Computer Supported Cooperative Work (CSCW)
https://doi.org/10.1007/s10606-024-09501-1
ECSCW CONTRIBUTION

Fleeting Alliances and Frugal Collaboration in Piecework: A Video-Analysis of Food Delivery Work in India

Riyaj Shaikh[1]*, Moira McGregor[1], Barry Brown[1,2] & Airi Lampinen[1]
[1] *Department of Computer and Systems Sciences, Stockholm University, Stockholm, Sweden (E-mail: riyaj.shaikh@dsv.su.se; E-mail: mcgregor.moira@gmail.com; E-mail: barry@dsv.su.se, barry@di.ku.dk; E-mail: airi@dsv.su.se);* [2] *University of Copenhagen, Copenhagen, Denmark*
Accepted: 3 May 2024

Abstract. Food delivery platforms are designed to match on-demand workers with jobs and then manage, monitor, and assess their performance. These platforms provide workers with a digital representation of delivery work. Once a worker accepts a delivery job they need to deal with the complexities of an unsettled urban landscape with varied infrastructures, traffic, and regulations. In particular, the Global South presents a demanding context for this type of work, given less clearly mapped addresses alongside other socio-cultural intricacies. In order to understand how food delivery workers bridge gaps and mismatches between the demands of the app and the realities encountered *in situ*, for this paper we shadowed six delivery workers over the course of their working day delivering food in Pune, India. The six workers included a complete novice and more experienced riders. We used helmet mounted cameras to record the delivery work, and how our participants managed the extra demands of food delivery work during the COVID-19 pandemic. Our moment-by-moment analysis of the video data is informed by the methodological traditions of ethnomethodology and conversation analysis. While the food delivery platform imposes a detailed workflow expected to be performed alone by the worker, our detailed video analysis reveals the collaborative nature of delivery work. We highlight how workers draw upon their ability to participate in 'fleeting alliances' and produce 'frugal collaboration' with co-located others, such as other delivery workers or security guards. This allows them to resolve everyday troubles, often learning or imparting 'the tricks of the trade' in the process. While gig platforms have commonly been presented as disruptive technologies for coordinating, regulating, and assessing gig workers individually and independently, our findings highlight collaboration as a critically important aspect of food delivery work.

Key Words: Piecework, Gig work, Food delivery, Collaboration, COVID-19 pandemic, Video analysis, Ethnography

1. Introduction

It is a longstanding finding of Computer-Supported Cooperative Work (CSCW) that when work is defined or managed as a solo endeavour, it still comes to be reconfigured by those doing the work as a joint or collaborative activity. As shown

Published online: 21 June 2024

by Hughes et al. (2001) in their now classic CSCW work on banking, while the job of serving a customer is one where a worker supposedly works on their own, the work actually involves many different forms of collaboration around solving problems, making accountable decisions, and managing workflows. In this paper, we examine a similar 'solo' type of work: platform-mediated food delivery work (Richardson, 2019). Drawing on a video analysis of food delivery work performed during the COVID-19 pandemic in India, we consider in detail the collaborative aspects of this type of gig work – a work practice that prior work has characterised as socially isolating (Seetharaman et al., 2021) while, simultaneously, revealing it as a site for informal and formal network building (e.g., Gregory and Maldonado, 2020; Woodcock and Graham, 2020). In particular, we focus on how food delivery depends upon collaborative problem-solving that emerges as part of the workflow that delivery workers are tasked to follow.

Food delivery platforms match workers with jobs to collect food orders from restaurants and deliver them to customers in a timely way. Delivery workers are managed, monitored, and their performance is assessed, with minimal human intervention and high reliance on technology. This arrangement has been characterised as *algorithmic management* (Lee et al., 2015; Jarrahi et al., 2021). Workers are tasked to follow a rigid workflow and expected to carry out the work independently, in line with the platform's digital representation of the world where delivery work happens. However, as is no surprise to scholars within the CSCW community, there is a contrast between the way workflow technologies depict the work and what is actually needed to carry out the work in practice. It also tends to fall on the workers to find ways to bridge this gap (Bowers, 1994), that is, to overcome the kinds of everyday troubles that cause confusion and/or disorientation but that are also part of the ordinary experience of doing the work (Garfinkel and Bittner, 1967; Brown and Laurier, 2012). In this sense, our description of normal troubles follows Garfinkel's. That is to say, it is not just about the mundane or everyday nature of workplace problems, but, more specifically, the problem arises from the inherent unavoidable mismatch between the representations of the work, and the world in which they flow. The food delivery workers we focus on are engaged in piecework (Alkhatib et al., 2017), that is, they are paid per completed delivery rather than compensated for the time spent working. This heightens the importance of resolving any issues that come up during the workflow as quickly and efficiently as possible, so as to keep earning (Shaikh et al., 2023).

Our research questions are as follows: (1) What kinds of everyday troubles do food delivery workers need to tackle across the workflow to complete deliveries successfully? (2) How do food delivery workers resolve these issues in collaboration with co-located others? The close analysis of video data of platform-mediated food delivery work *in situ* is informed by the methodological traditions of ethnomethodology and conversation analysis, and draws upon *in vivo* methods (Brown et al., 2013). In identifying some of the 'normal, natural troubles' (Garfinkel and Bittner, 1967) that workers encounter as they deliver food, we

describe how workers came to rely upon collaborations with co-present others to be able to carry out the work. In particular, our findings highlight how workers draw upon their ability to partake in *frugal collaborations* with other workers, restaurant staff, or passersby; and to form *fleeting alliances* in order to resolve emergent troubles, such as making sense of the strictly controlled and timed workflows laid out in the app, while navigating their incompletely mapped urban landscape.

While the word 'frugal' may carry negative connotations, we borrow the descriptor from the concept of frugal innovation (Zeschky et al., 2011) which involves product design and development born of a situation of constraint and resulting in products and services to meet the relatively basic needs of consumers. In India, this approach may also be referred to as 'Jugaad' (Rai, 2019), that is, "a social practice best understood as a pragmatic, ad hoc, networked approach to an obstacle". This problem-solving approach looks for workaround solutions to critical issues using the meagre resources available locally, with a focus on achieving minimal, 'good-enough' feature sets at the exclusion of all non-essential functionality. Analogously, we propose our delivery riders are required by the constraints and demands of the platforms to engage in frugal collaboration with people and resources in their immediate vicinity, to find workarounds that allow them to progress through the delivery workflow. The frugality of this type of collaboration was not continuous joint activity with interdependent objectives, but rather it was by necessity ad hoc, swift, and opportunistic. Any collaborative acts among workers were balanced against the demands of the job and its time pressures (See Figure 1).

We show that quick collaborations are crucial for getting the work done, although they remain mostly unaccounted for by the platform. In discussion, we elaborate on frugal collaboration as interaction that, while neither supported nor acknowledged by the platform, is necessary to complete particular deliveries effectively. Over time, in resolving immediate issues, workers also learn from others, as members of a momentary workplace community. Frugal collaboration, then, also serves a valuable function as a mode of informal workplace training.

Our study offers a detailed understanding of how mismatches between the platforms' digital representation of the work, workspace, and workers' experiences *in situ* remain invisible to the platform and are left for the worker to resolve. Our empirical contribution is based on our close video analysis of the situated responses of workers to the troubles they encounter when carrying out delivery work, in particular how they resort to spontaneous, quick, and empathic acts of collaboration with co-present others to deal with the issues they encounter. While the workers carry out their delivery assignments independently, and even as they are forced to deal with the economic stakes of the work on their own, they still rely on collaboration both to complete individual tasks and to make sense of the shifting requirements and opaque algorithmic functioning of the work arrangement. Such mundane and minute collaborations formed by gig workers often go unaccounted for in gig research. We offer uniquely detailed video analysis of food delivery work, unearthing how gig workers collaborate at every stage of the food delivery work-

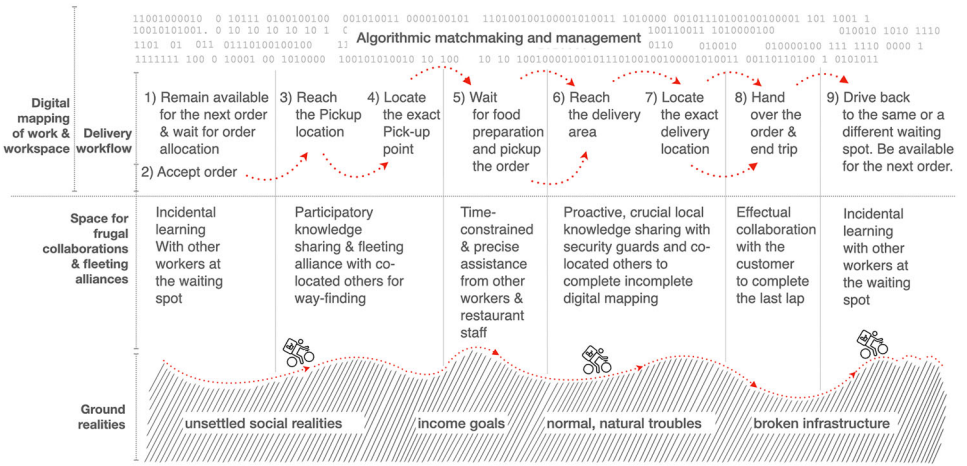

Figure 1. Alliances and collaboration to bridge the gap between the platform's digital mapping of work and workers' in-situ experiences.

flow itself (rather than consider worker cooperation as a separate activity that takes place beyond the work itself, such as in terms of unionising or protesting). With that, we open a new perspective to food delivery work, focusing on workers' collaborative efforts to overcome everyday challenges. Lastly, we discuss implications for design, considering both the solidarities between workers and other co-located actors that enable the successful completion of food deliveries and instances where workers' and the platform's incentives might, in fact, align.

2. Background

Food delivery work is a form of piecework that is conducted via a particular workflow system: the food delivery platform and its delivery app (Shaikh et al., 2023). The piece-wise economic arrangement, where workers get paid per completed task rather than based on their time, is familiar from crowdwork, a heavily researched form of computationally mediated on-demand labour(e.g. microwork via Amazon's Mechanical Turk (AMT)) (Martin et al., 2014). While crowdwork is performed entirely via online platforms, food delivery work is an instance of geographically tethered gig work (Woodcock and Graham, 2020). Our focus here is on food delivery work in particular, but in positioning our study, we engage with prior research on both crowdwork and gig work, as relevant. First, we highlight how prior research has, on the one hand, characterised gig work as an isolating form of work, yet, on the other, illustrated how it comes to entail collaboration even if it has been designed to be performed alone. Second, to set the scene for our detailed analysis of how food delivery work unfolds *in situ*, we provide a brief overview of prior research on 'normal, natural troubles' and how they might be studied with the help of video analytic methods. Finally, to contextualise our fieldwork from an Indian city, we discuss India as a specific setting for gig work.

2.1. Alienation and collaboration in gig work

As Kusk and Nouwens (2022) note in their review of research into platform-mediated food delivery work, this type of work is designed to be performed alone, and this has meaningful consequences for the working conditions and well-being of the workers – and, we might add, the efficiency of the deliveries made. While food delivery platforms typically position delivery work as independent, prior research acknowledges that delivery work is necessarily part of an interdependent arrangement: food cannot be delivered by workers until it has been prepared, nor can it be delivered without a customer receiving it (Richardson, 2019). Yet, the way platforms set up the food delivery workflow has implications for workers' opportunities to connect, collaborate, or organise with others: As one example, we can consider a study Seetharaman et al. (2021) conducted before the COVID-19 pandemic. Here, the authors depict the socially isolated nature of platform-based delivery work, explaining how delivery platforms kept workers occupied with a continuously

active order flow, leaving little opportunity for inter-relational and instrumental support to the workers. The workers' constant busyness alienated them from their friends and families, as well as authorities who could provide help. Further, Mrvos (2021) explains how such alienation among Uber drivers is rooted, in part, in the lack of access to the data Uber collects about them and their performance, as this makes it very difficult for the workers to organise and mobilise collectively. Finally, drawing on an empirical study of Uber drivers in Australia, (Walker et al., 2021) argue that Uber keeps drivers isolated from both each other and itself with the help of algorithmic management embedded in its platform. Aligning with Mrvos (Mrvos, 2021), Walker et al. also claim that such algorithmic management fragments any potential solidarity that could emerge among the drivers.

Yet, crowd and gig workers do repeatedly find opportunities to interact and collaborate, even when their work tasks have been designed to be performed alone and particularly when the tools that structure the workflow are not adequate for completing the tasks at hand. In 2016, Gray et al. (2016) illustrated how crowdworkers need to collaborate to address technical and social needs left unaddressed by the platform they work on. The authors made the case that crowdworkers are not the independent, autonomous workers they are often presented as. Even when piecework is designed to be done by individuals in isolation, workers find ways to support each other and solve problems together. Gray et al. (2016) further describe how crowdworkers collaborate with others in their networks not only to manage the administrative overhead associated with crowdwork and to find lucrative tasks and reputable employers, but also to recreate the social connections and support often associated with 'brick and mortar' work environments.

Food delivery resembles crowdwork in terms of the payment structure and the way the work is structured and managed via a platform – and, importantly, the way the workers are left to their own devices to resolve any troubles that need to be overcome to complete particular work assignments. There are, however, crucial differences, too, especially in that food delivery work takes place in physical, typically urban, environments, requiring workers to navigate both the social and logistical complexities involved, but also offering them with opportunities to witness – and sometimes interact with – other workers engaged in the same form of labor. Since the pioneering study of Gray et al. (2016), there has been further research documenting the informal support structures that crowd and gig workers establish for themselves (Yao et al., 2021; Qadri, 2021), including research that focuses on food delivery workers in particular (Gregory and Maldonado, 2020). One central point that has been emphasised is worker efforts to organise and/or unionise (e.g., Woodcock and Graham, 2020): As one specific example, Doorn (2020) describes, first, how a small group of Berlin-based food delivery workers sought to challenge the food delivery platform Deliveroo's market power by building their own makeshift calculative equipment to help them 'reverse engineer' the company's pricing algorithm and documents, then, the difficulties these workers ran into in their attempt to translate their fight for calculable earnings into a more comprehensive labour

politics. Within HCI, there have been efforts to address issues workers face by designing systems to empower workers: As the best known examples, *Turkopticon* (Irani and Silberman, 2013) allows crowdworkers to publicise and evaluate their relationships with employers while *Dynamo* (Salehi et al., 2015) aims to support crowdworkers in forming publics around issues they care about and, subsequently, in mobilising. Another line of recent work has adopted a similar worker-centric focus with the ambition to center worker well-being in gig work (Zhang et al., 2022; Lee et al., 2021).

Complementing prior work, we focus on the kind of collaboration that comes up in the course of carrying out food delivery work, examining in close detail the kinds of collaborative and/or helpful acts that enable workers to complete deliveries in a timely and successful manner. Here, we see a resonance with research on co-working days in the scope of the Hoffice initiative (Rossitto and Lampinen, 2018), where the authors describe participatory and collective efforts directed at accomplishing *individual* work and at transforming an atomised reality of 'flexible' work into a collective one. When it comes to food delivery, much like in the case of co-working at Hoffice, every worker is ultimately personally responsible for getting their own work done, rather than the setting presupposing the interdependencies of work that are implied in the classic CSCW notion of collaboration (Bannon and Schmidt, 1989; Schmidt and Bannon, 1992).

2.2. Studying technology-in-use

We make extensive use of video analysis to understand the work practices of on-demand delivery drivers. When it comes to studying technology-in-use, video recordings have been a longstanding method used in the workplace domain. They have been used for a range of different analytic purposes, but particularly to document social interaction with and around objects and technical artefacts (Hindmarsh et al., 2000; Vom Lehn et al., 2021; Tuncer et al., 2019). This research has studied interaction around screens, capturing on-screen interactions as part of ongoing work practice (Heath et al., 2002). Within the field of CSCW, workplace studies have introduced fixed cameras, in settings such as control rooms, surgeries, homes, offices, and museums (Luff and Heath, 1998; Heath and Luff, 2000; Heath et al., 2010), to capture technology use *in situ*. In this earlier work, video data is used to support analysis of the details of interaction: considering how users bring together physical and technical resources in complex ways. This form of analysis draws on conversation analysis and ethnomethodology with a focus on activity and interaction, such as gaze and talk. Critically, use of video data focuses analytic attention on the moment-by-moment sequential production of technologically mediated action. Rather than attempting to present general findings about technology use, then, the focus is on trying to understand 'why that here', that is, how sense is made of a situation through the use of talk, gesture, and interaction.

Within HCI more broadly, video analysis has been applied to study situations outside of work, too, such as family video calls (Gan et al., 2020) and walking and navigating with mobile maps (Laurier et al., 2015). Video has proven valuable in illuminating aspects of activities neglected by previous methods, particularly drawing on conversation analysis to understand technology-in-use. Using video methods to study the mobile use of technology, however, presents considerable challenges. Since the users of mobile technology are largely mobile themselves, fixed cameras are of limited use. This has been overcome in the last decade with the help of lightweight, wearable digital cameras. While portable, these small cameras also have a number of limitations in battery life and flexibility. Moreover, camera angles can be vital in capturing the situation of use, and mobile cameras are more difficult to aim, constrain, or control. Approaches that rely on such cameras in mobile settings are referred to as *in vivo* methods (Brown et al., 2013). They draw upon earlier analytic work using video and interaction analysis (Garfinkel, 2022; Suchman, 1987), while simultaneously providing a rich new perspective on work. We adopt them here to document platform-mediated, on-demand use as not simply something logged on a mobile phone, but action intimately connected with, and dependent upon, social interaction with others in the environment.

Gig work is a mobile activity where workers must face urban and social complexities of city infrastructure, traffic, and regulating authorities, all the while relying on their phones to receive instructions on where they should go and what they are required to do. In the process, workers are exposed to the ordinary 'troubles' which are 'naturally occurring' in the context and 'normal' in the sense that overcoming them is a common activity of all sorts of work (Brown and Laurier, 2012). Garfinkel and Bittner (1967) describe 'normal, natural troubles' where records often mismatch with the world they are meant to represent, and workers need to work around these problems as a common part of their job (see also Brown and Laurier, 2012). From our study of food delivery work, we observe that everyday troubles often establish grounds for collaboration between riders and other actors available in the same context, though not necessarily facing the same trouble. The video analysis presented in this paper considers these troubles and the collaboration devised to resolve them in detail.

2.3. Gig work in India

Gig work takes a distinct shape in the Global South where our study is situated. Here, we offer some context necessary to understand the everyday challenges gig workers face in India specifically. Early narratives of gig work, stemming from Silicon Valley, claimed that this new form of labour would liberate workers from the traditional corporate job model and value workers' autonomy and agency by letting them decide when and how much to work (Schor, 2021). This narrative has since been debunked, but it is worth noting that unlike this lost libertarian dream of Silicon Valley startups, their Indian counterparts never echoed the argument that

their technology would automatically yield decent work and good social relations (Schor, 2021), offering workers a better work–life balance. While the popular gig platforms in India appear as conceptual replicas of their Silicon Valley equivalents (Ola for taxi-hailing; Zomato and Swiggy for food delivery), there are no traces implying that they would fit into the idealistic framework of 'the sharing economy' (Lampinen, 2021). Rather, from their beginning, Indian gig platform startups were geared to scale up with the help of venture capital.

After the introduction of economic reforms of 1991 in India (Ahluwalia, 2002) which centred around liberalisation, privatisation and globalisation, coupled with increasing access to mobile devices and the internet, there has been a proliferation of platform-based services (like booking taxis, ordering food, hiring help, and online shopping) to cater to the growing demands of the neo-middle class and upper class. These platform companies have benefited from India's readily available pool of informal workforce, made up of workers who are deprived of economic security and the protection of work regulations. With timely payments and the possibility of controlling working hours, gig platforms have attracted and aligned informal sector workers to serve their customers' globalised aspirations (Raval and Pal, 2019). As per the Indian government's report on the gig and platform economy, 7.7 million workers were engaged in the gig economy in 2020-21. The report expects the Indian gig workforce to expand to 23.5 million workers by 2029-30 (NITI, 2022).

Though gig work has brought with it a sort of financial regularity and, for some, created an experience akin to micro-entrepreneurship (Prabhat et al., 2019), workers continue to operate in a legal vacuum of relevant labour laws for gig labour and platforms (Bharadkar et al., 2020). Persisting the exclusion from trade unionism, informal sector workers who undertake gig labour remain deprived of the opportunity to collaborate and improve their situation (Supriya, 2016). Another contributing factor is the lack of a specific physical workspace, which in most industrial production settings allows workers to co-locate, interact, and, ultimately, collaborate. With the entire city as their workspace, delivery workers everywhere have fewer opportunities to get together with one another. In India, the situation is further complicated by social and cultural complexities related to caste and class divides among workers and customers (Singh and Park, 2022), limiting possibilities and ways to cooperate.

A growing body of research from India unearths the unique shaping of the local landscape of gig work: Many studies have explored popular taxi-hailing platforms (Ola, Uber), denoting the changing work practices (Ahmed et al., 2016), formalisation of work (Sehrawat et al., 2021), challenges and opportunities (Prabhat et al., 2019), as well as the precarity and ancillary benefits (Muralidhar et al., 2022) entrenched in platform work. For example, Ahmed et al. (2016) depict how gig work disrupts traditional work practices – practices that often rely on informal sector labour – pushing workers to acquire new skills, while balancing gig work with traditional ways of earning money. With the growing popularity of platform services across strata and a scarcity of other opportunities, Indian gig workers often

have a severe financial dependency on gig income: workers are trying to eke out a living from gig work, rather than picking up gigs here and there as a supplementary form of work. Such dependency, however, compromises the autonomy otherwise enjoyed in traditional work setups (Muralidhar et al., 2022), despite the liberty promised by the platform that the worker can choose when and how much to work.

3. Material and method

We make use of eleven video recordings of episodes of food delivery work *in situ*. The study we present here is part of a larger ethnographic exploration of food delivery work in Pune, India (see also Shaikh et al., 2023). The fieldwork was performed between May 2020 and April 2021, traversing the first wave of the COVID-19 pandemic through to the early days of the second wave. The broad research objective of our ethnographic exploration was to understand the nature of gig work during the pandemic and workers' efforts to ensure they could continue earning despite the changing circumstances. In this paper, we focus specifically on (1) everyday troubles food delivery workers need to tackle across the workflow to complete deliveries successfully and (2) the ways in which food delivery workers resolve these issues in collaboration with co-located others. Before embarking on the main collection of video data of platform mediated food delivery work used here, the first author initiated formative fieldwork, including six semi-structured interviews over the phone and ethnographic observations and interactions with over 20 food delivery workers from four different locations across the city. This preparatory fieldwork helped to define the research questions, select methods, and recruit six workers to participate in video-recorded *ride-along sessions*.

3.1. Participants

The six delivery workers who took part in the ride-along sessions differed from one another in terms of age, background, as well as their individual engagement and experience with on-demand delivery platforms: Four were working full time and two part-time with the platform. Two had four years of experience, three had a year or less of experience, and the final participant had joined only the day before the ride-along session. The participants also had varied backgrounds and differed in terms of their economic reliance on food delivery work for their livelihood. Both the part-time delivery workers had another source of income: one was a trained electrician and the other worked as a member of the security staff with an IT company. Of the six participants, all had moved to live and work in Pune: two were migrant workers from other Indian states (Bihar and Jharkhand) while the other four came from different cities within the local state (Maharashtra). All participants were male, with ages ranging between 20-45 years. The first author sought to recruit a female food delivery worker on the ground during the fieldwork but could not locate anyone. This reflects the masculine shape taken by platform-mediated gig work in India (Kasliwal, 2023; Ansari, 2022).

During recruitment and subsequent engagements, the first author observed the rule not to disturb, interrupt, or delay (potential) participants' work. Participants were informed about the nature and the motivations for the study when they were first recruited. In assuring participants' informed verbal consent, the first author explained (1) that the collected information would be used only for research purposes, (2) that participants' identities would not be disclosed, (3) that only anonymised excerpts of interview and ride-along recordings would be included in eventual publications, and (4) that the first author has no affiliation with food delivery platform companies. The first author remained available to answer any queries participants had during and after the recruitment. He explicitly mentioned that participants could terminate their participation at any point in time without explanation. The ride-along sessions were conducted with the delivery workers' consent to wear an action camera on the helmet to record the entire delivery. The workers could take off the camera or turn it off at any point, without giving an explanation. The first author explained how to turn on and off the camera before the ride and also remained available for any technical issues during the ride. At specific moments, when asked to do so by respective participants, the first author held the helmet for them (as we will see in Clips 4.1.1, 4.2.2, parts of 4.3.1 and in 4.3.2).

For each ride-along session, participants were offered INR 200 as a compensation for their participation. While we took a number of efforts to compensate the drivers, some drivers refused or asked for the money to be dedicated to charity. Compensation for participants is not a straightforward matter, as it can transform the relationship, particularly in long-term ethnographic research, from one based around help and assistance into an at least partially monetary relationship. Our challenge, then, was to both compensate fairly but also allow our participants to refuse compensation if they preferred to do so. For any participants who we were unable to compensate directly, we, instead, donated the money to a local charity. Beyond the monetary compensation, the first author remained available for the participants outside of the fieldwork, assisting participants in his capacity if they reached out with personal enquiries, such as a job hunt or locating additional resources like a secondhand laptop. The first author did not provide or propose any such assistance to the participants during the study; the provided assistance was strictly in response to participants' own initiative.

3.2. Video recordings of food delivery work

With the ride-along sessions, we intended to capture food delivery work *in situ* from the worker's perspective. These sessions were designed so that the participant wore a chin-mounted action camera on the helmet they wore, to record the entire duration of a food delivery process, starting from the order allocation and finishing with delivery. We recorded six rides during the lunch slot and five during the dinner slot, each accompanied by a post-delivery conversation. These conversations took

the form of informal, individual interviews, covering topics such as the worker's overall experience of working with the platform and the specifics of the delivery they just performed. The interviews were conducted in the local language, Marathi, and in Hindi.

The ride-along sessions were planned and conducted only once the pandemic situation allowed arranging them in a safe manner and in compliance with local restrictions. The first author accompanied the rider on the pillion seat only if the rider/food delivery worker was comfortable with the arrangement. This allowed the participant to converse with the first author during the ride-along. Only one participant opted to ride alone, wearing the helmet with the camera. He agreed for a follow-up conversation, instead. The helmet and the camera were sanitised before and after every ride. The researcher sanitised his hands frequently and wore masks during the ride-along sessions.

Though the aim of the recordings was not to capture every moment of the worker's interactions with other actors or devices, once the camera was mounted, the worker controlled its orientation and the recording, and, thus, the incidental appearance of bystanders or customers. As such, we were not in a position to solicit the consent of those who were captured incidentally (Brown et al., 2011). To protect their integrity, we blur their appearances and anonymise any personal information captured in the footage. To ensure participants' anonymity, we use pseudonyms in presenting the findings. We have obscured participants' and bystanders' faces and other identifying features from the visuals included, opting for representative illustrations where necessary to protect their integrity.

3.3. Video analysis of ride-along sessions

As a first step in our analysis, each session recording was divided in two: The first part involves the food delivery work as performed *in situ*, beginning immediately as the worker receives an order or reaches the pick-up location, and continuing until completion of the delivery to the customer. The second part consists of the in-depth conversation with the participant as they travel back from the delivery location to their preferred waiting spot (the location where they wait for their next order).

Video data presented in this paper focuses on the first part of each session, amounting to approximately 11 hours of footage of food delivery work *in situ*. All 11 hours were then reviewed to identify instances of workers' interactions with other actors, as well as the delivery application in the course of their work. These instances were prepared into short video clips. These were, then, used for preliminary rounds of group data analysis, through which we identified a range of themes of initial interest: frustrating interactions with the app, workers being penalised for failures of other actors in the delivery process, workers juggling multiple demands in parallel (trying to balance the tasks of a waiter while navigating on a motorcycle over broken roads with inadequate maps and directions, operating

a mobile phone while carrying several fragile parcels of food), and workers dealing with the restrictions introduced in response to the COVID-19 pandemic.

After further rounds of analysis, eleven short video clips involving social interactions were selected from the corpus for closer analysis. This opened up space to investigate in detail the workers' collaborations with co-present others. At this stage, each clip was translated and transcribed in English, which facilitated close analysis of the dialogue and activity found within these clips. If additional context was needed to make sense of what could be observed in the video data, the authors revisited the surrounding video recordings to understand what happened before and after the events under scrutiny. During these iterations, we outlined food delivery workers' momentary collaborations with co-present others and their non-transactional alliances with other food delivery workers. These were mapped throughout the delivery workflow against the troubles arising at every stage of the workflow. Use of video data allows us to watch and re-watch "the moment-to-moment turn-taking procedures of everyday talk" (Boden and Zimmerman, 1991) and locate the fleeting alliances that the workers form while working. The video clips allow us to listen to the talk, see the gestures, as well as the situation and sequence of the interactions which are used in achieving, for example, orientation and alignment in way-finding with the delivery app. In this way, we can examine the different threads of activity involved in the accumulative co-operative action (Goodwin, 2017) of sense-making and way-finding that is required to get delivery work done. While our video data does not allow us to observe or comment on relationship building over time, the video recordings, combined with our broader fieldwork, give grounds to argue that the frugal and fleeting nature of interaction our analysis outlines is not a product of the methods but, rather, speaks to how delivery work unfolds *in situ*.

3.4. Ethical considerations

The first author, born and raised near Pune, spent significant parts of the COVID-19 pandemic in the city, experiencing the situation first-hand and performing the fieldwork in line with the subsequent situational awareness. Throughout the fieldwork, he remained considerate and empathetic toward the devastation the COVID-19 pandemic had brought to society at large and the workers in particular. The fieldwork was performed acknowledging the risk these workers were taking delivering food during the pandemic. Respecting their efforts, we remained considerate about how the pandemic impacted the informal labour sector, to which our participants belonged. Our aim was to learn about their work without causing further disruption. Ride-along sessions were conducted only when the first author felt fully healthy and had no COVID-19 symptoms. We observed and followed the rules and regulations imposed by the state and central governments. Respecting the lockdown rules and healthcare regulations, ride-along sessions were conducted only once the situation allowed it.

Our fieldwork performed in India does not clearly fall into any of the application areas specified in the Ethical Review Act in the country of our institution. Also, the national ethics review board only considers research conducted within the country. While we did not have any association with the local academic institutes or access to a local ethics board in India that could review and approve our study, we have striven to conduct the research ethically. Considering our research project's diverse, complex, and developing context, we have attended to the ethical standards for ICTD/ICT4D research (Dearden and Kleine, 2019). Also, aligning with the 'In-Action Ethics framework' by Frauenberger et al. (2016), we have strived to frame contextually relevant ethical responses, instead of going into the field with a static and formalized set of rules. Further, supporting an ethnographic sensitivity toward the local perspective and cultural reality, the first author drew on his previous fieldwork experience in India and within the local academic community to discuss appropriate methods and navigate the research process.

Though we intended to involve riders to discuss their recordings and also to comment on our initial analysis, it proved challenging to even locate the riders again, and we were hesitant to ask them to invest further time in our study. However, we acknowledge such participant involvement as best practice, whenever possible without burdening the participants, and believe it would have further strengthened our analysis and understanding of participants' work practice.

4. Findings

Our analysis depicts the acts of collaboration that food delivery workers (alternatively referred to as 'riders') often resort to in an effort to resolve the 'normal, natural troubles' (Garfinkel and Bittner, 1967) they encounter as they complete deliveries. We focus on the food delivery platform Zomato and the app it uses to structure delivery work, since this is a platform all of our participants worked with. Aligning with the definition of *workflow technology* proposed by Bowers (1994), the app on the worker's phone becomes a tool for the delivery platform to impose an order workflow – depicting the platform's digital representation of the world where food delivery happens and its vision of how deliveries get completed.

The Zomato app lays out a rigid series of activities and instructions which structure the work in a particular, sequential manner, leaving little room for workers' autonomy or discretion. We present our findings in line with this workflow to locate delivery workers' collaborative interactions with co-present others at three significant phases that form part of each delivery: (1) moving to the pick-up location (i.e. restaurant), (2) picking up the food, and (3) taking the delivery from the pick-up location to the customer (see Figure 1). After this, a fourth subsection focuses on delivery workers' troubles with restrictions related to the COVID-19 pandemic, imposed both by the platform and the surrounding community. Here, we depict how these play out both with and without an opportunity to team up with co-present others.

We present a close analysis of two separate video clips in each subsection. We illustrate each clip with a storyboard that captures the key frames and interactions, along with discussion of key parts of the interaction observed (full transcripts can be found in the Appendices).

4.1. Getting from the waiting spot to the pick-up point

Matching workers with customer orders, Zomato relies heavily on location-based services to mediate delivery workflows. For this to be successful, the riders need skills in navigation and way-finding. Among our participants, the level of engagement with the digital on-screen routing provided by the platform was on a broad continuum, from the experienced participant with local knowledge who glanced only briefly at the onscreen route provided to check their own progress, to our novice rider who had arrived to work in the city very recently and was, hence, dependent upon external knowledge and resources, such as the map onscreen, to find their way. We open our analysis with two clips from the early stage of the delivery workflow, where the delivery worker has accepted an order and is trying to reach the order pick-up point. Through the analysis of our video data, we show how drivers share knowledge through fleeting interactions, and thereby mitigate some of the problems encountered with the delivery app. The type of interaction among workers we see in the clips – which we refer to as frugal collaboration – may take the form of helping, problem-solving, and learning. It can be assumed to be a sequentially organised activity jointly accomplished by those involved.

4.1.1. Participatory knowledge-sharing for way finding

The first clip we analyse is situated in a *waiting spot*, one of the locations in the city where gig workers regularly congregate to wait until the platform allocates them the next order, or while the restaurant is preparing food. Delivery workers collectively identify these spots over time based on shared experience on where they would be most likely to receive orders. During the COVID-19 restrictions, the order flow was drastically reduced and these waiting spots became more perceivable, and their importance more pronounced, as they offered space for the delivery workers to socialise and pass the long wait times between orders.

The two participants in this clip are standing together at the waiting spot. Our participant Shiva was a novice in delivery work; it was his second day on the job, and he was new in town. Immediately after accepting the allocated order, Shiva asks an experienced colleague who is standing alongside him for directions to the pick-up location. The experienced rider checks the address on Shiva's phone and begins by simply pointing toward a mall full of different restaurants and stores. He gives some description while pointing, *"this, this – in the front"* (Figure 2, Frame 3). This may be understood as a 'first position', or an early candidate resource for the accomplishment of the larger goal of correctly identifying the pick-up restaurant

Figure 2. Novice food delivery worker asking for way-finding help at a waiting spot.

and getting there quickly. Highlighting the embodied nature of alignment in way-finding, Shiva gains the orientation of the other rider by standing up alongside and mirroring the pointing gesture of the experienced rider who is still holding his phone (Figure 2, Frame 4). With the general area established, Shiva seeks more specific detail of the pick-up location by asking: *"the one with the sticker?"* One way to request information from another involves including a candidate answer in the query. In a task like way-finding, including a candidate landmark in a request for directions is a useful way to guide or assist the respondent in providing specific information in the particular setting. Here, this allowed the experienced rider to confirm the mutual orientation to 'the one with the sticker', from which anchor he could then proceed to provide relevant narration on how to identify the pick-up restaurant. Then, in Frame 5, *'Yes, yes'* is the affirmation that Shiva now knows where to go (Figure 2). (See appendix A for transcript.)

The output of this accumulation of app interactions – talk while looking at screen, pointing, and face-to-face talk – was an exchange of the minimal knowledge required for Shiva to progress to the first stage of his food delivery process: the pick-up. Such timely, precise, and participatory knowledge-sharing overrides the availability of the digital map on which the platform designs the delivery workflow, expected to equip delivery workers to operate individually to find and reach the pick-up location.

As Shiva sets off towards the restaurant, the experienced rider calls out after him: *"Mark the app: Pickup reached"* (see Figure 2, Frame 6), volunteering his tips for getting ahead of the process. This momentary interaction has provided Shiva with valuable informal training for completing his delivery task efficiently. He can now proceed with the help of knowledge that is not available in the workflow or in Zomato's limited training materials.

4.1.2. Fleeting alliances during way finding

During the initial phase of the COVID-19 pandemic, restaurants were not allowed to serve customers in-house. Some used this time to renovate the place while keeping the kitchen running for online orders.

In our second clip, our participant Rana reaches one such pick-up location where the restaurant is visibly undergoing renovations. Rana needs to figure out where the restaurant now hands over the food orders. Even though there is another Zomato rider already standing waiting for an order next to a sign stating *'Contactless Pickup'*, Rana tries to establish the exact pick-up point at the restaurant as he approaches. (See appendix B for transcript.)

Almost ignoring the waiting rider, Rana directs an open query about the pick-up location towards a third person sitting to one side of the doorway (Figure 3, Frame 2). The other Zomato rider responds quickly and assures our participant – wrongly it transpires – that he is waiting at the correct place to collect the order (Figure 3, Frame 3). However, the person in the chair contradicts the waiting rider by directing Rana toward the back door of the restaurant for pick-ups (Figure 3, Frame 4). This

Figure 3. Food delivery worker finding exactly where the restaurant hands over the food orders.

newly shared knowledge offers a valuable course correction for both riders. Even though the pick-up location is not yet visible, Rana sets off in the direction given by the seated man. At this point, alignment between the map displayed in the app and the surrounding landscape is not completely certain. Rana finds just enough environmental information on his way to the back door. He goes only a few steps before asking another bystander for the pick-up location, receiving confirmation of the way to the back of the building (Figure 3, Frame 6,7). The delivery rider, who was initially waiting at the wrong spot, follows Rana to the back door and helps him check the order ID of the parcel kept on the table (Figure 3, Frame 9,10). Fleeting alliances, like those formed by Rana to locate the exact pick-up point after reaching the restaurant and to pick up the correct parcels, are crucial for getting the work done. Merely following the way-finding instructions from the app is not enough.

4.2. Picking up the order

The platform presents delivery workers with a sequence of tasks on the delivery app, aiming to structure the order collection in a particular manner. Once an order is marked as ready by the restaurant, the platform runs a reverse timer that counts down three minutes, during which a rider has to complete a sequence of tasks leading to the order pick-up. Yet, in this, the delivery workers depend heavily on the restaurant's order management systems and staff to be able to collect the order within the allotted time. In the following two clips, the riders try to comply with the reverse timer while dealing, in the first instance, with the restaurant and, in the second, an unexpected, modified workflow sequence that appeared in the app. Beyond the platform's attempt to shape the order pick-up (which assumes that workers operate in silos), workers here need to negotiate with the restaurant staff and collaborate with co-present bystanders to complete their pick-ups efficiently.

4.2.1. Time-constrained assistance to define the problem and register a complaint
This clip spans a period of almost five minutes, during which a participant, Ravish, arrives at the restaurant to pick up an order that has been prematurely marked as 'ready' by the kitchen staff. He is then kept waiting for his delivery for over four minutes. Amidst the disorder at the pick-up window, he interacts with two other delivery workers, who are waiting alongside him, and who offer him an account of his situation and suggestions on how to resolve it. The clip begins with Ravish reaching the small McDonald's pickup window and telling the researcher who accompanies him that *"The parcel is already ready. So I am (marking it as) picking-up."* A three-minute reverse timer appears immediately on-screen and begins to count down, meaning Ravish must pick up the parcel within the next three minutes. Along with the order ID, the platform shows that the order is ready. However, in reality, the kitchen staff are still preparing the order. It appears the restaurant has marked the order as ready for collection in error, leaving Ravish unable to complete

the task of picking up the food within the allotted time. We can see that he is stuck, and that the app does not provide any way for him to pass the responsibility for the delay back to the restaurant. (See appendix C for transcript.)

When Ravish arrives and asks for his order at the window by sharing the last four digits of the order ID, he gets contradictory replies from two staff members. One says; *"it's getting ready."* and the other; *"yes, yes, done."* (Figure 4, Frame 4). This is the first clue that something is wrong with the *Order Ready* notification shown in the app. When Ravish's reverse timer shows 1:52 min left, another rider arrives at the pick-up window (Figure 4, Frame 6). Now concerned about the time left in the reverse timer, Ravish mumbles: *"it's almost time!"*. This muted complaint is enough to invite comment from the other rider who suggests *"Mark it as not ready"*, leading to speculation about when that will be possible. Ravish explains he cannot do that at that moment and has to wait for two minutes for that option to become available (Figure 4, Frame 7). Then, with 35 seconds left in the reverse timer, one more rider and a customer gather around the window. The small pick-up window is now crowded with three or four people waiting for their orders. Pleading with the kitchen staff, Ravish asks how long his order will take. The staff, in reply, again asks for the order ID (Figure 4, Frame 9). The newly arrived delivery worker offers an assessment of the problem: *"Did they mark it ready before it was ready?"* Seizing on this formulation, Ravish registers a soft complaint with the kitchen staff, *"You already marked it as ready; what are you doing!"* (Figure 4, Frame 10). With the reverse timer already expired, the kitchen staff starts dispatching multiple orders simultaneously. In momentary chaos, all the other delivery workers receive their orders while Ravish continues to announce his order ID. One of the kitchen staff members finally brings his order and helps Ravish take a picture of the receipt (Figure 4, Frame 11,12), as required by the app. Ravish swiftly completes the remaining pick-up formalities on the app and gives a positive rating on the restaurant experience.

With these steps completed, the app shows Ravish the blue route to the customer's address on a map. He reviews this briefly before pocketing the phone, freeing up both hands. He reaches in carefully to pick up the paper bag with the food and balances two separate drinks in paper cups (Figure 4, Frame 13).

Throughout the clip, we see Ravish 'crushing the interface', that is, rapidly working his way through the multiple workflow task sequences, all the while trying to coordinate verbally with the kitchen staff. He completes some of the steps quickly and robotically, for example, wasting no time with questions about the sanitisation check (Figure 4, Frame 2), preparing to take and upload a photo of the bill, and confirming the order checklist of what he has to pick up (which says one package, although the order provided by the restaurant included one paper bag and two drinks).

During the fleeting alliance at the pick-up window, one rider suggested a solution to try to safeguard Ravish's performance on the platform, should the reverse timer run out (Figure 4, Frame 7,8). Through the worker-to-worker interactions, both

Figure 4. Tackling a reverse timer when the food order is not ready for pick-up.

riders may come to understand more about the constraints and functions of the workflow. However, illustrating the limitations of this kind of peer learning, the suggestion made that the platform will provide an option for a rider to mark the order as *'Not ready'* after two minutes did not actually materialise. Ravish was left unable to do anything to meet the demands of the timer, even though it was the restaurant that had made a mistake. Another incident of quick collaboration among riders occurred when another worker identified the cause of the issue. This formulation of the problem allowed Ravish to voice a complaint with the staff for the first time (Figure 4, Frame 10).

It is also worth understanding the cooperation Ravish devised with the kitchen staff. While information about the kitchen staff's actual organising for preparing and serving the food remains unavailable to Zomato, Ravish witnessed it first-hand. The order ID is the crucial reference point for the platform between the restaurant and the worker. Ravish relied on it, although the kitchen staff repeatedly asked for it as they remembered it selectively and temporarily, amongst all the other order numbers. Seeing the complexity in the order handling, Ravish registered a complaint with the kitchen staff only after indirectly initiated by another worker, and only once the reverse timer was about to run out. He toned his complaint down by adding a friendly touch, using the local language (Marathi) at the end of his utterance (Figure 4, Frame 10). We do not learn from the video recordings described here what the consequence of this delay was for Ravish. However, the restaurant will hardly profit from delivering outside the time allotted for pick-up. Yet, it is notable that the kitchen server who failed to get the order ready on time was observably helping Ravish to complete the final workflow tasks by holding the invoice to allow the photo of the bill for the *Invoice Verification* to be taken as swiftly as possible (Figure 4, Frame 12) – an act of cooperation not afforded the two other riders who got their food orders more quickly.

This clip illustrates several mismatches between the digital representation of the order pick-up workflow and the in-situ experience of order collection. Once the reverse timer started ticking down, the rider was stuck in the app's interface which gave him no recourse for repair regarding the workflow instruction issued to him: *'Order ready, pick now.'* The frustration for the rider is clear in the increasing urgency of his requests for the order. These discrepancies and how to deal with them may be considered one example of the normal, natural troubles (Garfinkel and Bittner, 1967) of platform-mediated work. What is more, the clip shows how, through brief dialogues with other riders also waiting to collect orders, Ravish managed to figure out what the problem was – that the restaurant had wrongly indicated that the order was ready – and then, with further help from another rider, found a way to address the issue. These examples show how the fleeting alliances riders form are both contingent and dynamic: they are based on the particular issue at hand, the existing knowledge and experience of the rider, as well as who else happens to be around. Moreover, they are socially organised, shaped by the opportunities and constraints created by the structures of talk (Rawls, 2008).

4.2.2. Precise and quick cooperation to address a change in the workflow

We now consider a clip from another delivery with the same participant, Ravish, during which the app throws up an unexpected task in the pick-up workflow, and where an adjacent delivery worker offers him advice on how to complete the workflow. Ravish is picking up an order of two tubs of ice cream from a specialist ice cream shop. It appears that in a particularly time-sensitive setting like a pick-up from an ice cream vendor, the platform issues an additional workflow task via the app, instructing the rider to evidence the ice cream order pick-up with a photo. The ice cream order has been wrapped by the vendor and placed on the counter in front of Ravish. Another rider is standing alongside him as the ice cream vendor assembles his order. Ravish hits the *'Order received'* button to acknowledge that his order is now ready. Ravish prepares to 'crush' the workflow interface as usual when he notices an additional instruction: *"click a photo of ice cream in ice cream bag."* Ravish sees this additional instruction on-screen for the first time and draws upon the knowledge of a co-located rider to make sense of and complete the request. (See appendix D for transcript.)

Immediately prior to the clip, Ravish was giving a knowledgeable account of what he was doing on the app to the researcher who was shadowing him on this delivery trip. However, in Frame 1, he is communicating to anyone who hears him that he has just noticed a change to the workflow in the app. Ravish says, *"Oh, it's asking to open it and take a picture!"* (Figure 5, Frame 1). His use of *'Oh'* may function here as a 'change-of-state' marker, indicating a change in the speaker's knowledge, awareness, or attention (Jefferson, 1978; Heritage, 1985). Ravish is letting it be known that this is something new to him – it is a step in the workflow that he has not seen before, potentially due to the perishable nature of ice cream. Ravish's expression of uncertainty, alongside his problem statement, invites knowledgeable elaboration. In his immediate environment, three other actors were present: the ice cream storekeeper, the researcher, and another rider who was also collecting a delivery. The researcher had no knowledge of how to use the app and was, therefore, unable to respond, and the ice cream vendor was engaged in a customer phone call. The only person potentially able to respond meaningfully was the other rider who was standing next to Ravish, and indeed, he initially offered up advice in the local language, Marathi: *"While keeping it in the bag."* However, Ravish responded to this with a further expression of uncertainty, *"Huh?"* (Figure 5, Frame 2). This response to the advice resulted in the other rider repeating the minimal instruction exactly as before, *"While keeping it in the bag"*, again in the local language (Figure 5, Frame 3).

When Ravish responds (Figure 5, Frame 3) *"Not of the bag"* he is providing a candidate understanding of the advice given by the other rider (Heritage, 1985). The uncertainty of his response invites correction and affords rights to the other rider to spell out more fully what Ravish should do to resolve the request. In response, the second rider offers advice on what to do for a third time – but notably, he switches to Hindi (acknowledging that Ravish was speaking Hindi and probably concluding

Figure 5. An adjacent worker offers a quick task correction to help complete the workflow for ice cream pick-up.

that he may not understand Marathi). He also provides a fuller explanation: *"KEEP IT IN THE BAG. Then take a snap"* (Figure 5, Frame 4). He further elaborates this verbal advice with embodied action to demonstrate how to place the ice cream package into the food delivery bag, and only then take the *'Ice Cream photo'* requested by the app.

What we observe here is precise and quick cooperation: the interaction between the two riders focuses initially on problem definition (how to comply with the task request in the app), which determines the sequential and bodily unfolding of the exchange of knowledge on how to deal with taking the requested photo of the ice

cream order. At the end of the interaction, there is an orientation toward the shared goal of completing the task sequence in the app.

For a rider offering to help another, for example by giving advice as here, knowing which competencies or knowledge are required in the particular context is an issue, for it is potentially different in each situation. The only known and constant variable between working riders is the scarcity of time. Therefore, the advice offered was initially minimal. However, it proved inadequate. Repeating the advice, then switching to a different language, expanding the instructions, and bodily enacting how to place the parcel before photographing it and submitting a photo to the platform, were incremental actions done as part of accomplishing local order so that both riders could progress and resume in their efforts to make deliveries in a timely way. Notably, there were no social graces or gratitude expressed by either rider, and the work of delivering was resumed swiftly by both. The time constraints imposed by the workflow reduce the opportunity – or obligation – for social niceties. Reflecting the communication economy created by the pressures of working under punitive reverse timers, the other rider's switch in language and use of embodied gestures swiftly became a demonstration and a practical lesson on what to do to take the requested photo correctly.

4.3. From the restaurant to the customer location

We now turn to the phase of the delivery workflow that is often considered the actual delivery leg: driving from the restaurant to the customer and handing over the food parcel(s). Here, Zomato devises a delivery workflow reliant on digital maps. Trusting the address provided by the customer, it plots a route on the digital map for the worker to follow. On the ground, however, riders have to deal with incomplete digital mapping, along with the continuous gentrification and expansion of the city which often makes it challenging to locate the customer's door. Aiming for a smooth customer experience, Zomato suggests that workers avoid calling customers. However, during the pandemic, conversing with customers became necessary as reaching their doorstep often required specific arrangements. The two clips in this section depict how workers rely on frugal cooperation with unfamiliar bystanders and customers to complete this final stretch of the delivery workflow.

4.3.1. Proactive sharing of local knowledge to compensate for incomplete mapping

Even though the platform offers a provision to the customer to track the location of the delivery worker throughout the duration of their food delivery, the opening question often posed by customers when a food delivery worker calls them is *"Where are you?"*. In the app, the customer's location is considered to be undisputed information that has been made available to the rider. However, our video data reveals there is often work required of the delivery worker to establish exactly where the customer's door may be found. Due in part to incomplete mapping for

parts of a city, the gap in delivery detail provided by the app may also be due to an erroneous customer address. When formal mapping is found to be inadequate, it is the fixed and well-known landmarks in the environment, such as buildings or road junctions, that become the oriented-to navigation points that riders rely on in their way-finding. (See appendix E for transcript.) The clip we now turn to is from the same ride during which our participant, Ravish, had already dealt with the wrongly initiated reverse timer for the order pick-up (Section 4.2.1). In this clip, Ravish reaches the delivery location provided by the app ahead of time. However, only after calling the customer thrice, he realises that he is, in fact, waiting at the wrong location. He, then, devises temporary partnerships with bystanders around him to correct the mismatch between the delivery location's digital marking and its actual positioning.

The clip begins as Ravish calls the customer for a third time, having reached the delivery location provided to him. During this call, it becomes apparent that the customer location provided by the app is incorrect. During his call with the customer, a security guard seeks to establish in which building the customer lives. He prompts Ravish with the right question to ask – *"phase 1 or phase 2?"* – voluntarily helping Ravish to move toward completing his delivery (Figure 6, Frame 2). Recognising the value of this prompt, Ravish asks for the direction to the correct location while still on the call with the customer (Figure 6, Frame 3). The security guards direct him to the correct building (Figure 6, Frame 4). Ravish concludes his interaction with the guards by explaining why he came to the current location (Figure 6, Frame 5). The buildings and the immediate surroundings visible in the clip appear to be under construction, lacking in finished road surfaces and street lights – all contributing to difficulty in mapping accurately, making it more challenging to deliver to the numerous new blocks and apartments.

Following directions from the security guards, Ravish takes 'the first left' and moves cautiously into a dark alley, yet he is still uncertain which is the correct building. He pauses to look again at the map provided by the app and tries to orient himself further (Figure 6, Frame 8). However, as the video reveals, the environment is rather dark and treacherous to move through safely on a motorbike, far less to locate a particular address. Once again, Ravish looks closely at the map and the written address to navigate between the anonymous buildings around him. He, then, turns for help to a storekeeper ensconced in a small, lit kiosk (Figure 6, Frame 9). Ravish calls over to him – *"Brother, Brother - Apolo 23"* – stating the name of the customer's building (Figure 6, Frame 10). His entreaty does not go ignored, and the storekeeper is able to help by confirming that the destination is directly ahead. With this crucial piece information, Ravish rushes up to the correct location, another gated building with a security guard in attendance. There, he hands over the parcel to a waiting child.

Ravish's efforts to locate the customer go well beyond the instructions provided by the app. Yet, the platform ignores his efforts (and its own role in the troubles the rider had to resolve), announcing a negative assessment of the delivery at the end

Figure 6. Rider collaborates with co-located others to find the correct delivery address.

of the clip: the trip has taken more than the estimated time (Figure 6, Frame 11). The struggle to find a delivery address is perennial. Yet significant, here, is how the platform assigns the trouble and its consequences to the rider alone.

4.3.2. Interaction with the client is discouraged by the app, yet often necessary

In the clip we now turn to, our participant, Raj, reaches the landmark (a local cake shop) for the delivery location provided by the platform app. He stops his bike in front of the landmark and is intent on phoning the customer to ask for the exact address. (See appendix F for transcript.)

As the clip begins, we see Raj standing with his bike in front of a busy multi-use building that has a bakery and several other small retail storefronts at the street level, with several residential floors above. He has just sent an automated SMS notification to the customer via the app. The system-generated message reads *"I have reached the door. Please collect your order."* We can see on the video that the rider received a confirmation on-screen that the SMS has been sent. With the message sent, the options displayed on-screen are *"Hand order to customer"* and *"Call Customer"*. Raj needs to call the customer to determine where to find their apartment door but he is struggling to click on the button to call the customer. The clickable button to call via the platform is located at the bottom of the screen, and as a result, the participant cannot easily tap the call button – the issue, here, is a basic failure in the usability of the interface. As a result, there is a 15-20 second delay during which we can observe Raj clicking on-screen repeatedly, trying to select the *'Call Customer'* button as the home screen keeps overriding the app's interface (Figure 7, Frame 3). Raj blames his phone, rather than the interface design, for preventing him from successfully tapping the button in a timely way. At this point, Raj notices that the customer is calling him (Figure 7, Frame 4), yet it takes another 15 seconds for him to be able to navigate the interface to accept the call and begin speaking with the customer.

Rather than helping the rider in making contact with the client to finalise the precise details of the drop-off address, the workflow has generated obstacles preventing Raj from asking the customer where their door is. Before Raj was able to instigate a phone call to the customer, the app required him to first send a misleading text message which informed the customer erroneously that his food delivery was outside of his door. Only then did the workflow display the option to *'Call Customer'*. So, delay and confusion was already written into the interaction between the rider and the customer. The basic usability of the interface was so poor that the participant was unable to initiate the call through the app, leaving the customer obliged to call in response to the SMS. The customer opened the call with a curt *"Where are you?"* (Figure 7, Frame 5), the same question we encountered in the previous clip. Throughout these frustrating interactions with the app, both the customer and the platform remain oblivious to the struggles of the rider on the street below.

Figure 7. Rider speaks with the customer to find the exact address after reaching the landmark.

4.4. Mediating pandemic precautions through the platform

During the COVID-19 pandemic, Zomato devised two ways to use workers and their bodily data to regain and retain customers' trust. First, with the help of partnering restaurants, the app started recording the body temperature of delivery workers and displaying it to the customers as an indication of safety precautions taken to ensure safe food delivery. Second, the platform began to ask delivery workers to submit a selfie where they wore a face mask. The platform could impose a monetary penalty or terminate the rider's account if such a selfie was not submitted when requested. This was an extension of an older practice where the worker had to submit a selfie with the company T-shirt and delivery bag to be able to log into the platform. We wish to highlight three issues related to the pandemic precautionary features implemented by the platform: First, they were futile in that they did not ensure anyone would be safe from infection. Second, collecting and using bodily data of workers in this manner introduces ethical concerns. Third, these transactional features, designed to retain customers, ignore the risks the pandemic posed on the workers and others in their work context.

In this final section of our findings, we illustrate how food delivery workers dealt with the precautions imposed by both the platform and the surrounding community in response to COVID-19. We examine two extracts from the same ride-video: The first shows our participant, Shiva, negotiating with security guards to pass through the entry gate to reach the customer's door and complete the delivery, despite displaying a higher than normal body temperature reading. In the second clip, Shiva has no scope to collaborate with other human actors to resolve the platform's demand to submit a *'selfie with the mask'*. The video extract shows him struggling with the app, alone, throughout the ride, and eventually getting a negative evaluation of his performance despite following the platform's regulations.

4.4.1. Momentary cooperation in tackling pandemic constraints

During the period of pandemic restrictions in India, many gated communities did not allow delivery riders to enter without first performing a temperature check in the presence of a security guard. (These temperature checks where separate and independent from those introduced by the platform in collaboration with restaurants.) The delivery platform ignored the time and effort that this additional temperature-check added to the delivery process: workers were obliged to adhere to the same delivery workflow that was used prior to the pandemic. Guards would check that the delivery riders' body temperature did not exceed 37.8C / 100.04F (as a reading above this could indicate a fever). In this clip, Shiva successfully collaborates with two security guards to pass through an entry gate, despite the unreasonable reading of his body temperature showing 100.7(F). (See appendix G for transcript.) On this, only his second day as a delivery worker in an unfamiliar city, Shiva struggled to find the drop-off location, riding his motorbike with the help of Google Maps in the scorching summer heat. When Shiva eventually arrives, he hurriedly calls out to two security guards waiting by the entry gate *'Order, Order!'*, and the apartment

number. Shiva is immediately tasked with completing the on-screen workflow of a gated-community app called MainGate, which one of the security guards hands to him on a second phone. In Frame 3 (Figure 8), Shiva's failure to successfully log the details of his delivery into the gated-community app and his refusal to try further sets a difficult path for him to initiate cooperation with the security guards. Indeed, in Frame 6 (Figure 8), Shiva adopts more formal Hindi language to ask if the second security guard could help by completing the gated-community app on his behalf. More delay ensues in Frames 7 and 8 (Figure 8), when the security guard checks Shiva's body temperature and announces that his temperature is over the permitted limit. The second guard proactively provides an explanation for the rider's raised body temperature: that he must have been riding in the sun for sometime (Figure 8, Frame 9). Shiva quickly accepts and confirms this reason as an explanation for his high temperature. His situation now is rather precarious: having exerted so much time and effort to find and reach the customer location, it would be a serious financial loss for him if he was not allowed to enter and complete the delivery. In the remaining frames, we see Shiva take back the gated-community residents' app for a third attempt to log the details. However, when he fails again, he returns the phone directly to the second guard seated in the cubicle, stating that the app says *'user is not found'* (Figure 8, Frame 11). At this point, the second security guard resolves the gated-community app issue and allows Shiva access to the building.

The momentary cooperation between the worker and the security guards highlights the social interactions and technical infrastructures that need to be navigated for our rider to reach his customer. Shiva made three attempts to work with the gated-community app as requested. Further, he even adopted a change in language to show respect for the security guards when asking for their support. The guards reciprocated his efforts – instead of rigidly enforcing the temperature restrictions, they considered a broader evaluation of the worker's context and eventually allowed him to pass through. As cooperative as the guards may have been, the food delivery was, nonetheless, delayed by almost five minutes and Shiva's efforts were ultimately assessed as *'not a perfect delivery'* by Zomato. There was no option available to Shiva to account for the extraneous tasks he needed to complete in parallel with the app's workflow, even though these were necessary to complete the delivery.

4.4.2. No channel for worker appeal

We end our findings with a data extract showing the severe lack of channels for negotiation and cooperation between the worker and the food delivery platform. Here, we capture Shiva dealing with the platform's automated request to submit a selfie with a mask. The data extract in this case refers to the whole delivery from accepting the order to delivering the food to the customer's address. Here, we present not a clip but a series of events from the same ride, showing how Shiva

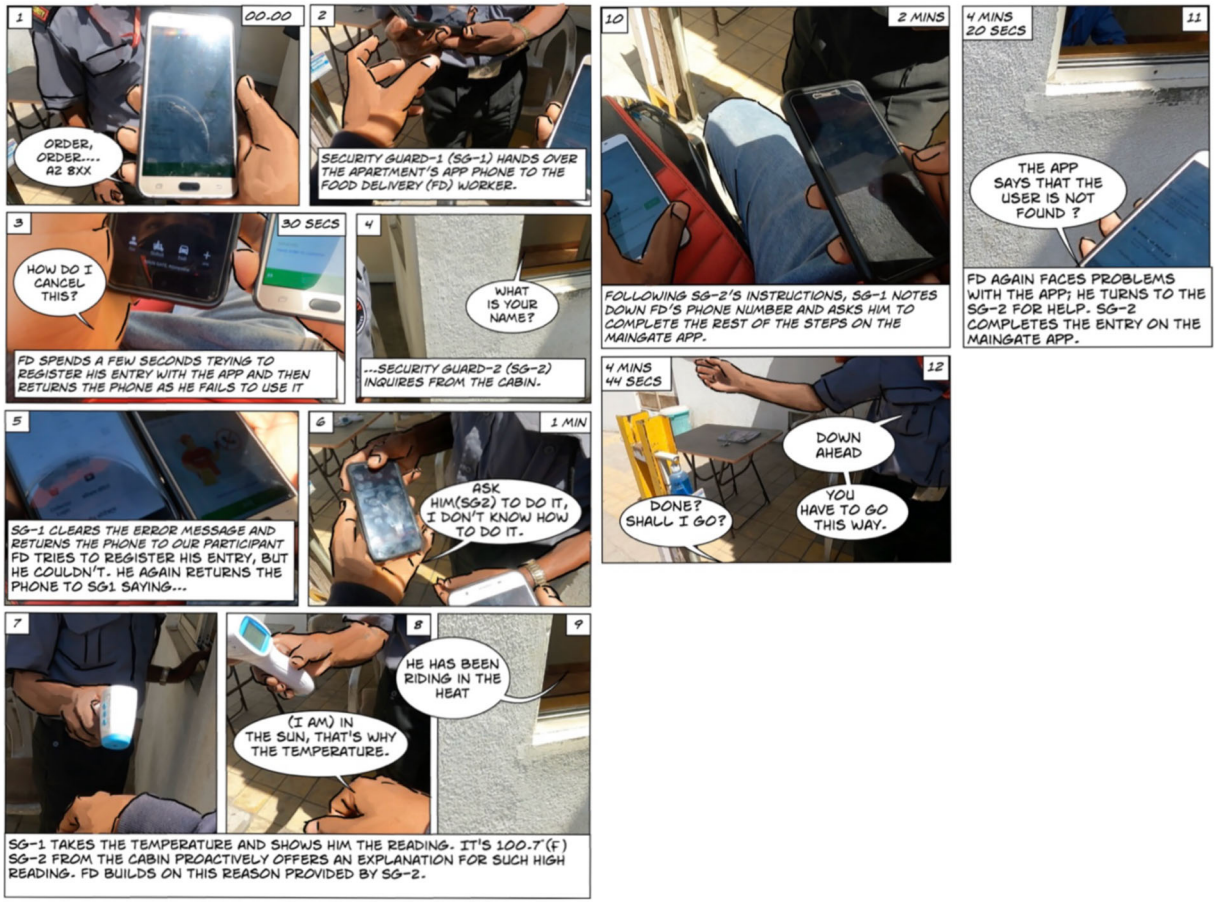

Figure 8. Rider draws upon solidarity with the security guards to enter the delivery location.

struggled to comply with the platform's demand for a selfie to verify that he was wearing a mask.

The incidence begins where 4.1.1 ends: Shiva is about to start for the pick-up location, when he gets the first notification from the platform requesting that he submit a selfie with a mask. The first on-screen notification states: *'Take one selfie: Please make sure your mask is clearly visible in the selfie'*. A green button below states: *'Take a selfie within 59 seconds'* (Figure 9, Frame 1). In the video, we see Shiva abiding by the platform's rules and regulations. The moment he receives this first notification, he immediately acts to capture and submit a selfie with a mask (Figure 9, Frame 2,3,4). Moreover, throughout the subsequent ride video, we see him wearing a mask. (See appendix H for the platform notifications in sequence.)

After a while, when Shiva is waiting at the pick-up location for the order, the delivery app crashes when he is trying to show the order details to the restaurant staff. When he reopens the app, he sees an error message about the requested selfie. It says: *'Time over ! You can not upload a selfie after the time ends. Quality assessment actions will be taken for failing to complete the grooming audit.'* (Figure 9, Frame 5,6).

In the last segment, where Shiva checks his earning dashboard, while approaching his bike after the delivery, a warning appears on his delivery app: *'You are not wearing a face mask. For your and customer's safety please always wear a face mask while delivering food with Zomato. Else you (your account)will be deactivated.'* (Figure 9, Frame 7). Shiva does not comply by clicking the only button on the warning. Instead, he manages to close the warning by clicking a tiny cross in the upper corner. This video clip allows us to observe how the rigidity of the platform workflow allows for no appeal by the worker. While the platform is trying to enforce safety and mask-wearing during the pandemic, the facial recognition technology being used to assess the evidence submitted by our participant has failed to recognise that the worker is wearing the mask correctly. The assessment based on facial recognition is wrong. The app has issued the rider with a warning that if the non-compliance will recur, his account on the platform will be deactivated. The primary action suggested for our participant to escape this warning screen was to hit the button stating *'Okay I will wear a mask'* (Figure 9, Frame 7) which was falsely extracting an admission from the rider that he had not been wearing a mask (even though he had). The video reveals Shiva hesitating to press this button, before opting for hitting the small cross to close the notification, instead. The on-screen request and the app's subsequent evaluation of Shiva's selfie submission provides him with no recourse: there is neither a channel available to interact reasonably with the platform nor can he cooperate with other human actors to discuss how to resolve the situation. The gap between the platform's faulty assessment of the worker's performance and the facts on the ground remains intact, and the platform's reality becomes the registered record of work for the rider.

Figure 9. Rider dealing with the platform's automated request to submit a selfie with a mask.

5. Discussion

Through our video analysis, we identify fleeting alliances and frugal collaboration amongst riders and other co-present actors as crucial for 'getting the job done'. Yet, these interactions remain unaccounted for by the platform: they are neither supported nor even acknowledged. We organise our discussion in three sections. First, we summarise and reflect on our findings about collaboration with co-located others as a response to the 'normal, natural troubles' of food delivery work, focusing specifically on *how* fleeting alliances and frugal collaboration are achieved in co-present interaction. Second, we discuss these interactions as a type of workplace training – a form of incidental learning that not only resolves the immediate issue but also allows workers to gain valuable skills and knowledge. This type of knowledge is necessary for succeeding as a rider yet typically unavailable in the official training materials provided by Zomato (and other food delivery platforms). Third, we consider more conceptually the kind of sociality revealed in the instances of fleeting alliances and frugal collaboration presented. Throughout the discussion, we consider the implications our findings have for both research and design, as related to food delivery work in particular and platform-mediated gig work more broadly.

5.1. Collaboration with co-located others as a response to the 'normal, natural troubles' of food delivery work

We have focused specifically on how riders come to resort to collaboration with co-present others to make sense of and comply with the platform's instructions for doing the work. Our video data illustrates that working for a platform is not simply about following the instructions provided on-screen but involves intensive 'gap analysis', that is, figuring out how the proposed workflow and the realities on the ground are misaligned and what to do about it. Complying with the platform's rigid workflows and successfully delivering food relies upon overcoming 'normal, natural troubles' (as outlined in (Garfinkel and Bittner, 1967; Brown and Laurier, 2012)). Through analysing the work practice *in situ*, we illustrate how carrying out the supposedly solo activity of delivering food comes to rely upon collaborative sense-making and knowledge-sharing among workers and with other co-present actors, such as restaurant staff and security guards. We have depicted an array of everyday troubles paired with social interactions geared towards addressing them. We characterise these interactions, which workers draw upon to join the dots and complete their deliveries, as *fleeting alliances* and *frugal collaboration* (See Figure 1).

We observed everyday troubles and associated interactions throughout the delivery workflow. First, locating and reaching the exact pick-up point was not always a straightforward task, even for experienced riders. Many restaurants had a customised way to hand over orders during the COVID-19 pandemic: some operated

behind closed shutters, others from a different location than the one provided on Zomato's digital map. This left riders to figure out how to collect orders on time. Even with no in-house business and overall lower workload during the pandemic, manual errors caused by the restaurant staff while handling online orders led to workflow disruptions for the riders. Next, reaching the customer locations and then the customers themselves often involved unanticipated trouble. Despite the address provided by the customer, unmapped or incomplete addresses and restrictions on contacting the customer caused problems in completing the delivery workflow's final steps. Finally, unexpected new demands imposed by the platform, such as an additional step during the order pick-up or the mandatory submission of a selfie with a mask, put riders in troubling situations, with little time to resolve the demand and no real recourse to appeal faulty assessments made by the platform.

The co-located others that riders reach out to in order to tackle these troubles include, but are not limited to, other delivery workers (both familiar and unfamiliar individuals), restaurant staff, security guards, local shop owners, and, at times, customers. A momentary engagement with one or more of these actors could provide the rider with (1) definitive information, for example in the form of precise directions to the pick-up/drop-off location, a specific course correction for task completion, or a simplified articulation to help voice a problem, (2) more vague suggestions that could still serve to solve or at least identify the problem, or (3) empathetic assistance and slight bending of rules to ease the situation, as seen in the temperature check at the gated community entrance. The riders often initiated these engagements by thinking aloud publicly about the hurdle they were facing, thus inviting co-present others to interact with them. In other cases, riders asked for assistance explicitly, voicing their need for support or advice, cautiously even if sometimes repeatedly.

We identify three key sources of 'trouble' in food delivery work: incomplete digital mapping, the time constraints in the workflow, and surveillance and monitoring features that are poorly matched with what the work is like *in situ*. First, while the food delivery platform relies entirely on the digital mapping of the city to deploy its service, the riders frequently struggle with incomplete mapping, such as inadequate or erroneous addresses for pick-up and delivery locations (see Sections 4.1.1 and 4.1.2). This leads to delays beyond the workers' control while assigning responsibility for finding the correct location squarely to the worker. Second, another set of everyday troubles for the riders emerges from circumstances created by the delivery workflow which is strictly timestamped and reflects the platform's intentions to shape food delivery in a particular manner. This offers riders no real agency in dealing with workflow demands. For example, as we saw in Section 4.2.1, a restaurant can mark an order ready ahead of time and, thereby, erroneously trigger the order pick-up timer in the workflow for the rider, leaving the rider to deal with the consequences. Riders have little recourse to appeal and are made to shoulder the blame for others' mistakes. Moreover, the platform can add new steps to the workflow at will, as and when needed; that may be collecting

additional information based on the food type (see Section 4.2.2) or asking riders to sanitise hands and record temperatures to foster a sense of safety and cleanliness for the customers during the pandemic (see Section 4.2.1). Workers must interpret, complete, and adhere to any changes in the workflow on the go, as new tasks and requirements appear. Lastly, the platform's surveillance and monitoring features are poorly matched with what the work is like *in situ* and offer no real means to appeal faulty decisions. For example, facial recognition allows the platform to check whether a rider is wearing a mask in the submitted picture but if the systems fails to recognise the mask, the consequences are once again left for the rider to worry about.

Our analysis points to design opportunities in terms of how the app might account for (and even support) the possibility of alliances and collaboration between co-present actors, during the delivery workflow and in the time between deliveries. Moreover, the platform itself could collaborate with riders more effectively. For instance, rather than imposing arbitrary questions on the riders while they are completing the work – which the workers 'crush' so as to move the workflow forward – the app might more productively solicit evaluative feedback from riders when a delivery has been algorithmically assessed as too slow or otherwise sub-standard. The app could allow riders to report what caused the issue, such as order not ready for pick-up as notified, incomplete customer address information, or customer address not in the location shown on the map. This would not only allow the riders to account for why the delivery was delayed but, importantly, serve the platform in improving its knowledge base over time, resulting in both smoother deliveries for the customers and an improved work experience for the riders.

5.2. Frugal collaboration and incidental learning

The value of informal learning has been long acknowledged, and in particular how social meetings and professional socialisation enable the sharing of tacit know-how and knowledge. Classic research on photocopy engineers (Orr, 1990, 1995) casts a light on many of these neglected practices, shaping how we think about workplace training. The apps that our delivery workers used offered training resources in the form of short videos depicting the different steps of the workflow. However, many crucial details were not documented or explained in these materials – perhaps quite understandably so, as capturing the whole of a complex work practice into any kind of an instruction manual is difficult, to say the least. Such missing yet crucial knowledge ranges from information about the local area that allows one to navigate efficiently despite incomplete digital mapping to advice on how to deal with unexpected changes in the workflow, as illustrated in the video clip from the ice cream parlor (see Section 4.3.2).

As discussed above, workers often relied on those around them at different parts of the delivery process, be that fellow workers, restaurant staff, or even passersby. While the availability of assistance was unpredictable, it had the advantage of

being potentially relevant to whatever problem was faced at that specific points in delivery. Moreover, those asked usually had the situational knowledge to help with the problem in hand, such as the location of a new apartment complex. The frugality of these collaborations enabled workers to learn on the job, at the actual points of need, when the information was most relevant to what they were doing. Frugal collaborations, in these situations, were opportunistic, ad hoc, and dependent upon a workplace community only briefly constituted. The learning that took place was passing and incidental, but without it, the job would have been much harder, particularly for those new to the job. What is crucial, here, is that workers interact with one another (and other bystanders) in a way that helps them to both complete their work tasks and, in a limited way, tap into the benefits that a work community can provide by way of social support and mutual learning. This allows the workers to both make sense of how the platform-mediated work is structured and figure out crucial *tricks of the trade* on the job, that is, the kind of tacit knowledge that is not provided by the platform companies even though it is necessary for success as a food delivery worker.

One interesting aspect of this training community is that the workers often had not met before. Rather, they recognised each other as fellow workers, all members of a loose community of gig workers. This is a particular sort of ad hoc community of practice (Wenger, 2000), of course, but notably, without sustained, mutual relationships between its participants. The community is constituted only momentarily and almost at random, yet assistance is given willingly. To this, we should add that assistance, and training as a side-product, was also given by others involved in the process. Interactions with restaurant staff were often rushed, since this was one part of the job that the app regulated heavily in terms of time allotted and actions required, monitored by punitive reverse timers (see Section 4.2.1). This said, restaurant staff were still relied upon to help not just with questions related to food and locations, but, at times, for assistance in managing the app, such as in taking a photo of the order receipt. Lastly, workers also turned to passers-by when their knowledge could be used to locate buildings and addresses.

One final point to make is that these learning moments are neither rewarded by the platform nor represented in the app in any way. Again, we can see how the algorithmic management of food delivery, though a vital part of arranging the work, only supports a partial view of the work practice. Here, we see a prominent design space to enable workers to better learn from each other so as to perform the work efficiently and to match their income goals with the platform's workflow expectations. Especially in a growing economy like India, platform-mediated services like food and grocery delivery or taxi-hailing disrupt the traditional work model where customers and service providers relied on minimal use of technology (if any), basing engagements, instead, on direct conversation between the involved parties. The gig platforms' approach has been to make themselves relevant by eliminating and ignoring such cooperation between those involved, replacing it with a technology-centric solution for matchmaking and coordination. While there are efficiencies in

how a platform can order and coordinate these types of multi-sided markets, we suggest platforms would benefit from also supporting the collaborations formed by their workers on the ground. A range of possibilities could be explored within, and beyond, the delivery app to assist workers in coordinating and conducting in-person training and mentoring sessions. One simple starting point could be to allow riders to show their locations and names on a map for drivers, to support knowledge about – and familiarity with – the local community of riders that they are a part of.

5.3. Fleeting alliances and frugal collaboration: A time-constrained sociality

Through our close analysis of the kinds of collaborative and/or helpful acts that enable workers to resolve 'the normal, natural troubles' that come up in the course of carrying out food delivery work, we have characterised these *frugal collaborations* as fast and spontaneous participatory interactions. They are entered into in response to emergent troubles and the subsequent uncertainty related to what one is supposed to do, and often they come to a swift close when the issue is resolved, with no visible signs of an expectation of reciprocity. We interpret them to be based in a form of solidarity among the workers – and to an extent others around them – where individuals are oriented toward supporting one another if they can, even when there is no immediate gain for them in doing so. The examples from our analysis also show that there is often little cost in offering this type of help: it can be done in the passing, while one is going about their own work or waiting to be able to continue with it. This resonates with how Graeber (2014) frames the logic of a local communism as "any human relationship that operates on the principle of 'from each according to their abilities, to each according to their needs."[1] To mark a related yet distinct issue, we have described as *fleeting alliances* situations where the actors, typically two or more riders, have a shared interest. For example, they might be trying to solve the same problem, such as locating the exact place where to pick up the food they are tasked to deliver. Here, they are still working on independent tasks – each their own delivery – but momentarily their workflows coincide and they can enter into a collaboration to resolve an issue both of them need to resolve as quickly as possible. As another type of example, we can think of the situation at the entry to a gated community, where there might be consequences for both the food delivery worker and the guards if the problem of entering to deliver the food does not get resolved. While the issue is more pressing to the food delivery worker, the security guards have little to win – and may have something to lose – if an unhappy resident files a complaint. Both fleeting alliances and frugal collaboration, then, resonate with the kind of participatory and collective efforts Rossitto and Lampinen (2018) documented at Hoffice: while everyone has their own work to worry about, helpful gestures and periodic collaboration on shared interests can both improve

[1] Graeber mentions that he could have also chosen a more neutral term such as "solidarity," "mutual aid," "conviviality", or even, "help".

the individual outputs and serve to re-introduce a sociable, humane element to the work experience.

As we have illustrated, fleeting alliances and frugal collaboration help workers address immediate issues and they also serve as a way of learning from one another, but beyond that, we note that they bring out a particular type of sociality among the workers. While everything about the workers' relationship and interactions with the food delivery platform is transactional and impersonal, the worker-to-worker interactions provide something of a counterbalance: our analysis depicts human-to-human interactions that involve voluntary acts of support, without expectations of direct reciprocity. Yet, we do not want to sugarcoat the interactions we observed: the collaborative acts we have discussed are, indeed, fleeting and frugal, performed under strict time constraints, and limited in their capacity to improve the workers' situation at work.

The tightly structured workflow, with its reverse timers for individual steps, constrains the workers' opportunities to interact with one another when out on a delivery. While this could easily be seen only as an impediment that serves to further isolate workers, we might, analytically, reflect on *how* the time constraints shape workers' interactions and the kinds of collaboration they enter. The shared context where it is obvious to all that time is of the essence serves to free actors from worrying about politeness and courteous exchanges of 'thank-yous' and 'you're-so-welcomes'. This is similar to the analysis that Ikkala and Lampinen (2015) offer of the early days of network hospitality on Airbnb where the 'paymentless payment' allowed hosts and guests to interact in a more sociable manner as they did not need to worry about interactions regarding money or other forms or reciprocation. When it comes to food delivery workers' frugal collaboration, the shared sense of urgency – along with the commonly shared experience that the app may pose problems given unexpected changes to the workflow and mismatches between what is represented in the app and what is happening on the ground – makes it socially acceptable to jump in, assist without having been asked to, and then swiftly move on. Connecting back to prior work around isolation and collaboration in piecework, our study contributes further evidence of sociable and collaborative acts, albeit in forms that are greatly constrained by how the platform structures the work.

Finally, it is worth briefly noting that what we have described is focused on work as it unfolds *in situ* and the collaborations and alliances we discuss concern solving immediate, time-sensitive issues. Prior research has documented gig workers' effort and difficulties in making broader structural change through, for example, unionisation (Woodcock and Graham, 2020; Doorn, 2020), but our data does not feature examples of collaboration on that level. What we have illustrated is more mundane: While the platform and its workflow app brings a workplace into being, it is the workers who make that workplace work for themselves, even if only in momentary and partial ways that leave much to be desired. This also gives us reason to believe that the phenomena we have identified here are not specific to the situation as it was during the early phase of the COVID-19 pandemic when the data we

have analysed was collected. While the waiting spots where the first author made initial contact with the riders became more prominent as the pandemic led to fewer orders and more idle time between deliveries, what we have discussed here takes place primarily *during* the delivery workflow.

6. Conclusion

Where classic CSCW scholarship (Schmidt and Simonee, 1996) has often described and discussed how computer systems could manage the complexity of coordinating cooperative work activities – individually conducted yet interdependent – we have considered a setting where workers are faced with a drastically different but equally complicated situation in which computer systems are used to set up an individualised workflow that presumes no collaboration for work that is necessarily part of an interdependent multi-actor system. Unlike the aims of earlier collaborative workplace technologies, the prevailing gig platforms involve algorithmic management designed to coordinate, regulate, and assess a rider's work individually and independently. Yet, our findings highlight collaboration as a critically important aspect of the interdependent work practice of food delivery. A distinguishing feature of our focus on the normal, natural troubles that food delivery workers encounter is that it is concerned with understanding what the world looks like from the point of view of its participants. Rather than independent individuals completing endless algorithmically managed delivery jobs on their own; what we can observe is how riders' delivery work is accomplished as a collaborative enterprise, dealing with everyday problems, in which knowledge and meaning are constructed and distributed in time-pressured work situations. Our video recordings of actions and decisions made *in situ* allow us to illustrate how getting the job done is often possible only with the help of co-present others, both in terms of resolving immediate issues that risk jeopardising individual deliveries but also by way of learning-on-the-job so that one becomes a more skilled rider, poised to deal with troubles as they continue to arise.

Appendix A Transcript for 4.1.1

The novice delivery driver is waiting for the next order allocation at a waiting spot with another experienced rider.
He receives an order. He accepts it and turns to his colleague to find out the directions for the pickup location.
FD 1: Where is this?
FD 2 takes the phone from FD1
FD 2: What is the name of this (place)?
The phone was showing the address on Google maps.
FD 1: One minute, go back
FD 2: Its here only.

FD 1: Where?
FD 2:This this, in the front.
((Pointing phone towards the location))
FD 1: Which one?
FD 2: This, the one in front ((Still pointing the phone in the same direction))
FD 1: The one with the sticker-? ((Points in same direction))
FD 2: Yes the one next to it.
FD 2 returns the phone to FD 1.
FD 2: There is this City cafe, this City cafe. Next to that.The back one in the middle.
FD 1: yes, yes
: We can walk there ((talking with the researcher))
FD 2: Mark it as reached, first.

Appendix B Transcript for 4.1.2

Food Delivery worker reaches the pickup location. The restaurant is under renovation. The worker tries to locate from where exactly the restaurant handovers the order.
FD 1: Where is order?
FD 1: Order, order, Zomato order?
Man on chair: Zomato?
FD 2: ((already waiting for order)):(From)Just here, here.
FD 1: Just here? Inside ?((Uncertainty))
FD 2 ((nods a confirmation, while continuing to read his phone))
Man on chair: Over there, back door ((gestures out and around the buidling))
FD 1: From over there?((Uses phone in hand to point to his right))
FD 1: Alright.
FD 2: Not from here any more?
Man on chair: [not audible]
FD 2: Did they start handing over from back door?
Man on chair: ((points again to direct both delivery riders to the back door of the restaurant))
FD1 starts walking
FD 1 ((mumbling))
FD 1: Where? Orders from here?
FD 3 ((another delivery guy is waiting on the street - He gestures to confirm deliveries pickup at back door))
FD 1: From behind? ((Again, an expression of uncertainty, to prompt a further direction))
FD1 keeps walking
FD 1: R 3 ((our participant mumbles R 3, this is the Delivery address, so rider is simultaneously preparing for the next leg))

((FD3 overtakes our participant, to try to secure his order pick up more quickly))
((they reach the back door order pickup location))
FD 1: Is it six nine XX XX?
FD 2: What is it (the order id)?
((In collaboration, FD2 is able to confirm that the order there is not for either of them - using commonly shared practice of referring to the final four digits only.))
FD 1: Six nine XX XX
FD 2 : [not audible]
FD 1: The order has not come yet?

Appendix C Transcript for 4.2.1

The food delivery worker reaches the McDonald's pick-up window. His application is showing the order is ready however the McD Kitchen staff is sill preparing the order.
FD1: The parcel is ready
FD1: The parcel is already ready. So I am (marking it as) picking-up.
FD1: Brother
FD1: Brother two one XX XX
KT1: What? 21..?
FD1: Two one XX XX
KT2: Yes sir, its getting ready
FD1: It's ready!
KT1: Done done
KT2: Is it ready?
KT1: Done done
KT2: What are you saying?
KT1: Yah..[not audible]
FD1: Sharing Pack of two MacVegge. [Reading the order items]
FD1: Is 21XX done?
FD1: Please give.
FD1: It's time. What is happening here
FD2: Mark it as not ready
FD2: Mark it as not ready
FD1: Already showed there that it is ready.
After two minutes, the option to mark it not ready will come.
FD1: Sir! Is it going to take more time? Please hand it over
KT1: What is it?
FD1: 21XX
FD3: Did they mark it ready before it was ready?
FD1: You marked it ready before it was ready
KT1/2: Done done
FD1: What are you doing man?

After a while, one of the kitchen staff members brings the order.
FD1: 21XX?
KT1/2: Ya Ya take it.

Appendix D Transcript for 4.2.2

Our participant is picking up an order of two tubs of ice cream from a busy ice cream shop. The delivery application in this specialist setting (ice cream vendor) issues an additional and unexpected step onscreen for the rider.
FD1: I need to confirm what all items are there.
FD1: Whether I have collected them or not.
((Reading the additional instruction, "click a photo of ice cream in ice cream bag", participant pauses and clicks on the Photo button which brings up a sample image onscreen))
FD1: ((In Hindi))Oh, it's asking to open it and take a picture!
((The app shows an example image onscreen in which the bag is open and food is visible, the branded delivery bag is not visible))
FD2: ((In Marathi))While keeping it in the bag ((in local language Marathi))
FD1: Hun?
FD2: ((In Marathi))While keeping it in the bag ((in local language Marathi))
FD1: ((In Hindi))Not of the bag
FD2: ((FD2 realises that our participant does not fully understand Marathi, so he re-issues his advice for taking Ice-Cream Collection Evidence Photo into Hindi))KEEP IT IN THE BAG. Then take a snap.

FD1: ((Addressing the researcher))Have to keep it in the bag
Researcher: Ok
FD1: Else they will charge a fine
Me: Oh ok.
FD1: This is how it works.

Appendix E Transcript for 4.3.1

The food delivery worker calls the customer after reaching the given delivery location. The customer and the security guards at the entry gate tells him that he is waiting at the wrong building, and directs him to the correct one. We can not hear the customer in this clip.
FD1: Hello? Mam, I am at (gate number) one...Mam, I am at the main gate

[One of the security guards sitting at the gate tries to interject]
SG1: (you are looking for the) Phase 1 or phase 2?
FD1: Oh is it ahead? ((talking with the customer))
SG1: (you are looking for the) Phase 1 or phase 2?

FD1: Alright ((talking with the customer)).
Where is two, is it ahead?((talking with the security guard))
SG2: yes. First left.
FD1: The first one, what?
SG2:Take first left ahead, Behind this.
FD1: Ok, behind this . ((talking with the security guard))
Okay mam, I will be there ((talking with the customer))
FD1: Ok, ok. You wait downstairs, I will be reaching there, in one min... ((talking with the customer))
FD1: Yes
((Food delivery works now talking with the security guards.))
FD1: The map stopped here, so I have to stop here.
Following the directions from the security guards, the food delivery worker enters a dark alley.
FD 1: This looks like a dead end.
He stops and spends sometime looking at the map in the app and scrolling through the customer's address details. He eventually asks a nearby local shopkeeper to find the correct building. He eventually asks a nearby local shopkeeper to find the correct building.
FD 1: Brother, brother...Apolo 23? ((talking with the shopkeeper))
SK : Apolo 23?
Shopkeeper points toward the building ahead. FD 1: This one?

Appendix F Transcript for 4.3.2

The food delivery worker reaches the delivery location. He is in front of the building where he's supposed to deliver the food. He is planning to call the customer to get the exact address, when the customers calls. He struggles to receive the call. Eventually he speaks with the customer.
FD1: In order to call the customer, first have to send a message
Damn, this phone...
The phone messed-up too. First I have to buy a new phone.
((Phone ringing))
FD1: I think the customer is calling
FD1: Hello
CST: Where are you?
FD1: Yes sir I am under the Royal cake.
CST: On top of it, The building is on top of it. Flat number XX.
FD1: in the same building, right?
CST: yes yes in the same building.
FD1: Ok ok sir
FD1: Was it number XX? ((thinking aloud))

FD1: Sir which floor?
CST: Umm, second floor
FD1: Second floor, ok ok.

Appendix G Transcript for 4.4.1

As the delivery worker enters the gate, we can see a security guard sitting in the cabin and the other one standing outside near the entry barrier. FD: I have an order... I have an order ((FD takes out his phone))
FD: B-, 8-4
SG1: is it A- or B-?
FD: A- A-
SG2 from the cabin hands over a phone to SG1. This phone has a community app to register the entry of a visitor.
SG2 says something [not audible], to which FD replies as "HO", meaning Yes.
SG1 hands over the community app phone to the FD.
SG1: Here, Make the entry.
((FD takes the phone and taps the screen a few times, trying to register with the app.He returns the phone to SG1, asking))
FD How do I cancel this?
SG1: Hun?
We can't see SG1's interactions with the community app phones,
He returns the phone to FD. It seems he has solved the problem. FD to takes the phone
At the same time, SG2 asks from the cabin,
SG2: What is your name?

FD: *Firstname Lastname* ((FD answers turning towards the cabin for a moment.))
FD is again trying to register the entry on the community app, holding his phone in the right hand and the community app phone in another. He hardly spends any time on it and asks SG1
FD: ((In Hindi)) Where is that?
SG1: ((In Hindi))What?....
FD tries to register his entry, but he couldn't. He returns the phone to SG1, saying,
FD: ((In Hindi)) Ask him(SG2) to do it, I don't know how to do it.

SG1 takes the phone and turns towards the cabin. FD starts clicking on his phone. SG2 asks something to SG. It's not audible.
SG2: ((In Marathi))Is it a parcel ?
FD: ((In Hindi))Its a parcel from Zomato.
At this point, we can see on his phone a notification from Zomato informing him about the possibility of getting the next order- "You may get the next order as

soon as you finish the current order. If you want to accept, then press Accept else logout." The buttons are labeled in Hindi. One says, "Log out later," The other one in green says, "Accept order." FD taps on the "Accept order" button. At the same time, the first security guard brings an infrared thermometer and takes our participant's temperature by applying the device to the rider's right hand. He also says something [not audible].
SG1 takes the temperature and shows him the reading. It's 100.7°C.

SG2: ((In Hindi)) He was riding in heat—
FD builds on this reason provided by SG2. He has his hand in the air thoughtout, offering to take the reading.
FD: ((In Marathi))(I am) in the sun, that's why the temperature.
SG1 takes the reading one more time. At the same time, SG2 suggests noting down FD's mobile number.
SG2: ((In Marathi))Take his number, his phone number.
SG1: Phone number?
SG2 hands over the community app phone to SG1 to register the phone number.
SG1:((In Marathi))Tell me your phone number
FD shares his phone number with SG1. SG1 enters the number in the community app phone. After sharing the number, FD says something not sure addressing to whom.
SG1:((In Marathi))See which company (you come from)?
FD: Zomato
SG1 says something about making the entry and handover the phone to delivery guy.
This time FD takes efforts to complete the entry. In between, he receives instructions from the SG2 to enter the flat number. At one point (4:03) he faces some confusion about the name of the apartment. Despite his efforts, he couldn't complete the task as he faces an error about user ID He turns to the SG2, handover the phone, saying
FD : ((In Hindi))The app is saying that the user is not found
SG2 helps him with registering the entry in the community app phone.
SG2: is it 804?
FD: ((In Hindi)) yes, 8-4...A-
FD: ((In Hindi))Done ? Shall I go?
SG2: Yes
FD: ((In Hindi))Where is A-?
SG2: ((In Hindi))down ahead
SG1: ((In Hindi))Go this way
SG1 indicates by pointing straight ahead
FD: ((In Marathi))The last one?
SG2: ((In Hindi))You see the one on that side?
FD1: ((In Hindi))There are only two buildings

SG1: ((In Hindi))Yes and you have to go this way.
FD starts the bike and enters the premise.

Appendix H Platform Notifications for 4.4.2

First notification
Rider gets the first notification to submit a selfie with the mask when heading toward the pickup location. He stops, takes a selfie with a mask, submits it, and again starts for the pickup location.
Take one selfie: Please make sure your mask is clearly visible in the selfie.
Button text - *Take a selfie within 59 seconds*
After submitting the selfie*Thank you...* ((remaining text is not readable))
Thumbs up icon is visible

Second notification
At the pickup location, when the rider was showing the order details to the worker at the restaurant, the delivery application crashed (twice). When he restarts it, and gets the next notification from the app regarding the selfie with the mask. The notification also shows a reverse timer reached 00:00.

Time over ! You can not upload a selfie after the time ends. Quality assessment actions will be taken for failing to complete the grooming audit.
Button text - *NEXT*

Third notification
After delivering the order, when the rider was walking towards his bike, checking his earning, the last notification warning appeared on the screen.
Not wearing face mask: You're not wearing a face mask. For your and customer's safety, please always wear a face mask while delivering food with Zomato. Else you (your account)will be deactivated.
Button Text - *Okay! I will wear mask.*

Acknowledgements

The authors thank all the participants for generously contributing to this study. We appreciate the time and efforts they put in to provide us with rich contextual information while performing the food delivery work during the COVID-19 pandemic. We thank Dr. Naveen Bagalkot of Srishti Manipal Institute of Art, Design, and Technology, who provided valuable discussions on research ethics and fieldwork in the Indian context. This work was supported by WASP-HS through a Marianne and Marcus Wallenberg Foundation project MMW 2019.0228 and the Digital Futures centre at KTH, Stockholm University and RISE.

Author Contributions

Riyaj Shaikh performed the field work and collected the data. Riyaj Shaikh prepared all the figures in discussion with other authors. Riyaj Shaikh and Moira Mcgregor wrote the main manuscript. Airi Lampinen and Barry Brown wrote parts of the introduction and discussion and reviewed the manuscript. The manuscript was reviewed for revised submission by all the authors.

Funding

Open access funding provided by Stockholm University.

Declarations

Ethical Approval

Our fieldwork performed in India does not clearly fall into any of the application areas specified in the Ethical Review Act in the country of our institution. Also, the national ethics review board only considers research conducted within the country. While we did not have any association with the local academic institutes or access to a local ethics board in India that could review and approve our study, we have striven to conduct the research ethically. Considering our research project's diverse, complex, and developing context, we have attended to the ethical standards for ICTD/ICT4D research (Dearden and Kleine, 2019). Also, aligning with the 'In-Action Ethics framework' by Frauenberger et al. (2016), we have strived to frame contextually situated ethical responses, instead of going into the field with a static and formalized set of rules.

Competing interests

The authors declare no competing interests.

References

Ahluwalia, Montek S. 2002. Economic reforms in India since 1991: Has gradualism worked? *Journal of Economic Perspectives* 16 (3): 67–88. https://doi.org/10.1257/089533002760278721.

Ahmed, Syed Ishtiaque, Nicola J. Bidwell, Himanshu Zade, Srihari H. Muralidhar, Anupama Dhareshwar, Baneen Karachiwala, Cedrick N. Tandong, and Jacki O'Neill. 2016. Peer-to-peer in the workplace: A view from the road. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, San Jose, California, USA, 5063–5075. Association for Computing Machinery.

Alkhatib, Ali, Michael S. Bernstein, and Margaret Levi. 2017. Examining crowd work and gig work through the historical lens of piecework. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, CHI '17, Denver, Colorado, USA, 4599–4616. Association for Computing Machinery.

Ansari, Halima Zoha. 2022. "Analysing Women's Labour in India's Gig Economy". https://feminisminindia.com/2022/01/25/india-gig-economy-women-work-zomato-urban-company.com/. Accessed 29 April 2024.

Bannon, Liam J, and Kjeld Schmidt. 1989. CSCW: Four characters in search of a context. In *ECSCW 1989: Proceedings of the First European Conference on Computer Supported Cooperative Work*. Computer Sciences Company, London.

Bharadkar, Kavya, Kaveri Medappa, Mohan Mani, Pradyumna Taduri, and Sachin Tiwari. 2020. Is platform work decent work? A case of food delivery workers in Karnataka. Technical report, Centre for Labour Studies, National Law School of India University.

Boden, Deirdre, and Donald H. Zimmerman. 1991. *Talk and social structure: Studies in ethnomethodology and conversation analysis*. California: University of California Press.

Bowers, John. 1994. The work to make a network work: studying cscw in action. In *Proceedings of the 1994 ACM Conference on Computer Supported Cooperative Work*, CSCW '94, Chapel Hill, North Carolina, USA, 287–298. Association for Computing Machinery.

Brown, Barry, and Eric Laurier. 2012. The normal natural troubles of driving with gps. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '12, Austin, Texas, USA, 1621–1630. Association for Computing Machinery.

Brown, Barry, Moira McGregor, and Eric Laurier. 2013. iphone in vivo: video analysis of mobile device use. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '13, Paris, France, 1031–1040. Association for Computing Machinery.

Brown, Barry, Stuart Reeves, and Scott Sherwood. 2011. Into the wild: challenges and opportunities for field trial methods. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '11, Vancouver, BC, Canada, 1657–1666. Association for Computing Machinery.

Dearden, Andy, and Dorothea Kleine. 2019. Ethical standards for the ictd/ict4d community: a participatory process and a co-created document. In *Proceedings of the Tenth International Conference on Information and Communication Technologies and Development*, ICTD '19, Ahmedabad, India. Association for Computing Machinery.

Doorn, Niels van. 2020. At what price? labour politics and calculative power struggles in on-demand food delivery. *Work Organisation, Labour and Globalisation* 14 (1): 136–149.

Frauenberger, Christopher, Marjo Rauhala, and Geraldine Fitzpatrick. 2016. In-action ethics. *Interacting with Computers* 29 (2): 220–236. https://doi.org/10.1093/iwc/iww024.

Gan, Yumei, Christian Greiffenhagen, and Christian Licoppe. 2020. Orchestrated openings in video calls: Getting young left-behind children to greet their migrant parents. *Journal of Pragmatics* 170: 364–380. https://doi.org/10.1016/j.pragma.2020.09.022.

Garfinkel, Harold. 2002. *Ethnomethodology's program: Working out Durkheim's aphorism*. Lanham, Maryland, U.S.: Rowman & Littlefield Publishers.

Garfinkel, Harold, and Egon Bittner. 1967. *"Good" organizational reasons for "Bad" clinical records, Studies in Ethnomethodology*. Englewood Cliffs: Prentice Hall.

Goodwin, Charles. 2017. *Co-Operative Action*. Cambridge, U.K.: Cambridge University Press.

Graeber, David. 2014. On the moral grounds of economic relations: A maussian approach. *Journal of Classical Sociology* 14 (1): 65–77. https://doi.org/10.1177/1468795X13494719.

Gray, Mary L., Siddharth Suri, Syed Shoaib Ali, and Deepti Kulkarni. 2016. The crowd is a collaborative network. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work and Social Computing*, CSCW '16, San Francisco, California, USA, 134–147. Association for Computing Machinery.

Gregory, Karen, and Miguel Maldonado. 2020. Delivering edinburgh: uncovering the digital geography of platform labour in the city. *Information, Communication and Society* 23: 1187–1202. https://doi.org/10.1080/1369118X.2020.1748087.

Heath, Christian, Jon Hindmarsh, and Paul Luff. 2010. *Video in Qualitative Research: Analysing Social Interaction in Everyday Life*. California: SAGE Publications Inc.

Heath, Christian, and Paul Luff. 2000. *Technology in Action*. Cambridge, U.K.: Cambridge University Press.

Heath, Christian, Marcus Sanchez Svensson, Jon Hindmarsh, Paul Luff, and Dirk vom Lehn. 2002. Configuring awareness. *Computer Supported Cooperative Work (CSCW)* 11 (3–4): 317–347. https://doi.org/10.1023/a:1021247413718.

Heritage, John. 1985. *A change-of-state token and aspects of its sequential placement*, 299–345. Cambridge, U.K.: Cambridge University Press.

Hindmarsh, Jon, Mike Fraser, Christian Heath, Steve Benford, and Chris Greenhalgh. 2000. Object-focused interaction in collaborative virtual environments. *ACM Transactions on Computer-Human Interaction* 7 (4): 477–509. https://doi.org/10.1145/365058.365088.

Hughes, John A., Jon O'Brien, Dave Randall, Mark Rouncefield, and Peter Tolmie. 2001. Some 'real' problems of 'virtual' organisation. *New Technology, Work and Employment* 16 (1): 49–64. https://doi.org/10.1111/1468-005x.00076.

Ikkala, Tapio, and Airi Lampinen. 2015. Monetizing network hospitality: Hospitality and sociability in the context of airbnb. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, CSCW '15, Vancouver, BC, Canada, 1033–1044. Association for Computing Machinery.

Irani, Lilly C, and M. Six Silberman. 2013. Turkopticon: interrupting worker invisibility in amazon mechanical turk. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '13, Paris, France, 611–620. Association for Computing Machinery.

Jarrahi, Mohammad Hossein, Gemma Newlands, Min Kyung Lee, Christine T. Wolf, Eliscia Kinder, and Will Sutherland. 2021. Algorithmic management in a work context. *Big Data and Society* 8 (2): 205395172110203. https://doi.org/10.1177/20539517211020332.

Jefferson, Gail. 1978. *Sequential aspects of storytelling in conversation, Studies in the organization of conversational interaction,* 219–248. Amsterdam: Elsevier.

Kasliwal, Ria. 2023. Gender and the gig economy: A qualitative study of gig platforms for women workers. https://www.orfonline.org/research/gender-and-the-gig-economy-a-qualitative-study-of-gig-platforms-for-women-workers-65948. Accessed 29 April 2024.

Kusk, Kalle, and Midas Nouwens. 2022. Platform-mediated food delivery work: A review for cscw. *Proceedings of the ACM on Human-Computer Interaction* 6 (CSCW2): 1–25. https://doi.org/10.1145/3555645.

Lampinen, Airi. 2021. *The Trouble with Sharing: Interpersonal Challenges in Peer-to-Peer Exchange*. California (USA): Morgan & Claypool Publishers.

Laurier, Eric, Barry Brown, and Moira McGregor. 2015. Mediated pedestrian mobility: Walking and the map app. *Mobilities* 11 (1): 117–134. https://doi.org/10.1080/17450101.2015.1099900.

Lee, Min Kyung, Daniel Kusbit, Evan Metsky, and Laura Dabbish. 2015. Working with machines: The impact of algorithmic and data-driven management on human workers. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, Seoul, Republic of Korea, 1603–1612. Association for Computing Machinery.

Lee, Min Kyung, Ishan Nigam, Angie Zhang, Joel Afriyie, Zhizhen Qin, and Sicun Gao. 2021. Participatory algorithmic management: Elicitation methods for worker well-being models. In *Proceedings of the 2021 AAAI/ACM Conference on AI, Ethics, and Society*, AIES '21, Virtual Event, USA, 715–726. Association for Computing Machinery.

Luff, Paul, and Christian Heath. 1998. Mobility in collaboration. In *Proceedings of the 1998 ACM conference on Computer Supported Cooperative Work*, CSCW98. ACM.

Martin, David, Benjamin V. Hanrahan, Jacki O'Neill, and Neha Gupta. 2014. Being a turker. In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing*, CSCW '14, Baltimore, Maryland, USA, 224–235. Association for Computing Machinery.

Mrvos, Dragana. 2021. Illusioned and alienated: Can gig workers organise collectively? *tripleC: Communication, Capitalism and Critique. Open Access Journal for a Global Sustainable Information Society* 19 (1): 262–276. https://doi.org/10.31269/triplec.v19i1.1236.

Muralidhar, Srihari Hulikal, Claus Bossen, and Jacki O'Neill. 2022. Between a rock and a hard place: Negotiating dependencies and precarity in the on-demand economy. *Computer Supported Cooperative Work (CSCW)* 31 (3): 443–486. https://doi.org/10.1007/s10606-022-09434-7.

NITI, Aayog. 2022. India's booming gig and platform economy: Perspectives and recommendations on the future of work. Technical report, NITI, Aayog.

Orr, Julian E. 1990. *Talking about machines: An ethnography of a modern job*. New York: Cornell University.

Orr, Julian E. 1995. Ethnography and organizational learning: In pursuit of learning at work. In *Organizational learning and technological change*, 47–60. Springer.

Prabhat, Shantanu, Sneha Nanavati, and Nimmi Rangaswamy. 2019. India's "uberwallah": profiling uber drivers in the gig economy. In *Proceedings of the Tenth International Conference on Information and Communication Technologies and Development*, ICTD '19, Ahmedabad, India. Association for Computing Machinery.

Qadri, Rida. 2021. What's in a network? infrastructures of mutual aid for digital platform workers during covid-19. *Proc. ACM Hum.-Comput. Interact.* 5(CSCW2). https://doi.org/10.1145/3479563.

Rai, Amit S. 2019. *Jugaad time: Ecologies of everyday hacking in India*. Durham, North Carolina: Duke University Press.

Raval, Noopur, and Joyojeet Pal. 2019. Making a "pro": 'professionalism' after platforms in beauty-work. *Proc. ACM Hum.-Comput. Interact.* 3(CSCW). https://doi.org/10.1145/3359277.

Rawls, Anne Warfield. 2008. Harold garfinkel, ethnomethodology and workplace studies. *Organization Studies* 29 (5): 701–732. https://doi.org/10.1177/0170840608088768.

Richardson, Lizzie. 2019. Platforms, markets, and contingent calculation: The flexible arrangement of the delivered meal. *Antipode* 52 (3): 619–636. https://doi.org/10.1111/anti.12546.

Rossitto, Chiara, and Airi Lampinen. 2018. Co-creating the workplace: Participatory efforts to enable individual work at the hoffice. *Computer Supported Cooperative Work (CSCW)* 27 (3–6): 947–982. https://doi.org/10.1007/s10606-018-9319-z.

Salehi, Niloufar, Lilly C. Irani, Michael S. Bernstein, Ali Alkhatib, Eva Ogbe, and Kristy Milland. 2015. We are dynamo: Overcoming stalling and friction in collective action for crowd workers. In *Proceedings of the 33rd annual ACM conference on human factors in computing systems*, 1621–1630.

Schmidt, Kjeld, and Liam Bannon. 1992. Taking cscw seriously: Supporting articulation work. *Computer Supported Cooperative Work (CSCW)* 1 (1–2): 7–40. https://doi.org/10.1007/bf00752449.

Schmidt, Kjeld, and Carla Simonee. 1996. Coordination mechanisms: Towards a conceptual foundation of cscw systems design. *Computer Supported Cooperative Work (CSCW)* 5 (2–3): 155–200. https://doi.org/10.1007/bf00133655.

Schor, Juliet. 2021. *After the gig: How the sharing economy got hijacked and how to win it back*. Downtown Oakland, California: Univ of California Press.

Seetharaman, Bhavani, Joyojeet Pal, and Julie Hui. 2021. Delivery work and the experience of social isolation. *Proc. ACM Hum.-Comput. Interact.* 5(CSCW1). https://doi.org/10.1145/3449138.

Sehrawat, Ujjwal, Namit Sawhney, Tejaswini Yeleswarapu, and Nimmi Rangaswamy. 2021. The everyday hci of uber drivers in India: A developing country perspective. *Proc. ACM Hum.-Comput. Interact.* 5(CSCW2). https://doi.org/10.1145/3479568.

Shaikh, Riyaj, Airi Lampinen, and Barry Brown. 2023. The work to make piecework work: An ethnographic study of food delivery work in India during the covid-19 pandemic. *Proceedings of the ACM on Human-Computer Interaction* 7 (CSCW2): 1–23. https://doi.org/10.1145/3610034.

Singh, Anubha, and Tina Park. 2022. Automating care: Online food delivery work during the covid-19 crisis in India. In *Proceedings of the 2022 ACM Conference on Fairness, Accountability, and Transparency*, FAccT '22, Seoul, Republic of Korea 160–172. Association for Computing Machinery.

Suchman, Lucy A. 1987. *Plans and situated actions: The problem of human-machine communication*. Cambridge, U.K.: Cambridge University Press.

Supriya, Routh. 2016. Informal workers' aggregation and law. *Theoretical Inquiries in Law* 17(1). https://doi.org/10.1515/til-2016-0011.

Tuncer, Sylvaine, Christian Licoppe, and Pentti Haddington. 2019. When objects become the focus of human action and activity: Object-centred sequences in social interaction. *Gesprächsforschung: Online-Zeitschrift zur verbalen Interaktion* 20: 384–398.

Vom Lehn, Dirk, Christian Heath, and Jon Hindmarsh. 2001. Exhibiting interaction: Conduct and collaboration in museums and galleries. *Symbolic Interaction* 24 (2): 189–216. https://doi.org/10.1525/si.2001.24.2.189.

Walker, Michael, Peter Fleming, and Marco Berti. 2021. 'you can't pick up a phone and talk to someone': How algorithms function as biopower in the gig economy. *Organization* 28 (1): 26–43. https://doi.org/10.1177/1350508420978831.

Wenger, Etienne. 2000. Communities of practice and social learning systems. *Organization* 7 (2): 225–246. https://doi.org/10.1177/135050840072002.

Woodcock, Jamie, and Mark Graham. 2020. *The gig economy : a critical introduction*. Cambridge, UK; Medford, Mass.: Polity Press.

Yao, Zheng, Silas Weden, Lea Emerlyn, Haiyi Zhu, and Robert E. Kraut. 2021. Together but alone: Atomization and peer support among gig workers. *Proc. ACM Hum.-Comput. Interact.* 5(CSCW2). https://doi.org/10.1145/3479535.

Zeschky, Marco, Bastian Widenmayer, and Oliver Gassmann. 2011. Frugal innovation in emerging markets. *Research-Technology Management* 54: 38–45. https://doi.org/10.5437/08956308X5404007.

Zhang, Angie, Alexander Boltz, Chun Wei Wang, and Min Kyung Lee. 2022. Algorithmic management reimagined for workers and by workers: Centering worker well-being in gig work. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems*, CHI '22, New Orleans, LA, USA. Association for Computing Machinery.

Publisher's Note