gain new temporal and spatial knowledge [24]. This enabled some to reach places unknown to other drivers, and some to gain insights about precise 'hot-spots' to 'capture', not wait for, customers.

Just as GPS-enabled systems change, rather than eliminate, wayfinding skills, they can change social skills [22,33]. Not needing to ask for route information can limit drivers' conversations with passengers, colleagues and locals [22]. On the other hand, drivers used GPS-enabled systems as guides to places where there are interesting customers to talk with [24] and to propose alternate routes for customers to choose from to avoid complaints [22]. Meanwhile, Lyft and Uber's ridesharing apps provoked social interactions, online and in streets, to reduce the effects of algorithmic 'errors' [32].

Technologies for the workers

Designing workplace technologies to be inclusive is not simple. Consider how Uber or Lyft drivers with more technical expertise and social capital often benefited most from collaboratively tackling issues arising due to the ridesharing app's algorithms [32]. Consider also how drivers with most knowledge about a dispatch systems' functionality earned highest incomes and had lower costs and those with less knowledge worked longer hours or maintained only a basic income [24]. Indeed, the competitive pressure that the system induced constrained some drivers, who were older, could not read the system's texts easily, were disturbed by it, and only used the system in a perfunctory way.

Inclusion in workplaces that are mediated by technology requires both access to those technologies and literacies in the representations and communication forms they use. Many efforts in India have tackled exclusion amongst low-income communities by designing text-free interfaces [42,43]. For example, Medhi et al. [37] designed a mobile phone interface for a job portal for service workers who typically have limited print and technological literacy.

Whilst accessible devices and interfaces are important for the auto drivers, they are not sufficient in fairly distributing resources across peers. Toyama [57] proposes that technologies in development contexts can, in fact, magnify existing differences in society. Even in developed countries, the peer economy often disadvantages, or provides few benefits to, people on no/low-incomes or in economically poorer communities [e.g. [16,56,28, 29]. They are most susceptible to exploitation, subjected to low wages, underpayment or ad-

verse working conditions and incur relatively more expensive liabilities and insurances [39,28]. Concerns about workers' rights are common for many digital micro-task crowdsourcing platforms, such as TaskRabbit and Amazon Mechanical Turk (AMT) [27, 35]. Technology platforms often create new working relationships, where digital middlemen [28], like AMT and Uber, operate in something of a grey area of poorly regulated labour markets [20,11] in which they do not identify as employers [46].

Accounting for the diverse experience, knowledge and skills workers have, or develop with technology, is also vital for inclusion; and an opportunity to achieve superior services. Recognising experience, knowledge and skills requires shifting focus towards workers' practices and away from technological platforms, which inherently privilege certain literacies [e.g. 3]. A body of research on micro-task work has begun to rectify prior emphasis on technology in examining crowdsourcing [27,35,23,30]. Thus, as is customary in workplace studies, we use ethnographic methods to understand the technology in use [9, 25, 45] and take the workers' perspective [50,55].

Two key issues that arise when taking the workers' perspective are choice and control. Providing workers with sufficient information about how a system works enables informed choice while opacity leads to distrust. Consider, for instance, the suspicions that some drivers in New York expressed because Uber's and Lyft's ride assignment algorithms were unclear [32]. Distrust and resistance often arise in the transport sector when in-vehicle computers are introduced, partly in response to the surveillance that many afford [44]. Trust is easily compromised in employment relationships [see 24] and, so too, in peer systems. For instance, drivers were dissatisfied with Uber and Lyft's customer ratings, which many found unfair [32] or arbitrary [48]. Choice and control are also integral to the original P2P movement's ethos and to considering the effects of workplace technologies on economically vulnerable people in developing regions. Sen defined development as a freedom both in constitutive and instrumental ways [52]. Taxi drivers note that they appreciate the freedom to schedule their itineraries and select destinations and types of passengers permitted by some dispatch systems [24]. This sense of freedom associates with fully understanding the system [24], which is not always true for Uber or Lyft's apps and some drivers prefer their regular taxi dispatch systems because they enable seeing and choosing freely between incoming requests [32].

In this paper we describe Ola's effects on the practices of auto drivers, both as a P2P service in dispatching rides and as the drivers' first experience of workplace technology. After explaining our methods and the context, we show how Ola fits into, and changes, drivers' practices. We conclude by considering the implications of these insights to designing a P2P service that might offer more effective, and also more inclusive and equitable, dispatch.

METHOD AND FIELD SITE

We conducted an ethnographic study of auto drivers in Bengaluru, April-July 2015. We used observation and in-situ and semi-structured interviewing to get a rich picture of drivers' practices, concerns and perceptions of technology. We observed 23 drivers (12 using Ola), during 14 days in the field, and conducted 48 semi-structured interviews (21 using Ola). Our population consists of 66 individual drivers, as we both observed and interviewed a few drivers. All field encounters were conducted in the official language of Karnataka state, Kannada, by a researcher fluent in it.

Drivers were recruited to our study by Three Wheel United (TWU), a social enterprise that helps auto drivers to buy their own autos; and Peace Auto, a network of auto drivers which campaigns for their rights. Recruitment was based on availability and willingness to take part and use or non-use of Ola. Drivers gave verbal consent to participate, with separate agreements to audio recording and photographs.

We observed the auto drivers as they went about their normal business, looking for and carrying passengers, taking breaks and so on. To avoid interfering with the process of picking up passengers, we followed behind an auto in a second auto. We identified pairs of drivers and hired the following auto to carry us at a fixed rate, set by TWU. For the first part of the day we sat in one auto and then changed to the other. The observed driver went about his normal business, whilst we followed, hopping out for short in situ interviews when the occasion arose (traffic lights, tea breaks, etc.). If the driver was using Ola, he signaled to us when he got an Ola ride and we got into his auto to drive to the passenger's destination. In the separate semi-structured interviews, we asked drivers about their biographical data, technology use, financial situation and work. For those using Ola we focused on the impact of Ola in their life, how they understood it and started using it, etc.

Data was collected through field-notes, audio recordings and photographs. The interviews were translated and transcribed. Our analysis took a broadly ethno-methodologial (EM) perspective [21]. EM ethnographies explicate the knowledgeable, artful ways in which participants orient to their work and reveal the ways in which technologies and other arfefacts are used as part of the accomplishment of work (see e.g. [10,49]). These rich insights have proved useful in informing the (re-) design of technologies to support or transform work [15,12,45].

DRIVER DEMOGRAPHICS AND DRIVING CONTEXT

The auto industry is male dominated and all 66 drivers in our study are male. Their average age was 39 years and 76% were 30-50 years old, which is representative of auto drivers in general [14]. As well as Kannada, most drivers speak at least one other language (typically Hindi, Tamil or Telugu) and 36 had some understanding of three or more languages, often including English. Most did not own a personal smart phone, and almost none had accessed the Internet, although two got their children to look up things

for them. Ten participants had never been to school, 20 dropped out after primary school, 28 completed high school, and 8 studied beyond high school.

Participants had an average of 14 years driving experience and the most experienced had 38 years of auto driving experience. Surveys typically classify Indian auto drivers as urban poor (based on housing and income) [40]. The average daily income of the majority of participants, after fuel and maintenance costs, was 600-800 INR (approx. USD8-11). An exceptional few earned more than 1000INR. Most were the sole earners in their families. Typically, drivers had enough income to cover their daily expenses but few were able to save though most wished to. With no buffer if events incurred additional costs, like [40] we classify the majority of drivers in our study as financially vulnerable.

Each city in India has its own norms about rickshaw drivers' use of meters, and use is hotly contested. Drivers in Bengaluru should use their meters but, while a considerable proportion do, use varies for different parts of the city, times of day and types of ride. Customers may have to approach multiple autos to find one prepared to use the meter. Drivers in our study almost always used their meter, as all were associated with TWU, who like Ola, require meter use. Ola passengers pay a 'convenience charge' on top of the meter fare, which varies at peak and off-peak times. Ola also pays an incentive to drivers if they carry a set number of Ola passengers in a day. This scheme changes regularly and drivers complained that incentives have declined. Being an auto driver (without Ola)

Driving an auto in Bengaluru is a hot, noisy, polluted business, in frequent heavy traffic, with typically long hours. 12-hour days, excluding breaks, are common. Drivers reported two busy periods, from 7am to midday and from 4pm to 8pm and many take a break during the hottest part of the day. The primary orientation of drivers is to find passengers, as they often struggle to get enough rides to make an adequate daily wage. Passengers and drivers locate each other by sight: drivers cruise slowly near the pavement at promising locations, i.e. where there are people on the street. They may be flagged down, by a hand wave, shout, and/or eye contact, or just slow down for people who are standing by the roadside or carrying baggage. They favor particular locations such as bus stops, schools, hospitals, etc., often planning a route , in whichever vicinity they happen to be in, to pass these places.

Autonomy, control and uncertainty

Auto drivers appreciate their independence. Each driver works for himself. Thus drivers can choose their hours and structure their day according to their priorities and preferences, e.g. taking their children to school. However, an important caveat to this flexibility is that they are not earning when they are not working. Furthermore, drivers have no control over passengers' availability and they often drive empty for some unpredictable period of the day. Their tight financial circumstances, limits the choices they actually make when out on the road. Despite preferring long or short rides or particular locations, drivers typically go wherever passengers want to go, except for the end of the day when tiredness or the need to get home may intervene.

As Mr. A says "*Just because I prefer not take some rides doesn't mean I don't. If I haven't gotten many rides, then I will have to take it, whether I like it or not. In the afternoon, I do not refuse anybody"*

Only 3 of 23 participants declined passengers during our observations. This arose when driver and passenger did not know the destination; passengers outnumbered seats, and would not pay enough extra; or, the ride was 'too short' (although other drivers prefer short rides). Being an auto driver is thus characterized by control over some aspects of working life but also by uncertainty and inconsistency.

Dealing with Uncertainty

Since drivers do not know for sure where they will find their next passenger, they employ various tactics to manage the uncertainty. 1) Driving around ('rounding') is the most common tactic and many drivers said they did not like to stop in one place for long.

*"I only do rounding to find passengers. I don't wait at any stands because it's a waste of time and then we feel lazy to drive passengers' around" (*Mr. B)

Drivers' decisions about what to do next account for a set of factors. These include the need to find passengers; the need for rest/to escape the sun; the payoff between using petrol in 'rounding' vs missing passengers and a losing momentum while stationary. 2) Drivers use their local knowledge of where and when they might find passengers in deciding what to do next. Mr. C picked up a passenger driving on a quite narrow internal lane. When we asked how he knew to come into this area, he said "*I know the area really well since I live around here and where I might find passengers*". Drivers have certain places they like to head to at particular times, such as hospitals, schools, cinemas, bus stops, offices, shopping malls. Yet none are guaranteed and drivers are not surprised if unsuccessful. 3) Drivers organize themselves to cover both peak hour periods, and some like to drive when others do not, such as on religious holidays or at midday when many take a break.

STARTING OLA

When auto drivers' sign-up, Olacabs gives them a locked smart phone, running the Ola app, in English, Kannada or Hindi. This is the first smartphone most drivers have used. Ola runs a 2-hour training program on "*how to use the device, how you should accept if you get a ride, how to keep your auto, how to behave with the passengers*" (Mr. D). Most drivers in our study mastered the device and the app, often after putting some effort into learning to use them.

MR. E: "*I found it difficult to use for a couple of days but now it's easy. It's in Kannada. I find it easy to understand*"

Some drivers reported getting help from fellow drivers and we saw drivers discussing troubles with the device. However, drivers have different levels of education and access to support when they have a problem. Even simple problems can be a barrier and not all drivers will ask for help. One driver had been unable to logon to his device for 2 weeks until a fieldworker spotted and fixed a simple number entry error, whereupon he logged in and got a ride. Drivers can call Olacabs, but they are not always very helpful or can forfeit up to a whole day's work by going to and waiting at the often busy office. Thus, drivers may delay going, preferring to drive without Ola than to lose a day's wages.

Most drivers in our study who tried to use Ola were able to learn, including at least one auto driver who had not been to school. However, education did seem to play a role in how easy Ola was to master, and concern about being unable to use it was a barrier to adoption for some non-users. A few drivers told us they would not join Ola as they might not be able to use the app because they had not been to school.

Figure 1: Passenger interface

Figure 2: Ola device mounted in auto-rickshaw

FINDING PASSENGERS WITH OLA

The most obvious changes when using Ola are the ways drivers and customers find one another and negotiate (Fig 1). Without Ola, drivers locate passengers by sight, negotiate whether to take them then set off towards their destination. Typically, this interaction takes just a few seconds. Ola changes the dynamics as drivers must first accept the passenger's request then physically locate them, and do not negotiate with the customer.

Once a customer confirms they want an auto, a request is broadcast to available drivers within a radius determined by the Ola algorithm, which appears to start at 2km. The driver is notified of the request by a loud beep and a pop-up box on the screen showing the pick-up and drop locations, labeled as area names. The driver has 30 seconds to respond to the request if no one else accepts the ride but, as drivers are usually competing, they often have just a few seconds to respond. Since only one driver can accept a request a split second can make all the difference. To enable them to see and respond rapidly to requests, drivers mount the device on a holder attached to their windscreen (Fig 2).

Being available for Ola requests

To be able to accept an Ola passenger, drivers must make themselves available for Ola requests. To do so they must be both in the radius to receive the request and free to accept it. Firstly, with regards to being within the request radius, Ola customers are not distributed evenly across the city. As customers must have a smart phone and Internet access to use the app, they concentrate in certain areas, which we call Ola Hotspots. Hotspots include software companies, certain business areas and areas "*where auto drivers refuse to take passengers or demand a lot over the meter*" (Mr. F). Drivers determine where Hotspots are because they hear many Ola beeps when they drive through them. Thus, although the technology mediates the search for passengers the auto drivers still actively 'seek out' Ola passengers. Some drivers changed their habits to spend more time in Hotspots. However, just as there may be many passengers in these Hotspots there were also many drivers. Other drivers just carried on as normal – if they are in those areas they will get Ola rides, if they are not they will find passengers the traditional way. There is no guarantee of getting a ride in these areas either. For instance, Mr. D stops at an Ola Hotspot every day outside a business school; yet, during our observations he waited 50 minutes before getting a non-Ola passenger. On another day whilst cruising around a different area Mr. R expressed surprise at not receiving any Ola requests at that hour. It was peak hour and he usually hears tens of requests there.

Secondly, all the drivers in our study used Ola alongside their traditional methods of picking up passengers. They do not accept new requests that come in when they have non-Ola passengers in their autos. However, Ola cannot detect a non-Ola passenger and depicts any driver that is logged in and not already engaged in an Ola ride as available. This means customers often see a representation of autos in their vicinity that is imprecise and may see autos on the map when being notified that there are no available autos.

Accepting Ola requests

Most drivers tried to accept the rides that came when they were available. However, they accounted for various factors in accepting a request. This includes the customer's pick-up and drop-off and their own location, traffic conditions and time of day. Travelling to the customer takes fuel and time and most drivers are unwilling to travel more than 2km to pick-up. Ola passengers pay the driver a 'convenience charge' of 10 INR over the meter, which compensates for the extra costs in fuel and phone calls, as discussed below.

"*If the passenger is a short distance away say, 1-1.5Kms, I can travel there and pick him up because I will at least get the extra 10 rupees from the customer. If the customer is over 2.5Kms, then it's a loss for me*" (Mr. G)

Drivers do not always have enough information to make a good decision. Mr. H explains, "*Now, the catch is the device doesn't show how far away the driver is from the pickup address. Sometimes we end up accepting it and then*

realize the distance of the pickup location from ours. The initial message […] only shows the area". Areas vary widely in scale, from just 1Km to 5km across. Drivers most common tactic is to accept and then, if it is too far, cancel or ask the passenger to cancel. Cancellations can, however, impact drivers' ratings, as we discuss later. Another tactic is to ignore rides when traffic conditions are poor. One driver reported how he and other drivers did not accept Ola rides in peak hours "*Because Ola will send a message to the passenger assuring that the driver will arrive in 5 minutes but it is not possible to reach a pickup location which is 1.5-2 Km away in such a short span of time".*

Drivers said that they only refused Ola rides on the basis of drop location at the end of the day, unless the destination was unknown. This reflects their practices with traditional passengers, although without Ola they can check if the passenger knows the destination.

Picking up the passenger

Having won an Ola ride, auto drivers must locate their passenger. As Ola does not give the exact pick-up location it often took 3-4 phone calls between drivers and customers to achieve a pick-up. Typically, drivers start heading towards the pick-up, following the map, to give customers time to call. If the customer does not contact them most drivers will call but some just cancel. Keeping an adequate credit balance on their phones is necessary for drivers to use Ola effectively but a financial burden. Drivers' preference for customers to call them fits expectations that people with more money call those with less [17,4]. However, the nature of the service transaction confounds this, particularly since drivers of taxis almost always call passengers.

Ola introduces a new uncertainty into the transaction: will the customer actually be at pick-up location? Since passengers can jump into any passing auto, waiting for an Ola auto is more burdensome, particularly since Ola's estimation of arrival time is often inaccurate. Thus, customers cancel their ride or, in the worst-case, leave before the driver arrives. As Mr. I reports "*I have never gone to the passengers and get complaints from them about me being late. They don't even wait that long, they just book another ride and I don't find the passenger there when I go there." "This has happened to me 4-5 times. […] This upsets me a lot*."

Negotiation

The Ola app replaces the need to negotiate fares, which is a clear benefit for the customer. One customer said, *"no negotiations need to be done which is what I like. If I take a regular auto […] 95% of them charge me one and a half time during the day"*. Drivers in our study typically charge by the meter and take any passenger, thus almost no negotiation with the passenger occurred even without Ola and little has changed by moving this 'negotiation' onto the app. However, as we mentioned, when the driver does not know the destination the app precludes any compromise, as the driver has little choice but to turn down the ride.

INTERWEAVING OLA WITH TRADITIONAL RIDES

Despite changing how customers and drivers find each other in some ways, much of the work of auto driving remains the same. Drivers incorporated Ola into existing routines and use it alongside their existing methods for getting passengers. On first glance, this is because drivers do not get enough Ola rides for it to be their sole means of business. Most drivers reported getting 2-5 Ola rides a day, and the next largest category was 6-8 rides. Yet, there is more to it than this. Drivers typically accept only a few of the many requests they hear day in Ola Hotspots. As Mr. J explains *"In a day, I get around 10-20 rides but I can't attend to all the 20 rides because I will have passengers in my auto.* […] *Some days I get 2 rides* […] *The most I have got is 5 rides*". Ola passengers compete with traditional passengers for rides, and most Ola requests come during the peak hours, when auto drivers are already busiest. Few come in when drivers most need to find passengers, as Mr. A describes *"Very rarely do we get 1 or 2 Ola rides in the afternoon*".

To encourage drivers to take Ola requests, Olacabs pays drivers an incentive of 10 INR off-peak and 40 INR on-peak per ride, if they get three or more rides a day. Nonetheless drivers do not choose to wait for an Ola request if they can get a traditional passenger instead. This is partly because getting Ola passengers is just as unpredictable as getting traditional passengers, as Mr. K says "*It depends on our luck*". Mr. L explains "*if you wait for Ola rides to come in when you are waiting at a particular location […] you end up waiting all day without getting either normal or Ola passengers*". Added to this are the extra costs and the risk the passenger might not wait. Mr. I confirms, "*In the evening too, if I'm near a company, I get rides on the street from them, who will go 1-2 kms to pick up somebody else from Ola? At these times, it doesn't really come of use*." Most drivers therefore continue to do rounds, only waiting during the quiet part of the day, just as they would for non-Ola passengers. To adapt an old idiom, a passenger in the hand is worth two in the bush.

Some drivers don't even make enough rides to get the incentives. Some long-term users reported that increasing competition had reduced rides per day. "*I can't guarantee that I might get incentives"* Mr. G said "*because they have 3 rides as a minimum for incentives and I don't get 3 rides every day"*. Even the promise of incentives will not make drivers wait for an Ola passenger. Obtaining the incentives involves elements of chance: being in the right place at the right time, without a passenger. This unpredictability combines with the unpredictability of getting traditional passengers and the constraints drivers operate under - the need to get enough rides to cover their living costs.

To conclude, whilst some drivers were very positive, saying Ola has increased their earnings or reduced their hours, others reported little impact on earnings or hours. Most were rather muted in their appreciation. They were glad of the extra rides, especially in quiet periods or places but, since

most Ola rides come at busy times and in busy areas, Ola did not produce a big change in their working lives.

COMPETITION

Drivers compete for non-Ola passengers at the side of the road. They rush towards potential passengers and negotiations start on a roughly first-come-first-served basis. Interrupting an ongoing negotiation can result in fights and rarely happens. A driver's success largely depends on his ability to locate a potential passenger, quickly reach them, and the outcome of the previous negotiation. With Ola drivers compete through the app, rushing to be the first to hit accept. The Ola competition introduces new elements.

First, whereas previously they only competed with the autos in sight of a passenger, now drivers compete with all Ola drivers in the request radius. Second, Ola's algorithm intervenes in this competition by influencing a drivers' chance of getting a ride. The drivers do not know how the request is distributed. In fact it is unclear whether the request is broadcast simultaneously to all drivers in the radius or from nearest to farthest over time, or to drivers with higher passenger- or Ola- ratings. Indeed, the algorithm is likely to change over time. What is important here is that it is Ola who controls the algorithm and its workings are not transparent to the drivers, as [32] also reported.

Finally, this new competition is only available by using Ola and, thus, disproportionately impacts on drivers who cannot, or do not believe they can, use the system. Consider Mr. B, a driver of 35 years who never went to school and cannot read and write. He is skilled at locating passengers and prides himself on knowing every nook and cranny of the city and alternative routes. Mr. B thinks Ola lets inexperienced drivers win rides that would otherwise be his:

"*Look at all these young and new auto drivers! They do not even know the roads and places. Yet, they are now getting the passengers using this new mobile phone. They take the rides, and then ask people on the road about the routes. […] If they did not have that phone, they would never get these passengers, when they did not know the destinations*."

Although none of the drivers in our study took rides when they did not know the destination, it is true that the app does not distinguish between drivers' expertise. Of course, even knowledgeable, experienced and highly skilled auto drivers cannot get Ola rides if they do not use the app. Further, whilst the app is relatively easy to use by people with schooling, drivers with little formal education are less able to use it and also may lack confidence in trying. Some, particularly older drivers, were unwilling to attempt to use it.

The introduction of Ola and Uber also puts auto drivers in more direct competition with cabs. Only autos can pick-up passengers directly from the side of the road, making them the 'go to' transport for immediate journeys. However, peer services have changed the dynamics of taxi booking, showing which cabs are nearby and enabling booking on a click. This, plus reduced cab fares for Ola taxis, make taxis a more attractive choice than previously. Whilst autos have a lower minimum fare, above that threshold cabs are cheaper per Km. A number of drivers mentioned their concern. "*The rate of the car has become less and is very competitive to the auto prices. The only reason a passenger might prefer an auto over a car because we can zip through traffic if need be. […] They are also increasing the number of cabs on the road which results in less business for us*" (Mr. M). Although not all drivers were concerned e.g. Mr. J "*People who prefer Ola cabs book Ola cabs and people who book Ola autos book Ola autos*".

From one perspective the Ola Auto app puts autos and cabs on a little more equal footing. However, some auto drivers were suspicious that Olacabs might be biased towards cabs while assigning rides. A couple complained that Ola intentionally shows less autos and more cabs, to encourage passengers to take cabs. Although there is no concrete evidence to support it, the drivers' claim shows mistrust in Ola and concern that it is not working to their benefit.

EVALUATION

Drivers are evaluated by their passengers and by Olacabs. When a passenger logs onto the app after completing a ride, they are prompted to select 1-5 stars and give a rationale from a pre-defined list. The driver sees a cumulative rating (number of stars) on the front page of his app. All the drivers had noticed the stars, but they were not always sure about how they worked. Some drivers did not even know they were from the passengers, but even if they did, they found it hard to understand why their ratings changed.

Mr. N said, "*The Ola people have said that the stars are related to the customer rating the driver. Sometimes in the afternoon, I have lesser stars and it increases in the evening. Some days when I have accepted lots of rides, I get lesser stars and some days when I barely have any passengers, I get rated high. I am not entirely sure why this happens.*"

Features of the implementation make understanding the stars difficult as drivers cannot associate a change in rating with a ride. They do not see individual passengers' ratings and because updates in ratings depend on when customers next open the app, there are erratic time intervals between rides and ratings. Further, drivers are unclear about how Olacabs rates them, as illustrated by Mr. O, "*I have seen the rating but do not know much about it. They just told us that our ratings go up when we take more rides and will go down if we cancel or reject a ride.*" Olacabs rates the drivers on certain aspects of their performance, such as number of accepted rides per day, number of cancellations, etc. However, it is unclear which, if any, of these aspects feed into the stars and whether the ratings feed into ride request algorithms or will do in the future. In the absence of concrete information, some drivers based their hypotheses on the partial information that they received from Ola and their own observations, similar to [32]. Some described customer ratings, some described Olacabs ratings, some described a

bit of both, e.g. Mr. A "*It increases if we take on more rides and/or if any customer gives me a 5 rating*".

Living with ratings

Drivers expressed varied opinions on the rating system, however the majority thought that it had some impact on them, even if they were not always sure what. Some saw it as a reflection of their performance, e.g. Mr. P said, "*If we get 4 stars it means we are the best driver"*, and some could be quite affected by a poor rating. Mr. Q explained, "*When I reject the ride, my stars go down. I then get very upset and switch off the phone and put it away.*". Others, who understood the system well, even reminded passengers to rate them, e.g. Mr. A said, "*I tell them at the end of each ride to give a rating. But sometimes they forget"*. One driver, Mr. J, believed the rating was connected to the number of rides he got, "*If my stars increase, I get more rides.*". Interestingly Mr. J also said he was indifferent to the stars "*If these stars points change it doesn't really affect me much. Yesterday it was 3.9, today it's 3 but that doesn't make any difference to me*". A few drivers said this, however even if Mr. J is indifferent he still keeps track of what his rating actually is. Finally, similar to [32], a few drivers were critical that the rating system did not capture the reasons for accepting or rejecting a ride. That is, the measurements were too gross to capture drivers' real performance.

DISCUSSION

Auto drivers are a financially vulnerable population that works long hours in a physically demanding job. Drivers' primary orientation is to find enough passengers each day to cover their basic living costs. Potentially, peer services, like Ola, may offer ways to increase drivers' livelihoods or improve their quality of life. Insights into how drivers incorporated Ola into their work practices and the advantages and problems they experienced in using Ola can inform ideas for a more equitable and inclusive system that, ultimately, will offer a superior solution for passengers, drivers and the digital middlemen.

Despite its potential Ola does not seem to appreciably transform the situation for drivers. While passengers get an auto service to their doorstep with a few key presses and phone calls, drivers carry the burden of locating a passenger in a timely manner once they have won a request. Only a few reported that using Ola had increased their earnings or reduced the number of hours they worked, and some reported that initial improvements in earnings declined over time.

Perhaps most importantly, Ola has not reduced the uncertainty of an auto driver's day. This is largely because they do not get enough Ola rides per day and crucially most Ola rides are requested when they are already busy. Interestingly, even the peak hour incentive of 40INR per passenger, after 3 rides, is not enough to persuade drivers to prefer Ola over traditional passengers. Although they get many Ola requests during peak hours when in Hotspots, drivers continue to take traditional passengers as normal and only accept Ola requests if they happen to come when they are empty. This is because getting an Ola passenger is no more predictable than getting a traditional passenger. Indeed Ola introduces new elements of uncertainty around getting enough rides to make the incentives, when a request will come in, winning requests, how far away the request is, whether and for how long the passenger will wait at the pick-up point and whether a drop-off will be far-off or in an Ola Hotspot.

Changing skills?

Before Ola, finding passengers on the road was mostly dependent on the driver's expertise. Like taxi drivers [47], a skilled auto driver is one who possesses knowledge about the spatial and temporal variation in demand and knowledge about routes around Bengaluru, including shortcuts through, and locations within, warrens of small internal streets that crisscross many areas. Ola introduces digital and print literacy alongside driver's existing passenger-finding and wayfinding literacies. Despite ease of use, Ola is not equally accessible in the auto driver community and excludes some drivers based on their (perceived) capability to adopt the technology, not their auto-driving skills. Further, it is possible that Ola may enable unskilled drivers to win rides they would not have got previously, which could result in a poorer service for customers. There is no evidence in our study of this, other than Mr. B's experience, as no participant was a newly qualified drivers. The drivers using Ola employed their geographical expertise just as they would without it. In fact, Ola tested drivers' geographical skills and knowledge more because they have less information to go on. Firstly, they must decide to accept or reject an Ola request without knowing the exact destination; and secondly, Ola removes collaborations that ensure at least one person in the auto knows the destination.

P2P in the workplace

Control

Choice and control is integral to the P2P movement's ethos and is vital in considering the effects of workplace technologies on economically vulnerable people in developing regions. While auto drivers value the independence and flexibility offered by their jobs, in reality the financial constraints on their operation limit the choices they actually make, both with and without Ola. At the moment, the drivers in our study maintained their independence largely because, like CabLink drivers [24], they could use the system as one in a set of ways to get passengers. However, using Ola could erode drivers' independence if Ola passengers dominate the marketplace to advance the role of the middleman and the influence of Ola's algorithm in mediating the passenger-driver relationship. Drivers' experience and knowledge, about when and where to find passengers, routes and locations, does not influence Ola's algorithm or the role it plays, and drivers have little understanding of how the system works. Such a shift in the marketplace is likely to be some way off in Bengaluru, given the socio-economic situation of many who use autos. Nonetheless to some extent Ola erodes drivers' freedom and control, with

little benefit so far. Yet, this does not have to be the case. Both [24] and [32] described taxi dispatch systems that enabled greater freedom and choice, and appropriations that support local knowledge.

Transparency

There are three places in which a lack of transparency in the Ola app impacts on drivers. Firstly, the working of the Ola algorithm is not transparent. For example, drivers do not have enough information about the distance between their current and the pick-up location to consistently make good decisions on whether or not to accept a ride. They assume that requests tend to be broadcast in a 2km radius, and should be fine to accept. Yet sometimes requests are broadcast much further and even 2km can be too far in peak hours. This can lead drivers or passengers to cancel rides, with penalties to a driver's ratings if he cancels.

Secondly, most drivers still prefer rounding to find passengers. This is partly because they rely on a mixture of Ola and traditional passengers and also because Ola Hotspots can be quite large and may increase competition. Currently, drivers understand the Ola landscape from personal experience. It is only by driving around that they come across where requests often/never come in, and where and when they have good/poor chances of winning a request. The mass of information that the Ola system produces from the collectivity of drivers and customers is currently not used, at least not for the benefit of the drivers. In theory this information could be made available to, and improved upon, by drivers who already organize themselves to cover quiet times, holidays and so on.

Thirdly, drivers poorly understand the rating system. Both passengers and Ola rate the drivers on various factors but, like the drivers, we do not know whether and how such ratings feed into ride assignments. This leads us to ask who is the rating system for? In its current form is not actionable by drivers, who have little idea why their ratings change in seemingly random ways. Thus, even if drivers want to act to improve their performance they cannot do so. If it is not for the drivers then, presumably, it is for Ola to determine who are good or bad drivers and identify dissatisfied customers. However, the ambiguous and subjective nature of the ratings makes it impossible for drivers to determine what is required to be a good driver.

There is also a deeper issue involved here that relates to introducing an evaluation system into drivers' daily work. While all are aware of the rating schema, drivers respond in different ways. Some try to adapt to this new culture, e.g. by reminding customers to rate them, whereas others profess indifference. This raises a second question around whether Ola is correctly measuring driver performance. Since Ola does not provide enough information for drivers to make a well informed choice on ride acceptance, they are often 'late', miss passengers, or cancel rides. All of these effects can impact drivers' ratings. Lee et al's [32] study on the Uber and Lyft drivers in USA shows that drivers in the shared economy are concerned about their rating, and critical about the perceived errors produced by algorithms for rating. The online social network of those drivers provides a platform for them to get united, blacklist misbehaving passengers, and thus develop a communal effort to balance the power equation. However, with limited Internet access, infra-structural support and digital literacy, such online unity is unlikely be common amongst Indian auto drivers. It is also reminiscent of crowd-workers who receive little useful feedback on their work and, thus, find it hard to improve or to challenge misconceptions built into a platform [23,35].

Another interesting aspect of Ola's evaluation system involves the power dynamics in the relationship between the drivers and passengers. Some studies in developing contexts suggest that technology amplifies difference [57]. If ratings feed into ride assignments, they could affect a driver's earnings. Since our study Olacabs has introduced driver ratings of passengers, which may balance the situation a little. However, passengers are unlikely to suffer the same impact from bad ratings. While the rating may affect the chance of a passenger to get a ride or make her pay more for it, for a driver it is a question of livelihood.

DESIGN REFLECTIONS

Recently we have seen the emergence of new types of technologically-mediated marketplaces creating new forms of organization. Studies of crowdwork show that for all their apparent novelty, markets such as AMT recreate existing hierarchies. For example, favoring employers over employees [27] or enabling different experiences in different populations [36]. The strident media debate about sectors of the peer economy such as Uber raise parallel concerns [6,28,38,39]. In both these markets workers are portrayed as independent contractors. Our study shows how Ola actually reduces the independence of drivers, by meditating between them and customers, but does little too reduce the uncertainty of auto-driving. Like a growing group of researchers studying crowdsourcing [36,51], we believe it does not have to be this way. More equitable re-design that takes seriously the rights and requirements of the workers could produce more sustainable marketplaces and benefit all the parties in the equation (e.g. drivers, customers and Ola). In speaking to notions of choice and control and the problems that arise from the lack of transparency, our findings echo those of studies of another technologically-mediated marketplace, AMT. Thus, to spark design ideas we compare what is hidden and revealed in AMT and Ola along three axis.

1. Making the work visible

Unlike AMT, Ola does not make all **work** visible to all involved. Drivers see specific jobs one-at-a-time, as Ola alerts them, and only drivers with print literacy can read the jobs. One set of design reflections, therefore, concern making work more visible by improving accessibility, providing better information about individual rides and comprehensively representing rides, autos and spatiotemporal patterns

of rides. Access could be widened by designing for low print literacy [see e.g. 37]; for example, notifying with spoken place names instead of Ola's beep. To support drivers' decision-making about individual rides, ride requests could contain more information e.g. show the pick-up as a sector on the map or providing estimates of time to pick-up.

Greater potential benefits could result from sharing information about patterns in Ola and non-Ola ride requests, available autos and traffic conditions. Information about Ola ride request patterns (e.g. volume, frequency, location) currently resides only with Ola, while information about real-time non-Ola passengers and traffic conditions is fragmented across drivers on the road. Empowering drivers to share real-time, information that adds to the data Ola already collects, stands to improve services to both Ola and non-Ola passengers. For instance, drivers could contribute to shared, dynamic images of the distribution of potential passengers and areas of congestion by sending alerts about surges in by-the-road passengers and/or traffic conditions in particular areas. Drivers seeking customers could access a view of surge areas or otherwise browse the 'ride map' of their locality. Meanwhile, Ola could improve time estimates to customers by accounting for the likely availability of autos based on recent busyness in an area. The reliability of updates about surge areas might be represented according to the number of drivers reporting a surge (e.g. darker shaded area for more reports).

2. Maximizing relationships

Whereas AMT hides **relationships between actors** (employer/workers) causing problems and workarounds [e.g.23], in Ola there is greater visibility, since drivers directly interact with individual customers, albeit transiently. Nonetheless, more could be done to enhance and benefit from customer-driver relationships. For example, individual drivers and customers have particular preferences and needs for particular rides. Drivers may know some areas better, be more flexible about waiting or driving short/long distances and most speak multiple languages. Similarly, customers may be in a hurry, require a certain language or a driver who knows the route; or have time to spare or be willing to navigate themselves. Incorporating preferences into the system could enable more sensitive ride assignment.

In current implementations, evaluation is a key part of the relationship but has little use since the rating system is not actionable and thus does not improve service. Drivers should be able to see the ratings of their last 2-3 customers, for instance, as well as their cumulative score. They should be encouraged to rate their customers, and customers who neither wait nor cancel a pick-up should face consequences. Olacabs should also make more visible the parameters of its own rating system and the effect they have on drivers. Finally, to support drivers in addressing barriers of technological literacy, a 'help me' request could enable drivers to identify others nearby able and prepared to assist in trouble-shooting or learning to use the system. This idea bears some similarities to a system that enabled rickshaw pullers in Dhaka, Bangladesh to get help in operating their mobile phones from their garage owner [1].

3. Making the role of the P2P provider visible

Current P2P and crowdsourcing services tend to position workers as independent agents or micro-entrepreneurs. This associates with a view is that P2P technologies allow greater freedom to workers as they ostensibly more directly connect customers with drivers. However, this view does not account for the influence of the service provider. Like Uber, Ola plays a powerful role in the market's operation, which directly impacts worker freedom. In Ola's case this substantially threatens to erode the freedom of drivers who previously operated independently. We do not argue that working independently is always optimal, but that the particular manifestation of power and control in these P2P systems is problematic. As Raval and Dourish note [46] crowdsourcing and P2P platform providers tend to hide their role in the marketplace in terms of both how much and how they operate. Digital middlemen, like Ola and Uber, can become pseudo-employers that manipulate the market to some extent without assuming any contractual responsibilities [23,27,35]. A fairer system to enable greater worker agency, by increasing the visibility of the P2P provider's role, is not, however, a simple proposition and is likely to be the topic of much future research.

Designing for multiple stakeholders

Whilst our design reflections largely focus on drivers' concerns, we are not oblivious to the concerns of the other stakeholders, notably the customers and Ola themselves. We believe that our suggestions should improve the customer experience. Our study revealed that customers are most concerned about price (specifically paying a fair price for the ride) and have low tolerance for waiting (e.g. they cancel rides or leave before the driver arrives). Our designs would enable customers to make more informed choices, based on better estimates of pick-up time and a view of the spatiotemporal landscape, and improve service due to less cancellation by drivers or passengers. Further, accounting for customer and driver preferences should improve the customer experience and worker satisfaction. More content workers are likely to produce a more robust and sustainable service. Certainly, Ola's rather fragile reputation with the driver community stands to benefit from improving the auto drivers' lot.

In summary

Design ideas that improve services might create few extra rides for auto drivers. However, enabling drivers to gain more insight about the ride landscape and better control in responding to this insight might help to ameliorate some of the uncertainty of their day and improve the quality of life, by reducing stress, such as found for some taxi-dispatch systems [22]. Perhaps, more generally, these design ideas illustrate the broader potential for P2P services to support the reasoned agency of all those interacting with them [49].

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