EMPOWERING AND COLLECTIVIZING GIG WORKERS: TOWARDS TECHNOLOGY AND POLICY IN SUPPORT OF PLATFORM-BASED LABOR

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To my parents, who led me to this world of inquiry.

ABSTRACT

Gig work, as an alternative form of employment, has drastically transformed how modern society labors, hires and transits within the past decade and half. But while gig work affords consumers extensive conveniences and support, laborers themselves face unprecedented and often unobserved physical, psychological, and financial challenges. This dissertation focuses on advancing technological and policy solutions that (1) empower and protect gig workers from the harms of data in-transparency and algorithmic management, which contribute to discrimination, over-surveillance as well as compromises of wages and safety, while (2) unifying worker communities and general public understanding of working conditions to resist current shortcomings in labor policy, regulation, and worker classification.

First, I present successful strategies that online freelancers employ, resulting from a quantitative analysis of worker messages from a leading online freelancing site, showing how personalization and standardization associated with success factors like job acquisition, project completion and long-term revenue. Beyond existing worker strategies, I also describe our design exploration of how related stakeholder groups envisioned (individualized) improvements practical but persistent issues plaguing gig workers. In particular, I showed stakeholders (local advocates/policymakers, platform employees and gig workers across sectors) compelling scenarios of gig work issues based on real-world cases documented in the literature and the press to workshop potential solutions and uncover latent desires and fears.

Next, I overview our development of a prototype data-sharing system, designed to advance solidarity, information exchange and related policy decisions. Data collectives embody one form of technological innovation to facilitate worker collectivism, advance advocacy, and inform policy. Collaborating with policy domain experts and workers to codesign this system – I identified data initiatives of interest between the groups (e.g., equity, safety, fair pay) as well as shared concerns and visions around data privacy and ownership. These design objectives informed Gig2Gether, a web app allowing workers across platforms to exchange stories, track and share work data, and present aggregated statistics and evidence to policymakers and advocates. Our week-long field study with 16 workers showed 1) them using the system to

record aggregatable and qualitative data, 2) enthusiasm to share uploaded data with peers and policymakers and 3) yearnings for additional methods of data-sharing.

Finally, I demonstrate the potential for game (mechanisms) to engage a broader audience in advocating for improved gig work conditions. Focusing on the rideshare context, we explore the potential for gamified in-ride interactions to advance passengers' understanding, empathy and advocacy for underexposed rideshare driving conditions and driver vulnerabilities. Through a series of workshops with 19 drivers and 15 riders, we revealed passenger knowledge gaps around rideshare vulnerabilities, tradeoffs and opportunities around consent and content in gamified in-ride interactions, as well as considerations of alternative interactions and incentives for achieving further awareness among the ridership.

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ACRONYMS

1 INTRODUCTION

Gig work, over the past decade, has driven transformative progress in both the online and offline labor markets. By expanding work access to previously marginalized individuals [41, 334], rapidly supplying labor demands just-in-time [36, 88], and attracting worker participation from around the globe [85], the platform-based gig economy prides itself in enabling the advent of alternative and more flexible forms of work. However, underlying such tremendous advancements are laborers who regularly contend with unprecedented risks and challenges: health risks and physical hazards [7, 68, 80, 416], intense competition and financial precarity [14, 27, 135, 368], oversurveillance and privacy violations [284, 336], a lack of social support and legal protections [19, 89, 421], not to mention algorithmically amplified control [55, 409], gamification [28, 312], and discrimination [138, 235, 326].

Exacerbating such conditions, platforms' refusal to disclose data that they (in)visibly collect creates boundaries that limit workers' information exchange with their peers and supporting stakeholders [420, 424]. Despite how workers dually provide both service and work data for platforms — with the latter subjecting them to surveillance-style data collection [388] — they remain outsiders to platform's collected data. Collectively, this data barrier stifles progress toward regulatory policy that improves gig work conditions [361]. At individual levels, such information asymmetries hinder career advancement opportunities for each worker [59]. In particular, the data deficit workers experience (around their own data) in platform-based work limits their abilities to strategize and plan for optimized workflows or schedules. This barrier motivates Part i of this dissertation, where we ask:

RQ1: Can we glean successful gig work strategies by statistically analyzing data that workers contribute as a part of their labor on gig platforms? [174]

In Chapter 2 I investigate this by quantitatively analyzing a large-scale dataset of communication data from workers (over two million messages, involving >56K projects and >58K freelancers) from a leading online freelancing site to investigate how standardizing and personalizing communication strategies associated with

project level and career achievements. Results reveal how 1) curating (i.e., personalizing) bidding messages associated a worker's chances of winning the bid; 2) keeping standardized schedules when responding to client messages (i.e., avoiding instant replying during the day) correlated with higher likelihoods of completing a project; and 3) standardizing bidding text (e.g., writing templates to submit bids for multiple projects) related to freelancers earn revenue over the long term, since it enables them to bid to a higher volume of projects. This investigation demonstrated the feasibility of harnessing successful strategies that drive worker success using data available to gig platforms, thus answering RQ1 for the case of an online freelancing platform.

Equipped with the understanding that large-scale data can indeed help workers uncover existing work patterns and strategies, I proceeded to explore (in Part ii)) the space of possible gig work futures where technology and policymaking can hold platforms accountable to more just and transparent (data) practices. Up to this point, recent research endeavors primarily uncovered the various forms of adverse conditions present in gig work, including labor exploitation through invisible logistical work [73, 75, 266, 385], amplifications of existing inequalities for lower-resourced groups [134, 249, 272, 348, 377], increased exposure to physical and health risks [7, 18, 122, 139, 209, 216, 416], without the safeguards of workers' compensation or health insurance [18, 382].

Beyond understandings on the downstream harms that result from the absence of regulation, impactful progress toward feasible and implementable solutions requires input and conversations with multiple related stakeholder groups, including those with power to affect decisions that advance gig work conditions. For example, stakeholders with influence on policymaking may be interested in considering ways to progress labor regulations through (state) legislative and administrative/enforcement processes, which lag behind litigation in this space [31, 74, 75]. Platform designers, as well, can directly affect future functionalities, operations, and services initiated by their employing platforms — making them important groups to consult when considering tangible changes to the digital infrastructures that gig workers primarily interact with. Thus, in Chapter 3, I engaged with multiple stakeholder groups to inquire:

RQ2 (a) What interventions for gig work conditions are most aligned with the preferences of gig workers, policymakers and platform designers? [175]

Specific to advances in policymaking, I pondered:

RQ2 (b): Where do federal labor protection laws fall short for individual gig workers? [173]

To explore the space of possible interventions, I began Chapter 3 by browsing related literature and news reports to inform the construction of scenarios that are illustrative of the issues prevalent in gig work. To identify feasible solutions to address these challenges, I then conducted co-design workshops with multiple stakeholder groups to pinpoint the advancements they are most motivated and poised to support and execute. In total, I conducted eight sessions with 7 local advocates / policymakers, 5 platform employees, and 8 gig workers, leveraging the speed dating design method to quickly elicit the preferences of stakeholders to address real-life gig work situations. In response to RQ2(a), I identified synergies and tensions for solutions between stakeholder groups, which included radical reimaginings of the existing public infrastructure and policy (e.g., universal healthcare, income pools coregulated by platforms and governments, worker-owned cooperatives), as well as more tangible and implementable but incremental interventions such as ways of enhancing work dispatching or helping workers connect with existing resources of the local workforce.

Related to policy, this investigation corroborated the need for advances in platform regulations, which scholars around the world have also advocated for [75, 102, 103, 159, 361]. To further and expand the legal and regulatory attention surrounding gig work, it is imperative to understand and address current legal limitations that fall short to protect workers in their labor. Thus, in Chapter 4, I synthesize exemplary cases where worker protections were recently encoded into certain state or city bills, as well as spaces where gig worker protections are insufficient when compared to standard employee rights — to advocate for more individualized policy advancements. This closer examination of the existing policy landscape advocates for more targeted, individualized, and personalized policies, benefits, and protections — as opposed to general, all encompassing solutions that neglect to account for diversity of gig task domains and the backgrounds of workers who complete this labor — in hopes of more sustainably and scalably supporting platform-based workers.

At the intersection of law and gig work, scholars across the world call for increased legislation and regulatory action [75, 201]. But despite the potential of large-scale worker data to reveal key insights about gig work conditions and practices (unveiled in Chapter 2), the lack of access to platform data forces policymakers

(among other related actors – e.g., advocates, policymakers, workers themselves) into a data deficit [159]. Moreover, platforms intentionally design their systems in a way that prevents workers from communicating or sharing work data with each other [359] — intentionally perpetuating information and power asymmetries and limiting workers' abilities to engage in collective actions (e.g., group sensemaking and decision-making, goal-setting). In Part iii, I seek to reduce these barriers to information exchange between stakeholders and among workers through the design and development of a data-sharing system to facilitate collectivism and inform policy. To start, I expand our understandings of the (shared) initiatives of interest where specific worker data may be of assistance to both impacted workers and stakeholders with influence in policymaking. Thus, I first explore

RQ3 (a) : How can data-sharing drive policy initiatives (of interest to both policy experts and affected workers) to improve gig work conditions? [179]

After identifying aligned initiatives of interest, we can begin exploring practical system mechanisms and interactions.

RQ3 (b) : What system capabilities and interaction mechanisms do gig workers require to engage in information exchange around their labor and to inform policy generation? [180]

To approach RQ3a, I explore in Chapter 5 the preferences and requirements that policy experts and impacted workers held around the design of a data-sharing system to advance peer support and regulatory infrastructures. In particular, I collaborated with 11 policy experts in interviews and 14 workers of four task domains (freelancing, ridesharing, food delivery, pet sitting) in co-design workshops to explore initiatives of interest that the aggregated data may support, as well as preferred methods of aggregating and sharing worker data among one another and with policymakers. By engaging with both groups, I identified several shared desires for initiatives on advancing gig work conditions that data-sharing can support, including further protections of equity, safety, and fair pay, as well as an improved understanding of the algorithms that assign work and ratings.

These codesign results revealed how workers (data producers) are willing to share labor data to advance regulations that improve working conditions with policymaking experts/influencers (data receivers) on topics of interest. But to collectively push back against platform-imposed power asymmetries, workers require advances in

digital infrastructures [49, 359, 427] that open up possibilities of information exchange with other workers on the same platform, gig workers from other platforms, as well as advocating groups that support their labor — e.g., labor organizers, policy experts. Although the idea of a cross-stakeholder and cross-platform data-sharing system holds potential for achieving several interventions identified in Chapter 3 (e.g., resource exchange / pooling, peer support, collective actions), both stakeholder groups raised several practical concerns in Chapter 5 that can cause them to withhold data: trust, privacy, ownership, lack of accommodations for work diversity.

In Chapter 6, I considered both the identified policy initiatives (that benefit from data collectives) and the design concerns / recommendations of workers and policy domain experts to create wireframes of a prototype data-sharing system. With active gig workers in its target domains, I iteratively refined its capabilities through pilot tests [180]. This process resulted in Gig2Gether, a web app with functionalities for workers to 1) track and share work data with each other, as well as 2) present such aggregate statistics and stories as evidence and motivation for policymakers and advocates to address pressing issues of gig work conditions. Through a 7-day field evaluation with 16 workers from three domains, I found that Gig2Gether facilitated cross-platform mutual support, enabled financial reflection and planning, and helped workers to envision future uses cases – e.g., collaborative examinations of algorithmic speculations, informing policy on issues of safety and pay – which motivated (latent) desiderata of additional interactive capabilities and data metrics.

In the proposed work (Chapter 7), I outline plans to co-design (counter-)data production mechanisms while aligning the policy objectives of both workers and policy experts. In particular, I propose a multistage process that engages both stakeholder groups in co-deliberation to identify methods of data visualization, cross-stakeholder interactions, and governance for collective data-sharing systems, using possible extensions of Gig2Gether as a boundary object. I began with a review of possible existing mechanisms from the system-building literature and follow-up to describe steps of the protocol for the iterative and stakeholder-centered development process.

In sum, this dissertation aims to identify strategies and worker-centered tools that support platform-based gig workers both in individual career advancement and in building collective power with peers. By focusing our findings on the existing lived experiences of workers, we approach this objective in a way that integrates into their workflows and addresses concrete needs that can be supported by further advances in technology and policy.

Thesis Statement

By integrating experiences, insights and (data) needs of gig workers and policy experts, we can design and develop technological interventions to better align (policy) preferences, thereby uniting worker communities to engage in mutual support and collective actions that challenge existing work conditions, visibilize hidden labor and inform more effective regulatory policy.

Part I

COLLECTIVE COMMUNICATION STRATEGIES

Gig workers individually develop several undocumented strategies for improving their earnings and advancing their careers. In the following part, we investigate communication strategies that (a large set of) workers used on a leading online freelancing platform, observing how such patterns of practice correlated with chances of success at multiple stages of their projects and careers.

2

STRATEGIES & WORKFLOWS FOR COMMUNICATION IN ONLINE FREELANCING

Online freelancing platforms employ gig workers and service clients around the globe to accomplish virtually deliverable tasks spanning a wide range of job categories and expertise levels. For many workers, the online gig economy provides an alternative to the traditional workplace, one that offers more autonomy, mobility, and flexibility - both physically and temporally [107, 223]. These affordances attracted 59 million workers in 2020, more than a third of the US workforce. Those workers collectively earned $1.2 trillion and 36% of them participated on a full-time basis [131]. In 2019, online freelancing allowed 46% of the gig worker population to be employed despite personal circumstances (e.g. caretaking, disabilities, etc.), and in 2016 it served as a primary source of income for 44% of workers [256].

However, the touted benefits of gig work come at a cost. On the other side of flexibility and decisional autonomy, workers are subject to self-management, an overhead absent in traditional employment. Meanwhile, physical and temporal flexibility may also result in a lack of boundaries between work and personal time - a phenomenon known as the autonomy paradox [351]. Gig workers must efficiently manage their limited resources such as energy, time, and connections.

To achieve lateral mobility — the freedom to work across different career fields or platforms — freelancers must spend extra effort skill training and invest more hours to seek out jobs across various sectors [223]. One particularly challenging aspect of online gig work is the digitally-mediated nature of communication. Although a remote working arrangement can enable temporal and spatial flexibility, digitally-mediated labor also deprives workers of many benefits inherent in face-to-face communication. Messages relayed through online channels suffer from a plethora of complications, including asynchronicity, connectivity issues, time zone differences, and a lack of nonverbal cues (e.g. tone of voice and body language such as gestures and facial expressions).

To cope with these challenges and efficiently manage their efforts, gig workers may develop alternative strategies, such as ***standardization*** or ***personalization***. Standardization work patterns may involve, for example, the use of job proposal tem-

plates to quickly submit multiple bid applications to different projects. It may also involve the use of a fixed working schedule. Personalization, in contrast, may entail customizing the content of a bid proposal to cater toward a particular client's needs, or tailoring a work schedule to align with or accommodate that of an employer.

In this chapter, we empirically investigate the efficacy of the above strategies, seeking answers to the following research questions:

1. How does standardization versus personalization in initial employer communications influence a freelancer's likelihood of winning a job?
2. How does standardization versus personalization in the timing of a worker's communication influence a freelancer's likelihood of completing an awarded project?
3. How do these practices impact workers' broader earning efficiency in the market?

Using data from a leading global freelancing platform, we analyze communication patterns derived from 2,031,068 direct messages exchanged between 58,397 freelancers and 25,480 employers, in relation to 56,222 projects, between January and March of 2010. We provide evidence that 1) personalizing initial communications toward a particular job increases the likelihood of being hired 2) maintaining a consistent work schedule increases the likelihood of project completion and 3) content standardization enables greatest overall earnings in the market, by allowing the freelancer to have larger bid and work volumes.

With the recent investment in and shift toward remote work by various workers and organizations, there is reason to believe that the prevalence of online gig work will continue to rise [22, 182]. To support new freelancers in acclimatizing and succeeding in this novel labor environment, our findings contribute understandings of effective work and communication strategies through a quantitative approach toward human-centered optimization. We discuss the practical implications that our empirical findings can have on the design of gig platforms as well as worker support tools that aim to assist freelancers in maximizing their working efficiencies and individual well-being.

2.1 RELATED WORK

2.1.1 *Challenges Endemic to Online Gig Work*

Gig work can be defined as "electronically mediated employment arrangements in which individuals find short-term tasks or projects via websites or mobile apps that connect them to clients and process payment" [224]. In short, online labor platforms act as an intermediary — providing boundary resources such as communication channels, evaluation metrics and automated transactions [196] — between freelancers who seek jobs and clients who look to hire professionals to complete various forms of work. This study focuses primarily on virtually-deliverable and knowledge-intensive work, as opposed to physical services such as furniture assemblage offered by gig workers on platforms such as TaskRabbit, ridesharing services that are now commonly provided by Uber/Lyft, or microwork such as those found on Amazon Mechanical Turk. The digital nature of gig work suggests the prospects of greater work flexibility and independence, and many workers report pursuing gig work with these benefits in mind [150]. However, such affordances comes at the cost of several unique challenges. For example, gig workers may face professional isolation and atomization over the long term [421], causing them to obtain fewer networking and advancement opportunities (reduced lateral and upward mobility, respectively) as well as limited social support while enduring fierce competition [223]. Beyond social isolation, workers must also contend with unique day-to-day difficulties, such as income instability and the need to self-manage — e.g. coordinating their time and resources, maintaining productivity, self-advertising, proactively seeking out new work, building reputation, and maintaining client relationships [368].

The unique structure of online labor platforms (intentionally) introduces elements of uncertainty and information asymmetries, which can create power imbalances that favor clients and enable platformic management [195, 196, 214, 227, 285, 368]. For instance, clients on Upwork are not required to disclose their identities (a privilege not afforded to its freelancers) and they may also leave private reviews for workers they've hired; freelancers, on the other hand, cannot even access the other bidders of a project they apply to, nor can they see who the ultimate winner is [196]. Specific components of platform structure, such as calculated ratings, have also been found to increase power asymmetries and worker precarity [368].

Compounding on their already precarious job situations, freelancers can be highly susceptible to volatility in the marketplace. For instance, Huang et al. [182] found that, during the 2008 recession, an unemployment increase of 1% was associated with a 14.9% increase in project bidding and a 21.8% rise in the number of active workers. More recently, Sutherland et al. [368] discovered that the COVID-19 pandemic caused a decrease in worker-controlled flexibility, along with increased competition, exploitation and workload intensity. As we gradually transition from this era of work from home, many employees face the dilemma of whether to remain remote [22]. Some companies hesitate to offer such long-term remote work options for their employees, which urges many workers to turn to freelancing alternatives. This looming wave of novice online freelancers, who likely intend to remain for the long term, poses many questions about successful strategies for online freelancing.

In a systematic review of the sharing economy in computing research, Dillahunt et. al. focused on the HCI community's contributions toward the sharing economy as well as underexplored and unexplored topics for future research. [97]. This prior literature review suggests that existing HCI studies on the sharing economy has been largely descriptive and qualitative. To diversify the range of HCI approaches applied toward the gig work context, we present here a quantitative study that leverages the aggregate past experiences of workers. The literature review also suggests a need for human-centered optimization that increases the decisional autonomy and long-term performance of workers, while minimizing overheads such as reduced availabilities, monetary cost, and worker burnout [97]. Within this empirical investigation we offer an initial identification of effective project-level and long-term self-management strategies, to inform novice freelancers about what, when, and how much to communicate with their clients, and more generally about the overall marginal benefit (or cost) of 'personalizing' service delivery — e.g., tailoring communications or work schedules to one's client.

2.1.2 *Strategies in Online Freelancing*

Compared to the more organization-centered employees of the traditional labor market, workers of the gig economy are individually-organized and experience many of the same challenges as entrepreneurs at the beginning of their gig career. With this in mind, we draw on literature in entrepreneurship to identify relevant strategies that could be applied to online freelancing. For resource-constrained entrepreneurs,

prior work [17, 47, 390] identified the strategy of bricolage - the act of creatively working with available, limited resources, and adapting them toward new or important purposes; or as Levi-Strauss put it: make do with "whatever is at hand" [248]. Online freelancers are also bricoleurs when they leverage available resources (such as messaging systems, client reviews and job descriptions to learn more about the requirements of a gig) to tailor their pitches toward employers accordingly.

One particular way of circumventing resource constraints is by engaging in network bricolage - where workers utilize their network resources in a manner that is different from the original basis for the connection, thereby creating new opportunities [63]. In the online gig economy, such resource-creators may find relational support by engaging with offline networks, developing a mentorship relationship with senior freelancers, or cold-emailing potential clients. Because the "infrastructure supporting individuals' careers in the gig economy is deeply relational in nature" [16], it is important that freelancers accrue portable human capital. After amassing such social capital, workers may maintain their reputation using various strategies such as keeping a high and positive rating, reaching out to past clients or cultivating relational agility by productively forming, maintaining and dissolving work relationships [36, 368].

To overcome information asymmetries in online labor markets, workers may engage in prosocial network bricolage behaviors to build connections, so that successful freelancers can share experiential knowledge and novice ones can gain from the collective advice of more veteran peers. Social media groups, for instance, serves as a key resource for informational peer support for rideshare drivers, helping them alleviate the burdens of atomization of being geographically dispersed [421]. In freelancing platforms such as Upwork, novice workers may leverage the advice of more senior and successful freelancers [196]. To circumvent power asymmetries and platformic management, workers might take courses to gain algorithmic literacy about the platform [196] or experiment with it themselves to develop strategies such as "saving searches" to improve recommended jobs or asking clients to report multiple hours of work as one condensed hour to improve their hourly rates [195].

For digitally-mediated work, many of these network bricolage behaviors involve some means of direct communication between the client and worker, such as emailing or messaging. While there are workers who use opt to use external communication tools to deal with technical inefficiencies, unreliability and monitoring concerns [195, 196], most online labor platforms provide a form of direct messaging system to mediate textual exchanges between workers and employers. In fact, one of

the platform's core functionalities is to facilitate communication between transacting parties [196]. Thus, we focus primarily on communication strategies that freelancers commonly engage in when chatting with potential clients.

2.1.3 *Stages of the Project Lifecycle*

While we intend to study strategies that are applicable during all periods of a freelancer's career, it is important to distinguish different points of a project cycle. In this study, we consider both the initial, pre-contract (bidding) stage and the project execution stage:

1. Bidding stage: Client may interact with multiple freelancers prior to offering the job to selected candidate(s), both clients and freelancers may negotiate and clarify the scope of work before finalizing on price

2. Execution stage: After the client makes the job offer and sends deposits promised compensation via an Escrow, the worker begins work to complete job demands

At the initial bidding stage (1), freelancers may attempt different techniques to garner the attention of a potential employer. These may include stylistic techniques such as the use of custom signatures and uppercase words for emphasis, as well as content curation strategies such as using templates to quickly initiate conversations with multiple employers. On the other spectrum, some freelancers may also choose to personalize the content of their (bid) messages to accommodate job demands. Following initial introductions, the freelancer and client negotiate to settle on a price and review contract terms to clear up points of confusion. At this point, if the project is ill-matched, either party may choose to reject the collaboration. During the execution stage (2), the worker may provide progress updates, request additional clarifications, or ask for milestone payments while the client can ask for updates to monitor progress. Note that after the successful completion (or abandonment) of the project, users may request reviews, provide reminders about payments, or bring up opportunities for future collaborations.

Evidence abounds that direct communication benefits sellers on digital marketplaces, including Alibaba, Amazon, and Travelweb [242, 369]. For instance, the use of live chat on Alibaba can increase purchase probability of tablets by 15.99% [369]. In online freelancing, it has been found that workers are 8.9% more likely to be hired if they initiate a direct message to a potential employer when submitting their bid

[168]. In our own sample data, we qualitatively observed comparable patterns of benefit. Specifically, we see that freelancers who employ high-quality templates (e.g., containing examples of past work and self-promotional messages) tend to receive more responses from clients. Further, we observe that freelancers who proactively provide progress updates to their clients during the course of a project are more likely to successfully complete the work and receive payment.

With the exception of [168], the present body of literature has yet to systematically investigate the communication strategies employed by workers in the context of online labor platforms. We thus currently have a limited understanding of the alternative work strategies that gig workers employ during job search and project execution, and the relative efficacy of each. Hence, we explore those questions here.

2.2 STANDARDIZATION VS PERSONALIZATION IN COMMUNICATION

At a high-level, online freelancers can be expected to adopt two main strategies: they can ***standardize*** their messaging practices — using techniques such as templated content or regular messaging hours — or ***personalize*** their communication to cater toward desires of an employer — by messaging during the client's preferred hours or curating their proposals to fit the needs of a job. While standardization offers efficiency gains by saving time and effort for freelancers, personalization can facilitate smoother correspondence with employers by providing them just the information they need, when they need it. However it remains unclear whether it's more efficient and beneficial for workers to take the standardized approach of offering their services to a large group of clients, or focus on more personalized services that accommodates the individual needs of each job and client.

A past study on telephone surveys examined the tension between standardization requirements (interviewers are prohibited from laughing during survey administration to maintain consistency across surveys) and rapport-maintenance expectations, which can manifest when survey respondents initiate a laughter invitation [228]. Although the interviewers of this study declined to join in on respondents' laughter invitations, there was no exploration of whether the breakage or maintenance of rapport through (the lack of) laughter responses affects the quality of the surveys – a success measure that would have been appropriate for this laughter study. In this piece we endeavor to explore how the tradeoff between standardization and person-

alization communication techniques affect success outcomes such as job acquisition and completion.

However we acknowledge that the two are not mutually exclusive practices – a freelancer may choose their strategies depending on plethora factors such as their familiarity with the client, expertise with the job posting, the stage of the job cycle they're currently in, or their personal bandwidth and availability. Standardization and personalization may also be exhibited in a different ways – freelancers may remain temporally consistent in their responses to client requests while remaining delivering standardized, templated message response content. So in addition to tradeoffs, we plan to also investigate how these strategies can interact with other factors and exhibit different effects when applied to multiple contexts.

2.2.1 *Standardization*

According to De Vries, standardardization is defined as *"the activity of establishing and recording a limited set of solutions to ... problems directed at benefits for the party or parties involved balancing their needs ... expecting that these solutions will be repeatedly or continuously used during a certain period by a substantial number of parties for whom they are meant"* [276]. For independent contractors, it is certainly expected that their services will be used among multiple parties. Meanwhile Lehr [152] considers standardization to be the *"social and technical process of developing the underlying artifact related to [information infrastructure] - ... standards that govern the communicative patterns"*. Such procedures for developing standardized communication brings us closer to process standardization, involving "the development of a common approach to such activities as establishing (and evaluating) a distributor network ... the underlying approach to relationship development strategies"[149]. In [149], Griffith et. al. explores communication strategies applied across different cultural contexts, and finds that standard processes may beneficial when applied to nations of similar cultural types, but not necessarily on a global scale. But to the extent of our knowledge, there exists no prior establishment of standardization measures for communicative practices in global, online freelancing platforms.

In corporate contexts, communication are found to benefit organizations during challenging or exciting times, while ill-conceived and incomplete communication caused by poorly constructed or delayed messages may turn small issues into major crises [286]. In business contexts (service sectors in particular), process standardiza-

tion offers profitable outcomes by helping define clear and precise output objectives for the service provider, and by better facilitating communication and coordination between exchange partners through increased uniformity of process activities [275, 311, 414]. For the freelancing context, we consider content standardization to be the process where workers repeatedly use messages constructed from templates to promote their services toward multiple clients or job postings, and temporal standardization to be the practice where freelancers message around a fixed time of the day across various projects.

In May 2020, Upwork (a leading online freelancing platform) presented a set of proposal templates as resources to guide beginner freelancers. But by June of 2021, the use of templates is no longer recommended and instead it is suggested that freelancers should *"focus more on [specific] project needs"*, suggesting that the benefits and harms of template use in bidding could be complicated [170].

2.2.2 *Personalization*

There's no shortage of existing frameworks for personalization, especially within marketing literature and persuasive (mobile & e-commerce) technologies [119, 428]. For technology, Blom defined personalization as "a process that changes the functionality, interface, information content, or distinctiveness of a system to increase its personal relevance to an individual" [37]; meanwhile the Personalization Consortium defined it as "the use of technology and customer information to tailor electronic commerce interactions between a business and each individual customer." [239]. In business contexts, personalization may entail "Customizing some feature of a product or service so that the customer enjoys more convenience, lower cost, or some other benefit" [299], and in internet marketing it has been considered "A specialized form of product differentiation, in which a solution is tailored for a specific individual" [153].

The definitions of personalization presented so far addresses the specialization of content or a service for an individual, which can be achieved through the presentation of curated options based on known information about their target user or customer - a process that Churchull refers to as *outcome personalization* [69]. But consider *process personalization* (which occurs in service encounters) where information is collected about a customer through realtime interactions, and instead of focusing solely on the outcomes, increasing the quality of interaction and delivery are

also a part of the objective [69]. Reflecting this more interactive definition, the Personalization Consortium expands on their previous definition: "Using information either previously obtained or provided in real-time about the customer, the exchange between the parties is altered to fit that customer's stated needs as well as needs perceived by the business based on the available customer information" [239]. Dyche and Robert's respective definitions are also more process-oriented "the capability to customize customer communication based on knowledge preferences and behaviors at the time of interaction" [323], and "The process of preparing an individualized communication for a specific person based on stated or implied preferences" [111].

In online chats that are devoid of physical signals from body language or tone of voice, personalizing interactions through messaging content and pace can be of paramount importance for improving interactions between transacting parties. Indeed, Blom identified that a key motivation for using personalization to be the enablement of access to information content [for the customer/client], which can help facilitate interactions and transactions [37]. Process personalization can also be personalized: "customized personalization is about personalizing to the consumer's interactional style and needs in the moment, as well as more stable or longer-term facets such as their demographic profile and/or manifest tastes", but the customized personalization can have varying effects depending on context and degree (obsequiousness, for instance, can be upsetting) [69]. In service encounters, personalization improves customer impressions [365] and in a persuasion study, personalized mobile messages successfully helped individuals by significantly reducing daily snacking [205]. But in the context of student-advisor instant messaging interactions [354], the adoption of accommodating temporal patterns has been shown to disrupt one's own temporal consistency.

For the freelancing context, we define personalization as the way in which a worker caters to the needs of a client by incorporating relevant job specifications into their message text or by client messages, at the expense of their own work schedule or time zone. At the outset, the relationship between standardization and personalization may seem divergent and potentially conflicting, and prior literature has long recognized the tension between information standardization and flexibility [152]. However, we discuss below how these practices might coexist and the potential trade-offs between the two in terms of their effects on outcome success during different stages of a project, as well as over a freelancer's long term career trajectory.

2.2.3 *Communication Strategies Across Stages*

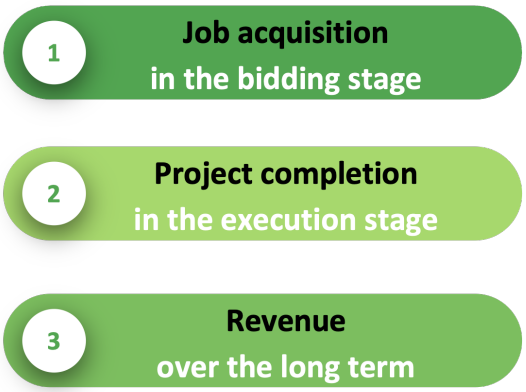


Figure 1: Outcome Measures and Associated (Project) Time Periods

Bidding Phase Strategies Vetting for a job in online freelancing platforms may seem intimidating to many workers, especially to beginners who may be submitting their first few bids. But as [168] has shown, reaching out to clients has a significant and positive impact on a freelancer's chances of procuring a job. Among the workers who do initiate conversations with clients, we consider whether content curation would have an effect on hiring probabilities. At the beginning of this investigation, the use of proposal (bid) templates was still a recommended practice by platforms such as Upwork. Since sending out templated first messages to multiple clients en masse can save time and maximize resource utility, we expected freelancers to leverage the advantages of template use when initiating conversations with clients.

Since the online gig economy is structured as a reverse auction market, clients are often subject to information asymmetries. In particular, the lack of insight into worker bandwidth may lead to wasted time and effort for the client [169]. Receiving direct messages from freelancers can help clients overcome such obscurity since the gesture of outreach serves as an indicator for clients to gauge the bandwidth and capacities of a freelancer. While we know that outreach in general has a positive effect on hiring probabilities [168], we may expect templated messages to induce the opposite effect: clients might observe that the freelancer has the time, capacity

and perhaps even desperation [109] to find work, but not the resources necessary to personalize the content of their message to target the needs of their individual project. Hence, we can expect clients to hire more freelancers who demonstrate sincerity through individualized content curation in their first outreach message and bid proposal texts:

Hypothesis 1: During the bidding stage of a project, we posit that

a. Standardizing first message text will *decrease* the probability of winning the bid.

b. Personalizing bid text to match job description requirements will *increase* the probability of winning the bid.

Execution Phase Strategies Due to intense competition in the online labor market [107], freelancers may feel pressured to respond to client requests as quickly as possible to minimize the chances of the clients noticing and hiring other competitors. However, this may reduce productivity during the execution phase since "constantly attending to IM . . . may prevent users from performing tasks efficiently" [164]. Furthermore, the cognitive switching costs accrued by toggling between attending to messages and focusing on work is especially pronounced during the execution stage: "the time to switch to the message was significantly slower when the notification arrived during the execution phase than either other phase" [383].

The expectation to remain responsive may disrupt freelancers' workflows, allowing clients to interrupt them when completing a task, thereby reducing their working efficiency. Some direct messages may exhibit characteristics of outeraction - communicative processes people use to connect with each other and to manage communication, rather than to information exchange. Outeractions can be especially disruptive because the content of the exchange is unrelated to the freelancer's task at hand: "time spent on messages and time to resume the search task were both longer when the message was irrelevant than when it was relevant" [383]. Hence, our second hypothesis examines how personalizing practices during the execution stage, such as responsiveness and accommodating the "regular hours" of a client, can affect project completion outcomes:

Hypothesis 2: During the execution stage, we expect that

a. Responding during a standardized period during the day will *improve* the probability of completing a project.

b. Personalizing response times (increasing responsiveness) will *negatively impact* the probability of completing a project.

Messaging Techniques & Revenue Outcomes such as award and completion statuses serve to measure the success of various messaging practices at the individual project level. However, to evaluate the impact of these practices over the long term, we must observe a more aggregated measure of the freelancer such as their monthly revenue or earning efficiency. With the exception of a study that found multitasking among Turkers to generate higher income more quickly [42], there's a scarcity of literature available investigating the effects of messaging patterns on freelancer revenue.

We think there is reason to believe that over the long term, standardization can help freelancers generate revenue while personalization will hurt their quantity of earnings because personalizing content for each specific client and always being available for and responsive to clients can be draining and unsustainable over the long term. But on the other hand, the opposite might also hold true: freelancers could adapt to manage their time in a way that they personalize and thrive for each of their projects without experiencing burnout. Thus, we leave the effects of standardization and personalization on revenue as a research question to be examined:

RQ 3: How do standardizing and personalizing help or harm revenue?

2.3 RESEARCH CONTEXT & METHODS

2.3.1 *Study Platform*

To conduct this study, we obtained data from a corporate partner (whose specific name will not be disclosed per agreements for data sharing) that is a leading platform in online freelancing. Example categories of work include data entry, software development, design, writing, etc. The dataset we acquired consisted of 2,031,068 messages, from 56,222 projects posted between January 1, 2010 and March 1, 2010, involving 58,397 freelancers and 25,480 clients. For each project we observed their associated project descriptions, bid text, messages, as well as timestamps for these

artifacts such as the submission and award dates of bids, the completion and payment times, as well as individual message timestamps. We did not impose limitations based on project category. For each stage of a project, we constructed two separate data frames using this sample. Observations in the first frame consisted of worker-job pairs (or conversations) that incorporated worker-related information such as bid price, bid text, reputation as well as information associated with the job, including project description text, submit date and buyer identification. In a separate freelancer-level frame we included long term worker-related attributes such as average bidding price and bid volumes.

2.3.2 *Measures of Key Variables*

We operationalized standardization and personalization in communication depending on the phase of the project. To more precisely capture standardization in the execution phase, we removed freelancers who multitask and work on more than one project at once – multitaskers represented roughly 12% of those who were awarded projects.

Bidding Phase Strategies

- **First Message Standardization:** To measure the extent to which freelancers *standardize* content in a conversation (i.e. worker-job pair) during the initial bidding stage, we calculated the *first-message similarity*. We obtain this measure for a particular conversation by calculating the cosine distance between the freelancer's vectorized [1] first message in the current project and the vectorized first message of their most recent prior project. Hence, freelancers who use the same set of words across first messages to multiple clients tend to score higher in this measure since they are more likely to employ standardized templates when conducting outreach.

✎ Example: If freelancer F uses a template T and sends T in their first message to the clients in both projects P_1 and P_2 (assuming P_2 immediately follows P_1), they will receive a measure of 1 for their first message standardization for project P_2. But if for their project P_3, F sends a first message that is completely different to the previous two (i.e. no words in the first message of P_3 matches

1 The vectorization approach we use is to simply create counters for word occurrences in the messages.

those in T), then the standardization measure for P_3 would be 0. Since this measure only concerns the first message content sent by the freelancer in each project, it will only be used as an explanatory variable for the bidding stage model.

- **Bid Text Personalization:** To quantify the amount of *personalization* that freelancers employ in the bidding stage, we computed the level of curation in the freelancer's bid text. This measure represents the degree of likeness (again obtained via cosine similarity) between the textual content of a freelancer's bid application and its associated project description post (submitted by the potential employer). Accordingly, freelancers who choose to include words and mirror content from the client's job post are considered to have higher measures of personalization.

✎ Example: Freelancer F submits a bid application B_1 to project P_1. B_1 borrows many words from the job posting. Subsequently, F applies to another project P_2 with B_2, but B_2 did not make use of any text from the job description. Freelancer F would have a higher measure of content personalization for P_1 than for P_2. Similar to first-message similarity, this variable measures a practice that can only be executed in the bidding stage, and will therefore only be used as a predictor variable for hiring outcomes.

2.3.2.1 *Execution phase strategies*

- **Response Time Standardization:** After a freelancer makes it past the selection stage and is awarded the job offer, we look at the effects of qualities such as timing on a freelancer's likelihood of successfully completing a project. In particular, we measure *standardization* in this stage by computing the schedule regularity of a freelancer within a particular project. To compute this measure, we first find the standard deviation in the timing of the day for a freelancer's messages across all their projects (this is a freelancer-level measure). But since that measures the variance in schedules, we invert the standard deviation by subtracting it from the total number of seconds in a day to better represent schedule regularity.

✎ High regularity example: Freelancer F sent a total of two messages, one at 11:02am and another at 11:12am [2]. The standard deviation of F's messages is five minutes, which means that the measure of schedule regularity is quite strong at 23 hours and 55 minutes.

✎ Low regularity example: By contrast, freelancer G sent two messages that are much further apart in the day - one of them at midnight (00:00:00) and another at noon (12:00:00). The standard deviation of of G's messages is six hours, and their schedule regularity is much lower (at 18 hours). Thus, the smaller the deviation in message sending times, the less likely that the freelancer compromises their own routines to accommodate clients' timezones or schedules.

- **Response Time Personalization:** To estimate whether *personalization* affects the likelihood of project completion, we calculated for each freelancer-project pair its *responsiveness*. First we determine the response gap of a message by calculating the amount of time it takes for a freelancer to respond to a message sent by the client[3]. Then all we average these response gaps across all messages of the conversation to obtain an aggregated measure at the worker-project level. Once again, we invert this measure by subtracting it from the the total number of seconds in a week so that it embodies responsiveness instead of response times.

✎ High responsiveness example: Freelancer F responded to two client messages in project P. For the first message they replied back 90 minutes after the client's message while the second response took them 30 minutes. The average response time of freelancer F in project P is very quick at 1 hour, which means that F's average responsiveness in project P is 6 days and 23 hours.

✎ Low responsiveness example: Now let's say freelancer G also worked on project P, and responded to two client messages for this project as well. Their first reply only took 1 hour but they missed the client's second message and ended

2 Note that the day when the messages were sent does not affect this variable as it measures regularity on a daily basis.

3 If an employer sends multiple messages before receiving a response, we consider the response time to be the difference in time between the freelancer's first response and the employer's *first* message that has not yet received a response.

up taking 9 days and 23 hours (a total of 239 hours) to respond. So the average response time for freelancer G in project P is much slower (at 10 days, or 240 hours), implying that their responsiveness for project P is much lower at 4 days. Intuitively, freelancers incur shorter gaps when they are being more responsive, which also demonstrates greater amounts of personalization in terms of message timing.

2.3.3 *Outcome Measures and Control Variables*

For measuring success at different stages, we gather the **job award status** to assess the outcome of the bidding stage, **project completion status** for the execution stage, and **overall monthly revenue** to account for long-term earnings. Both award and completion status are binary variables where "awarded" or "complete" corresponds with 1 while all other statuses ("rejected", "incomplete", or "pending") are marked as 0. Revenue is a dollar amount calculated on a monthly basis, the final value of of revenue per month is normalized with standard scaling.

Beyond these key explanatory variables, we also include other controlled variables: reputation is measured by whether the worker has received reviews in the past (*had prior reviews*), *bid price* is the amount that the freelancer is proposing to charge for their work (this variable is log-transformed to remove skewedness), *freelancer message count* is the total number of messages the freelancer sends within the project, number of bids won and projects completed account for how many projects the freelancer's has historically being hired for and completed, respectively, and are also log-transformed. All predictor variables are normalized for analysis via standard scaling. In Table 1 we provide descriptive statistics of both key and control variables for each of our models.

2.3.4 *Statistical Models*

Using separate linear regression models for different stages, we observe the effects of standardization and personalization techniques toward project hire, completion outcomes as well as earnings. When testing the hypotheses about the bidding and execution stages (H1 and H2), we eliminate the possibility that hiring and completion statuses are jointly determined with our explanatory variable by including a project-level fixed effects when running the logistic regression model. This captures

Bidding stage (project-level frame)							
Measure	Mean	Standard Deviation	Correlations				
			1	2	3	4	5
1. First message standardization	.494	.344					
2. Bid text personalization	.128	.124	-.106				
3. Had prior reviews	.611	.487	.211	-.175			
4. Bid price (log)	5.05	1.36	.121	.031	.043		
5. Bids won (log)	2.12	1.93	.212	-.154	.758	.078	
Execution stage (project-level frame)							
1. Response time standardization	7.05e04	4.15e03					
2. Response time personalization	5.22e5	6.23e05	-.025				
3. Had prior reviews	.612	.487	-.281	.008			
4. Bid price (log)	5.06	1.36	.050	-.021	.043		
5. Freelancer message count	4.82	7.90	-.082	.002	.107	-.018	
6. Projects completed (log)	4.35	1.38	-.107	-.005	.251	.029	.040
Freelancer - level frame							
1. Average first message standardization	.472	.253					
2. Average bid text personalization	.135	.100	-.189				
3. Average response time standardization	7.03e04	3.98e03	-.075	.159			
4. Average response time personalization	5.69e5	3.72e04	-.018	-.077	-.129		
5. Average bid price (log)	4.86	.896	.166	-.036	.008	-.066	
6. Had prior reviews average	.635	.452	.244	-.256	-.237	.119	.120

Table 1: Correlations, means and standard deviations of explanatory variables

time-invariant and job specific properties that might impact the model outcomes, as well as employer-level fixed effects, since there can be only one employer per job.

The models also include observable worker characteristics that may vary across bids such as reputation status and bid price. At the revenue level (R3), we first ran a regression model that used the four aforementioned strategies (measured by our key variables) to predict monthly revenue. Subsequently, we used the two bidding stage measures to predict the total freelancer bidding volume over the three month period to provide further insights for results of the revenue model.

2.4 RESULTS

Table 2: Bidding stage regression model with project fixed effects predicting job awards.

Dependent Variable: **Job award**	Coefficient	Standard Error
First message standardization	-.0301***	8.23e-05
Bid text personalization	.0358***	2.30e-03
Had prior reviews	3.90e-03***	7.72e-04
Bid price (log)	-.0258***	5.36e-04
No. bids won (log)	7.30e-03***	2.38e-04
Number of observations	603,286	
*** signifies a p-value <.001, errors are clustered by project		

2.4.1 *Bidding Strategies' Impacts on Hiring*

Table 2 shows the bidding stage regression results, where we explore the impacts of standardizing and personalizing first messages on the project award outcome (1 is awarded and 0 if not). The coefficients show that increasing standardization during the bidding stage hurts a freelancer's hiring probabilities, thereby supporting H1a. Specifically, standardizing first message content by one standard of deviation reduces their winning probabilities by .03%. Meanwhile, personalizing and curating the contents of a bid proposal based on the job posts increases their chances of winning the project (which is in alignment with H1b), but only slightly – personalizing bids by one standard of deviation improves award probability by .036%.

Note that we also controlled for freelancers' bid prices (which were log transformed after adding one since the log of zero is undefined), reputation – measured via the dummy variable *had prior reviews*, which represents whether the freelancer has received a rating for their work in the past, and a historical bidding success variable – the number of bids the freelancer won prior to the current project. We intentionally chose to not include actual rating values because the majority of ratings are positive and most jobs do not end up receiving reviews - their inclusion would

cause an inflated measure of reputation. As one would expect, having previously won bids and reviews to showcase on the profile is favorable for hiring, whereas bidding at a higher price harms hiring probabilities of a freelancer.

Table 3: Execution stage regression with project fixed-effects predicting job completions.

Dependent Variable: **Job completion**	Coefficient	Standard Error
Response time standardization	1.15e-07	1.16e-07
Response time personalization	-9.10e-09***	1.63e-09
Had prior reviews	5.90e-03***	2.01e-03
Bid price (log)	-1.27e-02***	1.03e-03
Freelancer message count	8.16e-03***	5.52e-04
No. completed projects	1.36e-03 .	7.33e-04
Number of observations	110,797	
*** signifies a p-value <.001 and . denotes a p-value < .1		
Errors are again clustered by project		

2.4.2 *Execution Strategies' Effects on Completion*

Table 3 shows our results for the execution stage model, where we explore the impacts of standardizing or personalizing responses time on the job completion. In this stage, we observe that in alignment with H1a, being online at regular hours of the day has a small and positive but insignificant effect on a freelancer's chances of completing a project. Meanwhile, being highly responsive to client messages (the personalization technique) significantly hurts completion, which is in agreement with H2b, but the effect is negligible.

Reputation and bid prices have a similar effect as in the bidding stage model. This suggests that reputable freelancers have higher chances of satisfying the demands of a client. Workers who demand higher payments will have a harder time gaining approval from their clients, since more costly payments will likely lead to increased expectations for work quality. Having received ratings for prior work is positively correlated as well. We also controlled for the number of messages that

a freelancer sends within the project, since message frequency will have a consequential impact on the variance/regularity of a worker's messaging schedule, and found that messaging more positively impacts completion probabilities. Meanwhile, having successfully completed projects slightly helps execution of the current one.

Table 4: Freelancer-level regression predicting monthly revenue with monthly fixed effects.

Dependent Variable: **Monthly revenue**	Coefficient	Standard Err.
Avg. first msg. standardization	.123***	3.23e-02
Avg. bid text personalization	-.146**	3.62e-02
Avg. response time standardization	-1.18e-06	1.37e-06
Avg. response time personalization	-1.52e-07	1.61e-07
Avg. bid price	.217***	1.22e-02
Had prior reviews average	.360***	1.61e-02
Number of observations	16149	
*** signifies a p-value <.001, ** denotes a p-value <.01		
Errors are clustered by month		

2.4.3 *Long-term Strategies' Impact on Earnings*

Our earnings model uses a freelancer-level instead of a project-level frame to capture revenue from all jobs of a month. Here we measure the effects of the same two pairs of standardization and personalization techniques above to investigate the question posed in R3. The four measurements are aggregated for each freelancer frame by averaging, and fixed effects are added to account for time variance.

Table 4 reveals that only messaging practices in the bidding stage had significant impacts on overall revenue. Specifically, standardization has a positive effect on revenue - increasing content standardization by one standard of deviation results in a .12% growth in monthly revenue, likely because it enables workers to submit more bids. Meanwhile bid personalization no longer offers the same enhancing effects it had at the project level. In fact, personalizing bid content by one standard of deviation can cost workers .15% of their monthly revenue. Reputation continues to impact

success in the same ways as before, and bid higher for individual projects naturally increases overall freelancer earnings.

To test our hypothesis that the inverted effects of content standardization is related to how it enables workers to take on larger volumes of work, we ran an additional model using bid volume as the dependent variable. The results (Table 5) show that increasing first message standardization by one standard of deviation during bidding can allow workers to apply to 36.6% more projects, thereby increasing their total earnings in the market.

Table 5: Freelancer-level regression predicting bid volume with monthly fixed effects.

Dependent Variable: **Bid volume**	Coefficient	Standard Error
Avg. first msg. standardization	36.6***	4.64
Avg. bid text personalization	-8.90 .	4.45
Avg. bid price (log)	5.79***	.720
Got reviews	28.0***	2.64
Number of observations	16149	
*** signifies a p-value <.001 and . denotes a p-value <.1		
Errors are clustered by month		

2.5 DISCUSSION

We examined the effects of standardizing versus personalizing communication practices on individual project success and monthly freelancer earnings. Our first set of findings confirmed that during the bidding stage, content standardization negatively associates with hiring rates (H1a) while personalization has a positive correlation (H1b). From this, we can infer that template use in the initial bidding stage may leave a negative impression with employers by signifying that the associated project is only one among many from the worker's perspective. Relatedly, borrowing and incorporating words and phrases from the client's own description of the project appears to have a favorable effect on clients, perhaps conveying worker sincerity and attentiveness. This suggests that when crafting job proposals (i.e. bid applications),

workers may want to carefully read and curate their writing to match the individual job requirements, instead of copying and pasting from templates. Or, as Upwork recommends – "Don't use a proposal template" [170].

However, our analysis of monthly revenue showed that over the long term, content standardization contributes to higher worker earnings, revealing a trade-off between project-level success and long term earning efficiency. To interpret potential mechanisms behind this effect, we examined the effects of the two strategies on bid volume (Table 5), which unveiled that using standardized proposal templates enabled workers to submit more bid applications, thereby indirectly contributing to higher monthly earnings. This tradeoff between standardization over the long term and personalization at the individual project level suggests that a worker should keep in mind their broader, long-term career goals while attending to minute and specific details of individual projects.

Once a freelancer begins working on the project, a fear of losing the gig might cause them to be overly responsive to a particular employer. Our results from the execution stage (Table 3) indicate that this reactive communication approach is negatively associated with project completion (H2b). This resonates with prior literature on instant messaging, which also found that always being highly responsive to messages in work-related conversations harms workers' abilities to stay on task [164]. Although our analysis does not indicate that response time standardization correlates significantly with long-term earnings, this null result may be due to other hidden characteristics, omitted from our model.

In place of instant replies, freelancers might consider a more proactive form of time-management where they adhere to a consistent daily work schedule and respond only at appropriate times within their own working hours. Naturally, some freelancers may only participate in the online labor market on a part-time basis (referred to by some as *casual earners*), while others are more professionally engaged (including those who are *financially strapped*) [256]. Regardless of a freelancer's online or offline employment status, there is reason to believe that having a consistent work schedule and an increased awareness of time will only benefit a workers' financial and mental well-beings over the long run.

To summarize, our results suggest that freelancers attempting increase their odds of winning a project can consider personalizing the content of their bid applications to cater toward client needs, those who have secured jobs can increase their chances of completion if they refrain from instantly responding to client messages. Workers seeking to increase monthly earnings might consider bidding for projects, which

can be achieved through the use of standardized bid proposal templates. Across all of our models, having reviews on a freelancer's profile positively impacts success, implying that workers seeking to thrive in the online environment may also benefit from image and reputation management.

2.5.1 *Design Implications*

Given these empirical findings, we propose design recommendations for tools that seek to support gig workers in their various endeavors. Since temporal responsiveness was shown to be harmful toward project completion success, designers might consider mechanisms that help workers stay focused and on task. This may take the form of an application or plugin, which may adopt features akin to those found in focus and productivity apps. Current platforms such as Upwork may also want to reconsider the inclusion of responsiveness [4] in worker profiles, since a worker's ability to respond to messages quickly might negatively impact their ability to finish a project.

To make bid personalization easier for workers, tool designers might attempt to use natural-language processing (NLP) methods to extract job requirements from project descriptions and surface them to workers in a more readable fashion. Note that even though current systems do have skill tags that allow clients to clearly define the scope of their project, we can expect many jobs to have unique specifications that cannot be captured by the limited options of a skill tag drop-down. Finally, for workers with relatively low monthly revenues, tools can provide reminders to motivate them to submit more bids and so that they may maximize their hiring probabilities and work volumes.

4 https://support.upwork.com/hc/en-us/articles/211062968-My-Stats

Part II

MULTI-STAKEHOLDER CODESIGN OF TECHNOLOGY & POLICY

While workers can individually develop strategies to advance their careers, such techniques do not contribute to the large-scale infrastructural changes necessary for improving gig work conditions. In the following, we collaborate with multiple stakeholder groups to explore possible interventions to improve gig work conditions across platforms and domains, revealing the promise of individualized policy and regulations, as well as technological advances to support worker collectivism.

3

ALIGNING MULTI-STAKEHOLDER POLICY & TECH PREFERENCES VIA CODESIGN

Beyond an understanding of scalable communication strategies in online freelancers, it is imperative to also understand worker challenges and strategies across gig work platforms and domains. Prior works in the domain have extensively documented the downstream impacts of unregulated space of gig labor platforms on workers ([15, 241, 343]) across platforms — ridesharing [75, 78, 142], freelancing [35, 336, 368], crowdwork [142, 381], carework [267, 376]). For instance, in their seminal work examining job quality in gig work, Wood et. al. described how platformic control causes workers to have weak structural power compared to clients, which results in burnout [409]. Yao et. al. found that while social media groups enabled workers to share experiential knowledge amongst one another, they fell short in building a collective identity among workers since strategic information-sharing could harm an individual worker's comparative advantage [421]. Howard investigated how labor laws apply in non-standard gig work arrangements, underscoring the health and safety risks involved for workers in such environments [171]. However, such works have yet to explore the prospective future solutions for mitigating cross-domain challenges in gig work. In this chapter, I covered how we leveraged speed-dating codesign sessions with multiple stakeholder groups to approach practical solutions for addressing issues affecting gig workers across domains.

Recent bodies of work within HCI increasingly urge and pursue the design of systems from a worker-centered perspective [292, 419, 426]. As a first step in this direction, Zhang et. al. codesigned alternative platform futures with workers to minimize the impact of algorithmic management on well-being [426]. In their research agenda, Ashford et. al. drew from organizational behavior theory to delineate potential behaviors that individual workers can capitalize on to thrive in the new world of work [16]. While these studies focus on worker-driven solutions, improving gig worker conditions requires the active involvement of and collaboration with multiple stakeholder groups [126, 143]. Expertise of regulators and lawmakers are required to craft and enforce mandates and labor regulations that govern the gig economy [26, 103], support from platforms is crucial to implement programs and engage in

co-regulation [56, 161], and worker input is indispensable to designing legal and platformic changes that engender practical and productive impact [201, 246].

Our work involved a diverse set of stakeholders, and by leveraging the speed dating method, we collaborated with participants from within the United States to brainstorm, develop and assess a wide range of service, policy and technological interventions for addressing the various social, financial and physical challenges of gig work [86]. The hidden costs and challenges emerging from such past bodies of work, combined with themes uncovered from local workshops and news articles, informed the construction of scenarios for our workshops. During the codesign sessions, speed dating allowed us to incorporate reported issues into scenarios accompanied by provocative questions and solutions, empowering us to 1.) learn latent social needs and boundaries of stakeholders and 2.) imagine and evaluate solutions without the high efforts of implementation. In conducting these workshops, we sought to answer the following research questions:

Research questions:

1. What incentives, preferences and deterrents do stakeholders have in supporting and implementing solutions for improving gig worker well-being?
2. What are the most desirable and feasible changes for improving challenges present in gig work?

Our multi-stakeholder workshops allowed us to share key quantitative and qualitative insights from regulators, platform practitioners and the gig workforce at large, revealing details about shared worker struggles, desired benefits and steps that stakeholders can take to turn imagined futures into reality. Thus, we make unique research contributions by 1.) presenting improvements to the gig work condition that are acceptable to multiple stakeholders groups and 2.) offering a discussion of how stakeholders can contribute to solutions and interventions. Through this endeavor, we hope to contribute to a future gig workplace that tracks and improves workers' physical, financial and social well being, so as to approach more equitable and inclusive gig platforms and communities.

3.1 RELATED WORKS

One way to segment gig platforms into domains is to consider the type of services provided: app work (e.g. Uber, DoorDash, TaskRabbit), crowdwork (e.g. Amazon

Mechanical Turk), and capital platform work (e.g. Airbnb, Etsy) [106]. A similar categorization sections platforms based on the physical or remote nature of the labor, with the former consisting of location-dependent labor (e.g. transport, food delivery, furniture assembly) and the latter comprising of digital services such as software development or logo design [185]. At the start, we focused primarily on app workers performing physical tasks, but found capital platform workers to share many of the same risks and challenges after reviewing relevant literature and articles. Thus, our workshops aim to address the various social, financial and power struggles as well as health and physical risks endemic to these two forms of gig work. In the following, we summarize five major shortcomings of gig work explored in past studies that informed our workshop design.

3.1.1 *Existing Risks and Challenges*

Missing Employment Benefits Although gig work offers more flexible work hours, limited employment benefits forces workers to complete additional hours of unpaid labor [12]. While many workers prefer to keep their legal classification as independent contractors for the associated flexibilities (e.g. no employer attachments), the lack of a formal employment arrangement costs them many benefits and protections, including wage guarantees, workers' compensation, unemployment insurance, healthy and safe work spaces, and the right to unionization [103]. The deprivation of workers' rights and protections that contractors experience (which especially impoverishes the mental health of working mothers [215]) has been longstanding, with accounts dating back to at least 2002 [186].

In an effort to avoid employment regulations, many gig platforms leverage workers' desires to remain contractors as an argument in court to avoid responsibilities of providing employee benefits. This argument for platforms is frequently used in trials since as early as 2017, after which more than 100 such US lawsuits have been filed against Uber regarding driver misclassifications, with many more appearing across other platforms and nations [19, 89]. To continue exploiting the legal loophole in employment classifications, gig platforms have spent hundreds of millions to lobby for the ballot measure Prop 22 in the summer of 2021 [77]. Presently, how workers should be classified remains an ongoing debate – the control and economic realities tests that serve to distinguish between employees and independent contractors both

lead to indeterminate results when applied to rideshare drivers, and different courts' interpretations of labor laws vary across statutes [19, 157].

Income Instability Gig workers also suffer from a lack of financial stability induced by job precarity and the temporary nature of contractual work [13]. In their study evaluating the job quality of gigs, Wood et. al. identified how algorithmic management of workers causes financial instability, social isolation as well as overwork and exhaustion [409]. The combination of low pay, high job insecurity, long working hours induces a high sense of precarity among gig workers [102, 181, 368, 399, 405]. One major contributor to the income instability of gig workers is seasonality, endangering the financial security of part-time gig workers. For instance, work in sports has always been characterized as precarious and seasonal, and the suspension of several major sports during the pandemic has intensified such impacts [197, 350]. Ravenelle et al. also identified increased vulnerabilities of gig workers during the pandemic, finding knowledge, sociological, and temporal/financial hurdles that prevent their access to unemployment assistance [317].

Minimal Access to Working Necessities The growing prevalence of gig work probes at previously unexplored social barriers, highlighting inadequacies in our public infrastructure. In New York City, exploitative labor practices induced by platforms and public infrastructure subject food couriers to dangerous working conditions, leading to a local labor union of cyclists in 2019 – *Los Deliveristas Unidos* [139]. Based on the lived experiences of its constituent deliveristas, the grassroots collective formed a list of five demands surrounding working conditions, including a right to 1.) free public bathroom access 2.) physical public space for eating, resting and protection from harsh weather conditions 3.) hazard pay for work performed that involve physical hardships (e.g. the COVID-19 pandemic) and 4.) protections from e-bike robberies, wage theft and health and safety hazards. While the city council passed a bill last year to ensure bathroom access for workers [395], enforcement is difficult and deliveristas still report instances of restaurants who restrict bathroom access [305].

Safety Concerns Without proper employment classification, gig workers do not enjoy the regulated safety assets provided to traditional workers (e.g. worker's compensation, health insurance, and unemployment insurance, among other laws and regulations) [2, 223, 225]. Unfortunately, the non-standard nature of many gig work

arrangements raises occupational health and safety risks, increasing scholarly, legal, and societal concern [7, 171, 291]. For instance, Ferrie et al. found that poor mental health outcomes can result from sudden unemployment [121], and by 2006, Virtanen et al.'s review of 27 case studies revealed a solid association between temporary employment and morbidity [398]. Over the past five years, the Markup has tracked a total of 361 ride-hail and delivery drivers as victims of carjackings or attempted carjackings [209].

Underlying drivers' safety are factors that disincentivize them to self-protect. Almoqbel and Wohn uncovered that platforms' rating systems to prevent drivers from engaging in protective behaviors (e.g. using dash cams) due to passengers' discomfort around monitoring (which lead to poor reviews); they further found drivers to share safety resources, vent about passengers, and coordinate informal union activities in online forums [7]. Beyond physical attacks, Bajwa et. al. discussed how precarity, occupational and platform-based vulnerabilities can cause psychological distress, increased risk for traffic accidents and musculoskeletal injuries, as well as work-induced stress, respectively [18]. From the perspective of international law, Howard discussed how legal misclassifications cause a loss of protections and benefits for workers across the globe [171].

Missing Collective Action Power The design and structure of online labor platforms creates unique challenges such as information asymmetries and power imbalances between workers and clients, giving rise to the platformic control and algorithmic management [148, 194, 196, 227, 285, 327, 368]. Such dynamics disincentivize workers from engaging in collectivism due to fears of losing competitive advantages [421]. Furthermore, the lack of physical workspaces prevents workers from forming collectively identifies and protesting inequities [49, 64], while antitrust and employment laws legally prevent them from performing such collective actions [13, 298]. It is also notable to mention that migrant workers comprise a growing portion of the platform labor market, but legal restrictions make it difficult for them to engage in union activities or benefit from national welfare systems [101].

To acquire more workplace gains and protections, workers can engage in collective labor activities. But as Yao et. al. and Johnston et. al. find, barriers such as geographic dispersal, individualistic nature of gig work, and platforms' opposition to worker organization, all prevent the building of a collective, group agency [201, 421]. Furthermore, "antiquated notions of collective bargaining . . . surrounding the gig economy" may not prove useful in the modern digital workforce [201]. Mean-

while, Khovanskaya et. al. leveraged historical insights from mid-20th century labor unions toward management to inform how contemporary data-driven worker advocacy can bring workers together over shared concerns and raise public awareness of working conditions, instead of engaging in bureaucratic negotiations with platforms [211]. But as Graham et. al. points out, there is a dearth of counterhegemonic research efforts particular to the gig economy that support the "building of alternatives, outrage, conflict, and worker organization", a gap that we hope to help fill [146, 340].

3.1.2 *Design Efforts to Study Worker Well-being*

Early efforts to combat algorithmic management arose in contexts of crowdwork (Amazon Mechanical Turk), rideshare driving, and food couriering. The pioneering piece along this line of work centered Turkopticon, a widely-adopted browser plug-in that overlays its requester/employer-reviewing features on top of the AMT site to resist minimal wages, low quality work, and unfair job rejections (a.k.a. wage theft). In the author's own words, the system aimed to "make questions of work conditions visible among technologists, policy makers, and the media" [190]. A companion tool Dynamo was developed subsequently to facilitate collective organization action among AMT workers [332]. A "social sensing" probe developed by You et. al. collected and shared personal health data of rideshare drivers with their significant others to promote well-being awareness (especially related to long working hours) and motivate behavioral changes [422]. Zhang et. al. leveraged algorithmic imaginaries to expand participants' current understandings of algorithms so as to generate alternative futures that actually support workers' needs [426]. In [26], Bates et. al. hosted two rounds of co-design workshops with gig cycle couriers in the U.K. to identify challenges in their working conditions and ideate alternative solutions. Codesign has also been used to unearth the accounts of essential workers such as airport janitorial staff [204]. Finally, Alvarez de la Vega, et al. used design fiction (informed by prior literature) in focus groups to discover potential design opportunities for improving the well-being of online freelancers [393].

These studies all took a worker-centered focus to empower and highlight the voices of underserved workers. We expand beyond workers to capture the opinions of three distinct but relevant stakeholder groups, so that these involved parties may take part in constructing a brighter and improved gig work future. In particular,

we hope our findings help policymakers make well-informed decisions when establishing new regulations to protect worker rights, as well as the media and public at large to exert pressure on platforms to implement worker-centered changes, benefits and programs.

3.1.3 *Multi-Stakeholder & Solution-Centered Approach*

While the challenges that gig workers face are well-studied, few investigations have taken a holistic perspective to examine how adjacent stakeholders such as platform-side designers or policymakers can play a role in alleviating such constraints. By asking our participants to generate and rank solutions to these issues, we aimed to identify the most desired and practical improvements for addressing the challenges present in gig work (RQ2). As Howard identified in their commentary, the key question of who should be held responsible for providing various job protections has yet to be answered [171], so we directly asked stakeholders about who should bring forth change (3.2.2) and probed their solution rankings with follow-up questions surrounding underlying incentives and constraints (RQ1). By eliciting such preferences and limitations, our workshops goes beyond worker perspectives to also explore unmet needs of platforms and policymakers, so as to help maximize their ability to support gig workers as advocates. Sociologists identified these three groups as key stakeholders of the gig economy [386], and our simultaneous engagement with all three ensures that the solutions arising from our workshops are acceptable to and welcomed by multiple involved parties. In particular, we encouraged participates to generate their own solutions as a means of negotiating for potential futures that they find the most suitable. After all, many factors that harm worker well-being (e.g. legal misclassifcation, algorithmic management) can only be mitigated with solutions at systemic as well as cultural levels, and such changes require the active collaboration and involvement of lawmakers, platform designers, gig workers, as well as the public at large.

3.2 METHODS

Table 6: Workshop IDs & Participant Summaries

Workshop ID	Stakeholder Group	# Participants	Relevant experience
R1	Regulators/Advocates	3	Manager at DHS; Director of community management at National Council of Jewish Women; intern analyst to director;
P1	Platform employees	2	Executive recruiter at a major rideshare organization; Product designer and an ex-employee of multiple e-commerce platforms
W1	Gig workers	3	1 deliverer and 1 driver for a popular food delivery platform; nurse at a healthcare company;
R2	Regulators/Advocates	2	Director of Mobility Dept for local city; Professor in organizational behavior and public policy
W2	Gig workers	5	Full time food courier of 1.5 years; freelancer at a platform for matching local labor to demand; IT freelancer
R3	Regulators	2	Local councilperson; Professor of Cyber Law, Policy, and Security
P2	Platform employees	2	Product manager at a platform for matching local labor to demand; Program lead at a rideshare platform
P3	Platform employee	1	Employee at a popular food delivery platform

3.2.1 *Recruitment and Participants*

Our participant pool consisted of three stakeholder groups: gig workers, local regulators and members of various public service organizations, as well as employees from popular gig work platforms, who were chosen because they represent the groups that can actively become involved in solutions for improving gig worker well-being, independently or collaboratively. Gig workers can develop and practice their own strategies, policy-makers can enact laws to restrict how platforms affect

workers, platform employees can modify features to improve gig worker well-being, and together they can drive forth systemic changes that bring us closer to healthy and productive gig communities.

We recruited a total of 20 unique participants across 8 workshops. The seven participants from the regulator/advocates group were reached through contacts from the Pittsburgh-based research institute Metro21, and consisted of individuals who self-identified as regulators or worker advocates from local organizations such as the Department of Human Services and United Way. While not all of our regulator participants are actively involved in policy-making (some study public policy while others work for government agencies), we did recruit one councilperson. The eight gig workers responded to our recruitment posts on Reddit and included individuals who made earnings on popular ridesharing or food delivery apps. The last group consisted of five platform employees (e.g. product designers, managers, and engineers) whom we contacted through a combination of Reddit posts and LinkedIn direct messages. Participants selection was based on responses to a pre-screen survey, which asked for affiliated organizations and engagement with gig work(ers). Table 6 summarizes the workshop participants and their relevant expertise, in chronological order of workshops dates.

3.2.2 *Study Design*

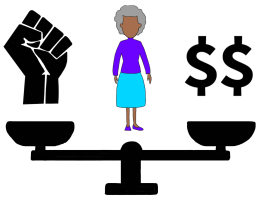
Speed Dating As the nature of gig work probes at previously unexplored social boundaries (e.g. traditional workers typically do not bear responsibility for consumers' physical or food safety), we require alternative methods for examining workers' needs, as well as to discover the social and cultural barriers that gig work pushes at, which are not yet well understood [86, 429]. Toward this end, we leveraged speed dating, a method that involved presenting pressing issues (design opportunities) and provocative alternative futures (design concepts) to multiple stakeholders in rapid sequence, enabling us to uncover their latent needs, desires, fears and dreams. Unlike romantic speed dating, where the goal is to pair potential couples, the technique strives to match gig work issues to potential solutions. Speed dating has been utilized in a variety of domains (e.g. attention management [66], AI ethics checklists [253] smart homes [200]) to rapidly explore of concepts/solutions to issues without needing to implement the proposed technologies [86].

Most similar to our contexts, Dillahunt et. al. found speed dating effective in identifying concepts for addressing needs of underserved job seekers [96]. Following their study design, we presented to participants a series of issues that gig workers face, but did not pair each issue with a tool/design concept in the same way. Instead, we offered a list of alternative futures (and encouraged participants to generate their own solutions) to broaden the horizon of imagined possibilities. While parts of our study design drew inspiration from [96], we center our work around gig workers instead of underserved job seekers, and expand the pool of imagined solutions by incorporating the voices of diverse stakeholder groups.

Scenario Construction Initially, we generated ten scenario stories and subsequently solicited the critique of other researchers working in the space of supporting gig workers to help us finalize a problem space comprising five scenarios (see Table 7). The scenarios were developed based on challenges outlined in relevant literature as well as pressing issues that received press coverage. In particular, the fourth [5] and fifth [116] scenarios were conceived based on accounts of stories of worker situations covered in the respective articles. Each scenario maps back to the respective paragraph in 3.1.1. To avoid promoting "blue-sky" thinking, which (as Harrington et. al. pointed out [156]) may lead to frustration for the very population we intend to serve, the authors collectively generated ideas ahead of time to prepopulate the solution space (which consisted of ideas implementable by each of the three involved stakeholder groups to avoid imbuing our opinions on who should hold responsibility), so as to help participants brainstorm.

Though all scenario characters were fictitious, the first three were inspired by concerns expressed during a local workshop organized by the National Council of Jewish Women, which explored the hidden costs of gig work. The fourth [5] and fifth [116] scenarios were based on accounts of stories of worker situations covered in the respective articles. All five scenarios represent prevalent issues gig workers face today: missing employee benefits, financial instability, a lack of essential working necessities, safety issues and workers' minimized ability to take collective action. With the exception of the persona in Scenario 3, who reflects the common characteristics of food deliverers (i.e. male, young, and of an immigrant background [249]), the demographics of characters are intentionally non-representative of the general gig worker population to encourage the consideration of marginalized workers (women, elders, etc.), who often face issues such as bias, harassment, and pay gaps, all of which intersect with algorithmic control [11, 124, 125, 193, 249].

Table 7: Problem Space: Scenario Summaries

Scenario #	Scenario Summary & Probing Question	Persona & Addressed Issues
1	Renee is a new driver for the popular ridesharing company Lyber as well as a single parent, she struggles to balance driving full-time and caring for her two-year-old. When her child is sick, she does not have time to drive, meaning she won't be able to afford basic costs for food, rent and child care. **Probing question**: Unlike traditional employees, gig workers often do not have **employment benefits**. What do you think the solution should be?	 Lack of Employment Benefits (e.g. childcare, PTO)
2	Dave started helping residents move in on TaskBunny last May and had a fruitful first 6 months due to new students and employees moving in for the fall. But now that it's the middle of winter, no clients are hiring for his services in January. Dave has no savings nor jobs lined up and he is struggling to pay rent. **Probing question**: What changes can help Dave overcome challenges induced by **unstable income**?	 Income Instability
3	Susan is a delivery driver for GrubDash, and many restaurants that she delivers for recently started banning public access to bathrooms. Now Susan has to detour to spaces like gas stations, libraries, and sometimes even ER's just to catch a bathroom break. **Probing question**: What changes should be made to help Susan with **bathroom breaks**?	 Lack of Working Necessities
4	George traveled to a dangerous part of town to deliver for LyberEats last night and was attacked by an unknown individual after the drop-off. He arrives at the ER to check on his injuries but is lost on how to provide health insurance information. He was offline from LyberEats at the time of attack. **Probing question**: How should drivers like George be protected from such **attacks and overcharges**?	 Safety & Healthcare
5	Marianne makes a living knitting and selling gloves on Ebsy. Two years ago, Ebsy increased transaction fees by 42%, promising to bring in more buyers. Instead, Ebsy attracted more sellers with the funds, raising competition. To protest the fee increase, sellers are closing their shops for a week to strike and Marianne now has to decide between losing income versus losing negotiating power with Ebsy. **Probing question**: What changes could be made to help Marianne and future sellers deal with similar dilemmas?	 Lack of Transparency & Collective Agency

Storyboards To present these scenarios, we constructed five pictorial storyboards depicting stories based on news articles, local workshops, and prior work. Storyboarding, defined as "a short graphical depiction of a narrative", is an effective tool for demonstrating 1.) impacts of technologies on human activity and 2.) effects of proposed (technological) interventions and solutions before implementation. Since we cover a wide range of gig worker types in this study (e.g. food couriers, rideshare drivers, movers and online sellers), storyboards allow participants to quickly engage with specific situations, connecting their own lived experiences when applicable. Following Truong et. al.'s guidelines [384] on best practices for storyboarding (concise background, intentional text, characters, graphics, passing of time, etc.), we drew empathy from our participants using personas of gig workers, included text to orient participants in the character's world, and only constructed three frames per scenario to succinctly convey each character's activities to avert bogging participants down with overt details.

Procedures Each scenario was presented via three storyboard cards, and we guided conversation using a probing question that focuses discussions around broader underlying issues. After introducing the scenario and probing question, we requested that participants read the prepopulated solutions and treat them as seed solutions for generating their own ideas, and subsequently **rank all the solutions for the scenario**. During the ranking process, we solicited the rationales of participants' ranking decisions to probe at and uncover latent social boundaries and desiderata. Due to time constraints, we did not engage our participants in a formal consensus building processes (e.g. the Delphi method) during rankings. After solution ranking, we asked a set of followup questions to wrap up each scenario. The scenarios were presented in the same order across all workshop sessions, as shown in Table 7.

After completing the above, participants were asked to **rank the five scenarios** in terms of what they thought were most important to address, effectively performing needs-validation over the issues we presented. In summary, we asked participants of each workshop to complete the following set of tasks, in order:

1. For each of the five scenarios:
    a) Examine the scenario's storyboard and accompanying descriptive text (including the probing question)
    b) Read through and discuss the list of prepared solutions, then add newly generated ideas

c) Rank the solutions (including the ideas generated live) based on preferences and priorities, using sticky notes
d) Explain reasoning for ranking preferences
e) List the most and least preferred solutions
f) Express who should be responsible for implementing the mentioned solutions (using provided check-boxes)

2. Rank the five scenarios in terms of which issues are most important to address

Participants were encouraged to add solutions at any point in these steps. Additional materials used for workshops are included in supplementary materials, and solutions generated by participants are available in the Appendix.

3.2.3 *Workshop Setup*

We conducted a total of 8 co-design workshops with 20 participants, one of which was in-person while the rest were virtually conducted via Zoom. All participants were located in the United States and compensated at a rate of $60/hour for their time, and each workshop lasted 90-120 minutes. To encourage discussion and collaboration among participants of the same stakeholder group, we included 2-3 participants in most workshops instead of conducting individual sessions. Combining the gig workers with the policymakers or platform employees could have discouraged workers to speak up in workshops, and thus we only included one stakeholder group in each workshop (Table 6 indicates the relevant stakeholder group to each workshop). This separation was intended to avoid further disempowerment of already marginalized voices, and to minimize the emergence of power differentials that could have resulted from potential employment relationships – workers in one group may have been demotivated to express their honest opinions if the workshop also hosted their employer. Because we studied our stakeholder groups separately, participants were able to connect and collaborate easily with peers from similar backgrounds. This setup of groups with similar experiences and values made each co-design workshop a productive discussion rather than confrontational. We also helped different participant groups collaborate asynchronously with each other by updating them on relevant solutions and rankings from previous workshop sessions.

Prior to each workshop, we set up whiteboards on Miro or physical easel pads to present the scenarios and potential solutions to participants, which served as a space

for participants to rank or add solutions via sticky notes, and to document their finalized preferences. We took video recordings and field notes across workshops and collected participants' solution rankings, votes on who should take responsibility, and newly generated solutions.

3.2.4 *Analysis*

To begin analysis, we first computed average rankings for each solution and extracted the three highest and lowest ranked solutions for each scenario based on these averages. We then engaged in a thematic analysis approach to analyze 14 hours of Zoom recordings (transcribed by the online service *Rev.com*) and 18 pages of field notes. In the first stage of the analysis, we followed an opening coding approach, where one to two researchers independently conducted qualitative coding for each workshop's data (at least one of these coders was present at the corresponding workshop) [79, 262, 296, 362]. During this process, coders remained receptive and looked for as many codes as possible, while keeping in mind our research questions on worker well-being, the issues that each scenario targets, and potential future changes. The coders met to refine and resolve any disagreements about the initial codes, resulting in a total of 567 unique codes. In the next stage of analysis, we iteratively combined these codes into emergent themes and subthemes, wrote descriptive memos, and built an affinity diagram to map the relationships between categories [33, 167]. This analysis produced 8 themes and 63 subthemes, and we describe these findings below. The first set of findings gives an overview of participants' rationales for rankings across scenarios, the second set reports on scenario-based themes from participant's reactions and perspectives on our proposed solutions, and the last set describes themes from participant-generated solutions.

Table 8: Summary of Stakeholder's Motivations and Deterrents

Stakeholders	Motivating factors and preferences	Deterrents
Platform	• Minimize worker decommission • Required compliance to mandates and regulations • Preserve public image	• Increased operation costs • Thin profit margins & market competition • Legal liabilities
Workers	• Leverage multiple platforms • Personalized solutions	• Disruptors to earning opportunities or client relations • Short-term or unreliable solutions
Regulators	• Worker-initiated collective action • Hold platforms responsible for initiating and implementing solutions that benefit their workers	• Providing special accommodations to specific worker subgroups • Invasive monitoring of workers

3.3 RESULTS

Each stakeholder group offered unique reactions to our scenarios and proposed solutions. Thus, we start by presenting overarching incentives and preferences that motivates each stakeholder group to initiate change, as well as factors that prevent them from implementing suggested solutions. Next we delve into individual scenarios to unfold participants' quantitative rankings of solutions and provide a debrief of their rationales using qualitative results. We end by describing participants' imagined solutions that spanned across workshops and scenarios.

3.3.1 *Multi-Stakeholders' Incentives, Preferences & Deterrents*

In this section, we present themes that emerged across various scenarios, reporting on stakeholders' overall incentives and preferences that motivate them to promote change for improving gig worker well-being, as well as factors that deter them from implementing suggested solutions. These patterns were revealed through discussions during solution-ranking/generation; Table 8 summarizes these findings.

3.3.1.1 *Platform Motivations & Preferences*

Minimize Worker Decommission Platforms are inherently incentivized to support participating workers, since their operations depend critically upon labor supply. For example, when workers are decommissioned, platforms are motivated to bring them back on a job because "if the worker's not making money, if the worker's not available to work or just isn't working, the platform is not making money" (P1). Worker decommission can result from a variety of factors, including fluctuating seasonal demands, a lack of opportunities or unmet childcare needs: "If somebody doesn't have childcare, that does make them less likely to be available for work on the platform, which is problematic for the platform" (P1).

Government Mandates and Regulations Regulatory pressure can incentivize platforms to make changes, but an excess of mandates can cause them to "think that a lot of this regulation stifles innovation" (P1). Mandates are also undesirable to platforms because since they mean "that we're more restricted, that we're gonna have to pay more" (P1). In addition to restricting platforms from implementing novel features, the cost of (unfunded) mandates can also "significantly restrict our bottom line and our ability to continue to function as a platform" (P1).

Preserving Public Image To circumvent additional regulations, platforms are willing to implement services to preserve public image and "appease the general public or regulators or media ... by offering something like a childcare program" (P1). Platforms' aversion to regulation is strong enough to dedicate "large government relation teams that ... strongly lobby against" mandates "except where they think that it benefits them to show the public for PR reasons" (P1).

3.3.1.2 *Deterrents for Platforms*

High Operation Costs Many of the solutions we presented called for the development of services or programs to benefit workers. Platforms cited high costs and other service priorities as reasons against implementation: "if we're adding incremental benefits, we have to reduce something else" (P1). According to a P1 participant, implementing a single feature can cost "easily six months of three engineers time, plus maybe a month of design effort, plus ... you're probably talking about

an initiative it's gonna cost $650,000", and such initiatives may be so "prohibitively expensive, to the degree [that] the platform might not continue to be sustainable".

Thin Profit Margins One might suggest that platforms use resources gleaned from profit margins to develop features that promote worker well-being. However, platform-side participants relates how "margins are getting tougher and tougher on a lot of these products and services" (P1). In order to provide for increased pay or benefits, "the platform effectively needs to take less", but "the company's not really gonna take less cut because [then] they couldn't pay their employees and they just have to cut heads" (P1). Alternatively, platforms can "increase price [of its service]", but that instigates a negative cycle by putting the platform at risk for user abandonment because if "you raise it too high, you lose customers automatically, they don't wanna pay 50 bucks to go five miles", so it "reduces the number of users that will use the platform, which will cause Lyber to make less" (P1).

Competition Between Platforms Exacerbating monetary constraints, customers were deemed "very price sensitive, they're fickle, they may open both [apps]" (P1). If they are not satisfied with prices, clients might just abandon the service altogether: "There is a maximum amount of money that Lyber passengers are willing to pay for a single trip where [they] start to see declines in usage" (P1). In fact, platforms assign "an entire revenue optimization team that figures out how much can be charged and how much people are willing to pay." (P1).

Legal Liabilities In addition to costs, another factor that demotivates platforms from service offerings is their potential legal ramifications. Platform participants fear such potential complications and "hope that there wouldn't be reputational risk to Lyber by Renee's[/workers'] kid[s], potentially getting injured by being taken care of by another parent" (P1). Regulator participants also recognized the risks, noting that "one of the reasons why childcare programs aren't on sites in corporations is [because] the liability is huge" (R2). The ambiguous legal classification of gig workers also disincentives additional provisions of benefits since "the more that you ... treat somebody as if they're an employee, the more they can argue in court that they are an employee" (P1).

3.3.1.3 *Worker Practices, Motivations & Preferences*

Leverage Multiple Platforms To address instability, workers related experiences of engaging with multiple platforms at once: "if things slow down on one platform, then you can go to another" (W2). Distributing worker profiles across multiple platforms raises opportunities of procuring gigs, and workers view the labor of finding work as their own responsibility: "you can't just sit there and say that TaskBunny should be responsible . . . when it's off season, it's upon you now to maybe seek other alternatives of earning" (W1).

Personalized Solutions The instability of gigs often forces workers to fit needs around work schedules, but ironically the promised flexibility is oftentimes what drove them toward gigs in the first place [232]. Thus it's on platforms to adjust around worker schedules, "to understand the kind of situation that you're in and then they'll try to adjust to fit your availability . . . this is the best way . . . [when] they're trying to adjust to your schedule . . . [and] to your situation" (W1). Adjusting to workers' circumstances can provide a peace of mind through both regularity on standard days and accommodations during emergencies. Platforms don't currently account for situations where "[there is an] employee who is on maternity leave . . . [or] away for stuff like funerals", but workers desire solutions that consider "the various kinds of condition[s] that needs them to be away from work" (W1).

3.3.1.4 *Deterrents for Workers*

Impediments to Earning or Damages to Client Relations Worker participants held a strong aversion against changes that conflict with their own priorities (e.g. making earnings, maintaining good reputation with clients). For example, when presented with Susan's predicament of being blocked from restaurant bathrooms, one worker explained how "you need to work to get money", challenging the hypothetical idea that if "all the restaurants fail to offer bathroom services, do you stop working?" (W1). Another worker opposed "the restriction of platforms, [since] that means you wouldn't have work" (W2). They were also mindful of client relationships, stating concerns that "avoid[ing] orders from those locations, meaning that the clients would suffer" (W2). Beyond clients, workers also "wouldn't want to get on a restaurant's bad side" (W2).

Short-term or Unreliable Solutions Temporary solutions were also undesirable to workers, as they offer only short-lived relief to long-lasting problems. While some help is better than nothing, "they are just short term, they may be a day or two solutions in a month, in the whole season" (W2). For childcare needs, "[days of paid time off] is not a solution because ... she has to stay with the kid" (W1). Worker participants also resisted solutions out of their control, since they may be breakable – "security equipment could fail, maybe the cameras have failed to work, or failed to capture a clear image of the attack" (W1) – or unreliable – "off-season events that are planned by TaskBunny maybe would not be very reliable" (W2).

3.3.1.5 *Regulator Motivations & Preferences*

Hold Platforms Accountable Regulator participants held companies largely responsible to creating better working conditions for their employees. One R3 participant emphasizes how "it's the company's responsibility to create a work environment that is conducive to people succeeding and building the lives that they want". Specifically, they "could imagine a world in which the platform invests in safe bathroom facilities for their own people" (R3). In addition to bathroom access, one regulator also contended that "platforms are viable for healthcare consequences associated with the work that their people are doing" (R3).

Worker-initiated Collective Efforts Power and informational asymmetries makes regulators "reluctant to say the burden should fall on one person's shoulder to save themselves" (R3). Instead, regulator participants recommended "finding ways for the gig workers to combine effectively" (R3), through collective worker actions such as pooling, unionizing and striking to impose pressure on platforms to initiate change. But since gig workers are not employees, many questions exist around how to collectively organize and bargain: "How do you strike when you're not a union? How do you strike and what do you demand?" (R2). Soliciting company involvement was one potential solution: "If not in a formal union, having a company that gives their employees the opportunity to convene and to say what matters most to them could be good as a company practice or policy" (R2).

3.3.1.6 *Deterrents for Regulators*

Special Accommodations for Particular Subgroups Regulators repeatedly emphasized inclusion (of workers and customers alike) and resisted special accommo-

dations for specific groups. They raised additional questions like "Do you have it for the single dad? Do you have it for like elder care? Where do you stop?" (R3). For instance, while the idea of issuing badges to workers helps with limits on bathroom access, it also prompts problems of privacy and misuse: "thing about badges ... is that even if they're voluntary, any program of self-identification creates risks ... with prospective privacy vulnerable populations, you can't really predict how that kind of information is going to circulate and be used in an inappropriate way" (R3). In general, regulator participants objected to "the idea of demarcating workers differently ... that's dangerous and creates fault lines between people ... even if ... you're not closely tied to each other" (R2). Thus, it's imperative "for the company to have its own policies (designed either by mandate or by voluntary corporate structure) to be as inclusive [of] as many different types of workers as possible" (R3).

Violations of Worker Privacy Regulators also opposed invasive monitoring of workers, citing a violation of basic human rights. For example, "a single mom badge come with risk ... [you can imagine] some sketchy dude who likes to pick up women with kids and abuse them, then I think identifying someone as such could lead to safety concerns" (R2). Another participant protests how "we've gotten to the point where, because of technology and oversight, people have literally no independence - they can't even go to the bathroom on their own [initiative] anymore ... [it's] kind of a human rights violation to have that kind of deep oversight of your employee" (R3). Monitoring via dash cams also pose issues of invasion, for while they allow workers "to share [footage]... with the police so that they can help solve the crime", they may also be "pointing in at them as they're driving, I could see just a huge amount of privacy concerns rising from that" (R3).

3.3.2 *Scenario Rankings and Rationales*

In the following scenario-based analysis, we include the top three most favored solutions as well as disliked solutions, and indicate the workshops that casted their votes via a bracked list of workshop IDs. Some solutions triggered polarizing opinions across different stakeholder groups, and may therefore simultaneously appear as both favored and disliked. To elucidate the strength of preference, we include the average rankings of individual solutions across all workshops, where lower rankings indicate more preferred solutions. To summarize each scenario, we wrap up

with a recap of tensions between stakeholder groups and acceptable solutions that are common grounds to multiple stakeholder groups.

Table 9: Scenario 1 Rankings and Voting Summary

 Renee balancing rideshare work and childcare.	**Scenario 1** (Absence of employment benefits)		**Avg Ranking** (lower = preferred)
	Top 3 most **favored** solutions	Platform offers childcare program [R1-2, W1-2, P3]	2.625
		Paid Time Off (PTO) [R1-3, W2]	3.313
		Driver-support groups [R3, W1, P1]	3.313
	Top 3 most **disliked** solutions	Platform offers higher hourly pay [R1, W1-2, P1-2]	5.250
		Worker adds incentives to encourage tips [R2-3, W1]	4.625
		Knowing the destination of incoming rides [R1, R3, W1, P2]	4.688
	Who should be responsible for making changes	• 7 of 8 workshops voted platforms [R1, R2, R3, W1, W2, P2, P3] • 4 of 8 workshops voted workers [W1, W2, P1, P2] • 5 of 8 workshops voted regulators [R1, R2, R3, P2, P3]	

Scenario 1 – Absence of Employment Benefits (e.g. childcare, PTO) Worker and regulator participants preferred benefits such as childcare or part time off, which most workshops decided it was on platforms to implement. Platform-initiated development of childcare programs was considered especially ideal since it offers more flexibility in implementation, but the fear of receiving mandates does drive platforms towards action. In addition to childcare, paid time off can similarly offer temporary relief to Renee's situation. However, platforms were reluctant to provide benefits like these due to restricted funding. As non-employees, workers are currently not guaranteed allowances like paid time off or childcare support, and platforms fear that any government mandates requiring so might incur additional costs. As an exception, regulators from Washington state have set an example for other localities by granting gig workers certain guarantees like sick leave or minimum wage, without sacrificing their status as an independent contractor[1]. Finally, regulators and platforms were both inclined to avoid regulatory micromanagement, but welcome platform-initiated changes, which could be incentivized by regulations. One way

1 Bill HB2076 offers Washington drivers sick leave and minimum wage standards when they transport a passenger in their car: https://lawfilesext.leg.wa.gov/biennium/2021-22/Pdf/Bills/House%20Passed%20Legislature/2076-S.PL.pdf?q=20220309063519

to motivate rather than regulate platforms is through taxation mechanisms, where platforms either receive a tax break for providing a certain benefit, or pay the a tax for the government to provide the benefit to workers. Some platform designers may prefer this solution since a worker benefit program or service with regulation might mandate a specific timeline or a particular way of implementation.

Summary of stakeholder stances and recommendations: All valued worker benefits (e.g., childcare and PTO) highly, and were inclined to think that platforms implement and pay for it. But platforms were reluctant to act due to associated costs and legal liabilities. Regulators can incentivize platforms by mandating some workers benefits, but should guard against micromanaging the execution of such initiatives.

Table 10: Scenario 2 Rankings and Voting Summary

 Dave facing seasonal lows in job opportunities.	**Scenario 2** (Income instability)		**Ranking**
	Top 3 most **favored** solutions	Winter side hustles/off-season work recommendation [all]	1.000
		Platforms plan events during off seasons [R2, P1, P3]	3.875
		Workers conduct long-term financial planning [W1-2]	4.188
	Top 3 most **disliked** solutions	Workers conduct long-term financial planning [R1-2, P1-2]	4.188
		Platforms plan events during off seasons [R3, W1-2, P2]	3.875
		Regulators provide unemployment benefits [R2, P1]	4.188
	Who should be responsible for making changes	• 8 of 8 workshops voted platforms [R1, R2, R3, W1, W2, P1, P2, P3]	
		• 5 of 8 workshops voted workers [R1, W1, W2, P1, P3]	
		• 3 of 8 workshops voted regulators [R2, W2, P2]	

Scenario 2 – Income Instability Platforms are overwhelmingly happy to plan off-season events to help decommissioned workers, since it also brings them earnings. In fact, one participant's employer platform already offers an effective incentive program for workers to complete snow removal jobs. One way of encouraging client engagement that participants recommended was the initiation of a "spring-cleaning week", which would prompt them toward a task that they wouldn't otherwise think about. Such events advantage workers by giving them information that substitutes for the social network they would've relied on informally. However, workers worry that income from platform-initiated events offer only minor gains, not long-term solutions – it was imperative to workers that they can plan for and control their own financial situations. One way that workers can curb the effects of seasonal fluctuations was to leverage the availability of multiple platforms, so that when they don't have work at TaskBunny, they can earn through jobs somewhere else. Platforms

can also help workers conduct financial planning by including features like in-app earnings projections. Finally, platforms are disinclined to provide unemployment benefits, citing (on top of costs) how disbursing unemployment funds upfront may cause recipients to immediately spend it or lose their motivation to work.

Summary of stakeholder stances and recommendations: Compared to platform-planned off-season events, workers preferred to be in control of their own financial planning. Since platforms were unwilling to provide unemployment benefits, workers can overcome seasonal lows by engaging with alternative platforms. Such worker inclinations toward increased agency presents unique opportunities for HCI designers to invent technological solutions for workers that integrate multiple platforms and facilitate cross-platform information sharing.

Table 11: Scenario 3 Rankings and Voting Summary

 Susan struggling to access bathrooms at restaurants that she delivered for.	**Scenario 3** (Missing Access to Working Necessities)		**Ranking**
	Top 3 most **favored** solutions	Platforms negotiate with restaurants to open bathroom locations to workers. [R1, W1-2, P2-3]	2.188
		Platforms show public bathroom locations in apps. [R1, P1-3]	2.125
		Regulators require restaurants to provide bathroom access. [R1-2, W1-2]	4.188
	Top 3 most **disliked** solutions	Platforms cut off online orders during busy hours. [R1-3, W1, P1-3]	7.688
		Workers petition restaurants for bathroom access. [R2, P2]	5.375
		Workers share public bathroom locations with one another. [W1, P2]	5.188
	Who should be responsible for making changes	• 8 of 8 workshops voted platforms [R1, R2, R3, W1, W2, P1, P2, P3] • 3 of 8 workshops voted workers [W1, W2, P1] • 7 of 8 workshops voted regulators [R1, R2, R3, W1, W2, P1, P2]	

Scenario 3 – Missing Access to Working Necessities All workshops recognized bathroom access as a basic need. As service-providers to restaurants, workers (along with regulators) felt adamant that deliverers like Susan should not be denied necessary access to bathrooms. One worker was willing to publicly voice such opinions through petitions and suggested that platforms issue badges to workers so that they can be given direct bathroom access in restaurants. While regulator participants conceded that public infrastructure improvements are needed to build more clean and safe bathrooms, they also believe it is platforms' responsibilities to negotiate with

restaurants, and to share with the workers a map indicating restaurants where the public is allowed to use the restroom. Unfortunately, platforms were reluctant to require bathroom access for workers from restaurants because they predict a drop-off in the number of participating restaurants. One platform participant commented that it's really hard to make bathroom access mandatory from the food safety perspective. On the other hand, a regulator also noted how there are health code requirements that expect bathrooms to be publicly accessible. Bathrooms are one instance of underdeveloped public service, and in general we find that gig work exposes a lack of basic, fundamental safety nets in our public infrastructure.

Summary of stakeholder stances and recommendations: Our existing public infrastructure does not offer enough safe and public bathrooms, and gig work is starting to probe at the social boundary between platforms, restaurants, and workers regarding how workers should access facilities like bathrooms that are essential for work. Platforms can offer technological support by integrating restroom locations into maps and incorporating restroom breaks into route planning.

Table 12: Scenario 4 Rankings and Voting Summary

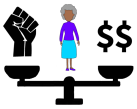
 George receives a high medical bill for injuries received from an attack at an unsafe area after a delivery.	**Scenario 4** (Undermined Safety & Worker Protections)		**Ranking**
	Top 3 most **favored** solutions	Regulators pass universal healthcare. [R2-3, W1-2, P2]	3.375
		Platforms provide security equipment. [R1-2, W1, P3]	3.250
		Platforms provide worker's compensation. [R1-2, W2, P2]	3.250
	Top 3 most **disliked** solutions	Regulators restrict platforms from sending drivers to high-crime areas. [R2-3, W1-2, P1-3]	7.563
		Regulators require platforms to issue a warning when workers enter high-crime areas. [R2-3, W1-2, P2]	5.250
		Platforms provide workers additional subsidies for serving in high-crime areas. [R2-3]	4.875
	Who should be responsible for making changes	• 8 of 8 workshops voted platforms [R1, R2, R3, W1, W2, P1, P2, P3] • 2 of 8 workshops voted workers [W1, P1] • 6 of 8 workshops voted regulators [R1, R2, R3, W1, P2, P3]	

Scenario 4 – Undermined Safety & Worker Protections The idea of restricting deliveries in high crime areas was rejected by all three stakeholder groups. In particular, regulators discouraged investing in technological improvements (e.g. signals and buttons and alerts) because identifying dangerous locations can evolve into digital redlining, thereby reinforcing existing stigma surrounding the place. Cutting off orders hurts restaurants because it generates less revenue, harms drivers by reduc-

ing their income, and angers hungry people since they can't get food delivery. Regulators recognized how this scenario calls attention to underlying issues of unsafe communities, and to address these, all workshops voted for platforms to contribute toward community safety improvements, through provisions of a safe operational vehicle, personal protective equipment etc. But security measures shouldn't really mean just the equipment, it also involves security personnel, which can take the form of visible public presences such as the police. Unfortunately, the public police force in general is overstretched and underfunded. Even if emergency buttons directing to the police were to be implemented, they would be fraught with issues related to fair distribution – people would wonder why higher status law enforcement is more responsive to the platforms and its drivers, raising questions like "Why did GrubHub drivers get the button? Why doesn't everybody get a button?" (R3). Worker and regulator participants also thought that platforms should provide workers' compensation, especially if the injuries were received in area where workers arrived to for a gig. From a worker's perspective, those compensations could go a long way in helping George pay for his bills. Lastly, a regulator suggested providing more available medical facilities so that workers can have "a place where they can go and get that quick healthcare" (R2).

Summary of stakeholder stances and recommendations: Segregating areas by restricting (delivery) services in high-crime locations is not the way forward. Regulators and platforms should work together to improve community safety. In particular, platforms should invest in security equipment for workers while regulators can provide more visible public presences as security personnel.

Table 13: Scenario 5 Rankings and Voting Summary

 Marianne's earnings were compromised after intransparent and unfair platform decisions	**Scenario 5** (Intransparency & need for collective action)		**Ranking**
	Top 3 most **favored** solutions	Platforms implement transparent policies about decisions to keep workers informed. [W1, P1, P3]	3.750
		Workers notify buyers of their situation to garner support. [R1-R3]	3.875
		Regulators impose a ceiling on transaction fees. [R1, R3, W1]	4.250
	Top 3 most **disliked** solutions	Workers pool savings to strike without losing income. [R1-2, P1-2]	6.000
		Workers maintain a good relationship with platform by not participating in the strike [R2-3, P2]	5.625
		Workers participate in the strike by stopping sales. [W1, P1-2]	4.313
	Who should be responsible for making changes	• 6 of 8 workshops voted platforms [R2, W1, W2, P1, P2, P3] • 5 of 8 workshops voted workers [R1, R3, W1, W2, P2] • 5 of 8 workshops voted regulators [R2, R3, W1, W2, P3]	

Scenario 5 – Intransparency & need for collective action Transparent policies were most desired by both worker and platform participants, so that sellers like Marianne have time to plan for drastic changes. Because Ebsy failed to communicate their decisions to workers like Marianne ahead of time, now she has to deal with the dilemma of whether or not to strike. Even platform employees thought Ebsy "definitely did a wrong thing" by destroying their "long-term trust situation" with sellers through intransparency, which is "something we should avoid, and the regulators should require transparent policies . . . because sellers is actually why your platform exist[s]" (P1). To help workers achieve financial stability, platform participants recommended sellers strengthen their portfolio by putting their products on different platforms. This strategy of multi-apping is commonly employed even before the pandemic, and across continents [143]. Regulator participants heavily encouraged workers like Marianne to participate in collective actions such as strikes, citing a list of reasons: it is a way of gaining power, Marianne owes her coworkers the support, and because solidarity is what makes strikes work. However, regulators also acknowledged the difficulties of collective organization, since it requires a "certain savvy with regard to using social media" (R3), which requires careful planning as a community. Indeed, workers strongly resisted engaging in collective action (as is observable through the most disliked solutions), expressing that they did not feel

"comfortable having their savings pooled together" (W2). One platform participant also recommended that workers refrain from striking and "maintain a good relationship with Ebsy" (P1), rationalizing that doing so can advantage Marianne by boosting her sales while other sellers strike.

Summary of stakeholder stances and recommendations: Transparency is a good first step for ensuring that workers have agency in making alternative plans. However, the legal categorization of workers as non-employees complicates potentials for collective actions and unionization. Furthermore, it's difficult for workers to build enough trust among one another to contribute toward pooling or strikes.

Table 14: Participant generated solutions

<table>
<tr><th></th><th>Platforms</th><th>Regulators</th><th>Workers</th></tr>
<tr><td rowspan="3">Radical / Reach Solutions</td><td>• Partnerships between platforms
• Improved transparency policies
• Cross-platform worker rating system
• Green light hubs
• Platform-subsidized maternity leave</td><td>• A third legal class of workers
• More clean & safe public bathrooms
• More police /safety solutions</td><td rowspan="2">• Worker-owned cooperatives
• Worker-initiated petitions & strikes</td></tr>
<tr><td colspan="2">• Mandatory company-funded worker compensations
• Regulator/platform-backed income pools
• Universal basic income
• Higher hourly pay for all
• Improved insurance schemes
• Price ceiling on all transactions</td></tr>
<tr><td colspan="3">• Shifts in legal and social classifications of gig workers</td></tr>
<tr><td>Incremental Changes</td><td>• Reduce wait times & offer better rides
• Allow worker-scheduled rides
• Earnings projections with category suggestions
• Company-supported savings
• Employer-sponsored financial education
• Worker-success programs
• Trust-based loans & loyal worker bonuses
• Within-vehicle lock mechanisms
• Emergency button on bikes
• Anti-violence investment</td><td>• Employee assistance programs (EAPs)
• Job training
• Help workers connect with the local workforce system</td><td>•Leverage multiple platforms
• Make financial plans personally</td></tr>
</table>

3.3.3 *Participant-generated Solutions*

In the following section we highlight some new ideas that participants organically generated during workshops. During the analysis phase, we divided these contributions into radical and reach solutions and further categorized them by the stakeholder group(s) that can bring them into reality. Table 14 summarizes these ideas.

3.3.3.1 *Radical Re-imaginings*

Platform-side Actions Many platform stakeholders consider *multi-platform partnerships* plausible and effective solutions. Discounts for childcare was one partnership idea from P2, which would work "if there was some childcare provider, and [with them as a partner] we said [to workers] because you're a worker [on our platform], you get 60% off or something" (P2). Help with rent is another benefit that partnerships can provide workers, where they receive "a $20 contribution that could be used then on this GigEasy platform to purchase rent protection" (P2). Finally, P3 imagined a cross-platform rating system for workers so that their reputations can be shared across platforms, which can allow workers to easily maintain reputation across platforms and for platforms to recommend workers to one another.

All stakeholder groups advocated for *improved platformic transparency*, which can help increase worker autonomy and agency. For instance, one platform designer conjectures that "if you presented it [earnings projections] in the right way and maybe said: 'you're tasking in the moving category and we expect like during these months, this will be your earnings. But here's some categories where we think this would be your earnings and you should sign up for those' "(P2), then workers would have more options on improving income. *Well-presented, transparent, and actionable recommendations* would offer workers insights for long-term planning.

On top of technological improvements, *platforms can help alleviate the shortcomings of public infrastructure*. For instance P2 called for the establishment of more green light hubs, or partner support centers that contain lounges and bathrooms, so that workers can have physical locations to stop, rest and support one another. W1 and R2 both organically generated universal maternity leave (paid for by companies) as a solution for Renee, and W1 even voted for it as their favorite solution.

Regulatory Actions Taking a more revisionist approach, a P2 participant envisioned "*a third legal class of worker*[s] existing", since "so much of the legal battle has

been about: either you're a contractor or you're an employee ... if there were some third class of worker, then you could actually have an employment scheme that made sense for the type of work that people were doing". By shifting focus away from the legal risks of overstepping the boundaries of contractual work, a new classification could redirect platform efforts toward more improvements and protections.

The previously unprecedented rise in gig work revealed *numerous inadequacies in our public infrastructure*, where many fundamental improvements are needed to ensure the sustainable functioning of the gig economy. Both R3 participants vehemently stood up for "more clean, safe public bathrooms" and P3 thought the government should send more police (or safety solutions) to help unsafe neighborhoods for cases like George's.

Worker-side Actions Many regulators supported worker-initiated *petitions, strikes (3.3.1.5) and worker-owned cooperatives* (R2). But while collective efforts are easier to introduce than new regulations "because it doesn't require any sort of legal intervention", collective organization is difficult since "most of the people I know who drive ... they don't want that kind of responsibility" (R3). Platform themselves act as an additional barrier against community-building, since they "intentionally never ... built up any type of community around the drivers" (P2).

Collaborations Between All Stakeholders Instead, participants proposed *shifts in legal and social classifications of workers* [277] since "gig worker[s] these days ... are treated in a variety of political ways, legal ways, social ways, cultural ways ... and so we, as a matter of public policy ... should be figuring out how to level it up" (R3). Improved treatment of gig workers can start from us all, by "changing our preconception about who a worker is, and what it means to work, and the kind of vulnerabilities that you have as a worker in a gig economy" (R3), we would collectively contribute toward improved perceptions of and conditions for gig workers.

Co-regulated Platformic/Government Actions While a legal reclassification of workers can help them reap many benefits and protections, such drastic labor law adjustments are unlikely to take effect in the near future. In the meantime, regulators and platform designers recommended more specific *policies to protect worker safety and earnings*. For cases like George, R1 advocated for mandatory company-funded worker compensations (to ameliorate the costs of task-related injuries), and R3 suggested regulator/platform-backed income pools for seasonal workers like Dave.

Beyond policy revisions and additional mandates, participants also advocated for more radical and reach solutions that provide *universal benefits*, while acknowledging their current infeasibility. For instance, universal healthcare (a researcher-generated idea), garnered the most support and was the highest ranked solution across three workshops for George's scenario. R2 participants proposed earning guarantees such as universal basic income for Dave's situation, and higher hourly pay for everyone in the case of Renee. P2 recommended improved insurance schemes with a fixed coverage gap and R1 advocated for the government to impose a price ceiling on all transactions to reduce the risks that sellers like Marianne experience wage theft.

3.3.3.2 *Incremental Improvements*

Platformic Actions To build upon existing algorithmic functions, participants proposed various *new platform features and initiatives to help workers improve efficiency, raise earnings and protect health and safety*. To approach higher worker productivity, P3 recommended optimizing the existing algorithm to reduce wait times, offer better rides/tasks, and allow workers to schedule rides ahead of time. To increase earnings, participants suggested new category suggestions (P2) and company supported savings (R2). More indirectly, workers can raise earnings by acquiring or honing (new) skills. Hence, participants recommended initiatives such as employer-sponsored financial education (R3) and worker-success programs (P2) so that workers can adjust for marketing offerings, availabilities, supplies, etc. For veteran workers, trust-based loans or bonuses (P2) can dissuade loyal workers from leaving the platform.

Participants generated a variety of ways that platforms can help promote physical safety. Some "quick hit, easy solution[s]" include a "*locking mechanism in the vehicle* ... a drop space you can't open, [because] more than once, I've known day workers getting mugged because they're easily identifiable as having money on them" (R2) as well as "*driver check-ins and an emergency button* ... it's not gonna get [to] the root cause, ... [but it is a] small way to assure that the workers feel a little bit more comfortable" (R3). A W1 worker also confirmed prior findings of driver preferences on safety equipment [7], stating that "driver check-in also is good ... just in case things like attacks happened". Finally, platforms can begin "*investing in that kind of root cause anti-violence work* that the particular municipality or locality might need ... [which] could be [delivered] in the form of a grant to that municipality" (R3).

Regulatory/Government Action Many of these aforementioned programs and benefits are also implementable by governments. For instance one R1 participant pointed out how *employee assistance and job training programs* already exist. Meanwhile, *helping workers connect with local workforce system* could have assisted workers like Dave seek additional tasks and income during off seasons.

Worker-side Actions In addition to changes from the platform end, participants also suggested ways that workers can take the matter into their own hands. W1, W2 and P3 all recommended workers like Marianne to *leverage multiple platforms* by selling products on these different sites simultaneously (3.3.2), so as to curb the effects of unforeseen situations. In the case of Dave, W2 participants saw an opportunity for the worker to personally make financial plans in preparation for seasonal changes.

3.4 DISCUSSION

In this study, we took a stakeholder-driven approach with platforms, regulators and workers to examine pressing issues related to gig work. In doing so, we hope to provide a richer and more holistic picture of where we currently stand in terms of gig work conditions, as well as where improvements are possible and most needed. By conducting these co-design workshops with relevant stakeholder groups, we can address a broader set of needs, approach more practical and realistic designs, and further our progress in creating the gig work futures that we discuss, imagine, and dream for together. In the following section, we shed light on these multi-stakeholder findings by highlighting design recommendations, ideas for collaboration, and key insights that emerge from the intersection of stakeholders' perspectives. On top of recommending new avenues for future work and developments in service, policy and technology, we also provide cautions against potentially harmful side effects that may arise from implementing these solutions.

3.4.1 *Technological Implications*

- **Platform-initiated changes as low hanging fruits**. Our findings suggest that platforms can initiate a range of incremental changes for improving gig work conditions, including ways of increasing earning opportunities and services to benefit worker health and safety. For instance, the in-app display of public

bathroom locations was one of the most favored solutions in 3.3.2, and may serve as a temporary fix for the current shortage of public bathrooms. To help curb the seasonal nature of gigs, platforms can recommend off-season work opportunities and provide in-app earnings projections to guide financial planning (3.3.2). Such features are also aligned with platforms' overall preferences and can benefit platforms in the long run, by offering competitive advantages that help to retain existing workers and attract newcomers.

- **Technologies that motivate workers to voice concerns without harming earning opportunities**. Currently, workers hesitate to engage in collective actions despite overwhelming support from advocates and regulators because they 1) lack legal protections and social support and 2) fear a loss of work opportunities that may result from damaged relationship with platforms. Future system designers can explore ways of encouraging prosocial data-sharing among workers to foster communities of support, where workers can protect and advocate for their gig community's well-being with data-driven insights without needing to worry about legal implications or reputational consequences [49]. Prior studies have suggested using data-driven insights to raise public awareness about worrying circumstances surrounding (gig) work environments [49, 211], and a feasibility analysis showed the potentials of platform cooperatives replacing investor-owned platforms [46]. Mobilization of gig workers are increasing in Europe [70] and Latin America, where they leveraged social media to coalesce in large-scale, organized, international strikes [172], showing how informal labor networks and mutual aid can transform distributed workforces even in the absence of formal union structures [308].

- **Multi-platform collaborations**. Gig platforms largely coexist as competitors to one another. Our participants encouraged multi-platform collaborations, which can benefit both workers and platforms. For example, partnerships across platforms can help workers battle the instabilities of gigs (3.3.2) and provide assistance with childcare (3.3.2) while cross-platform worker ratings can encourage to workers reuse a single portfolio across platforms and tasks (3.3.3.1), which can increase earning opportunities (3.3.1.3, 3.3.2) [174]. Recent work anticipates the need for both workers and clients to engage the services of several platforms simultaneously, pointing to potential rise of multi-platform systems [9]. This suggests an opportunity gap where tooling and resources can be developed to help workers easily transition and switch between platforms.

Cautions The innovations proposed above can have potentially deleterious side effects that developers should guard against. For instance, a system for collective actions can **expose and breach the privacy of protesting workers**, possibly causing losses of earning opportunities. Furthermore, while our workers called for more personalized accommodations, such arrangements inevitably **trades off with privacy** [136, 231, 336], potentially requiring platforms to access and monitor working habits and other behaviors. Implementations of personalization features should take care to not cross the line between customization and invasive surveillance. Finally, the cross-platform ratings of workers can exert **overt pressure on workers to maintain good reputation** – small disagreements with one client could affect their earning potentials across platforms. Hence, designers of multi-platform rating systems should consider protective mechanisms to prevent clients from abusing rating privileges.

3.4.2 *Policy Implications*

- **Regulations to incentivize platform-initiated programs and accommodations.** While regulators strongly advocate for empowering the collective voice of gig workers and creating better gig work environments, platforms are reluctant to provide such resources, listing a plethora of reasons for such inaction. Hence, policymakers and platforms should work together to devise regulatory measures that motivate platforms to mobilize and provide services/resources that benefit worker well-being. Such incentives can take many forms: our participants suggested tax breaks (3.3.2), government subsidies (3.3.3.1), and in the case of Washington state – new litigation to offer benefits such as workers' compensation alongside the flexibility of independent contracting (3.3.2) [401].
- **Regulations on platforms to ensure occupational health & safety.** Many regulator participants admit that some of the occupational risks gig workers experience in the US are consequences of missing or inadequate public infrastructure. For example, the lack of available public bathrooms contributed to Susan's inability to meet a dire biological need at work (3.3.2), and this shortage has only been aggravated by the pandemic [43]. Similarly, physical safety of food couriers can be compromised in the wake of rising crime without protections by visible public presences (3.3.2) [213]. Thus, it is of increasing urgency for policymakers to propose mandates and regulations to drive platforms' efforts that

promote gig worker health and safety and subsequently for regulators enforce such directives, so as to close the gap between policy and regulation [118].

- **Enhanced legal & public perceptions of gig work.** As Howard found, the legal misclassification of gig workers as contractors is a major contributor to their substandard conditions of occupational health and safety [171]. Participants brought up both legislative and cultural shifts in how we consider gig workers (see 3.3.3.1 Regulatory Actions and Collaborations Between All Stakeholders) as first steps toward mitigating existing social stigmas and legal misclassifications. That is, a change in worker status must begin with an updated perception of workers from the public at large – we should raise our own awareness of workers' vulnerabilities instead of considering them as fungible/replaceable, and reflect on how we can contribute toward improvements of current conditions. While an abundance of reports and studies have criticized how platforms abuse the inappropriate classification of gig workers as contractors to subvert corporate responsibilities and liabilities [88, 91, 102, 148, 245, 382], further advancements in policy and public discourse are needed to provide workers with the employee benefits and protections they deserve.

Cautions An excess of specific regulations run the risk of **micromanaging platforms** (3.3.2), therefore regulators should provide companies enough flexibility in how they implement benefit programs and services to workers, but at the same time make sure the changes are measurable and enforceable, as Johnston et. al. suggested [201]. Regarding proposed improvements for public infrastructure (e.g. bathroom access and public safety), regulator participants expressed concerns around **redlining districts that are less safe or developed**, hence future policy proposals should be inclusive of traditionally underserved populations and localities [96, 144, 382].

3.4.3 *Service & Management Implications*

- **Regulators and platforms prioritize & co-regulate (universal) benefits.** Regulator and worker participants welcomed various employee benefits — e.g., healthcare, security equipment, worker's compensation, price ceilings on transaction fees, and childcare services (Table 11 and 9). Many of these "universal" benefits require co-regulation from regulators, lawmakers and platforms, who must collaborate to fix legal loopholes and market inefficiencies (3.3.3.1) [56].

Hence, future work can investigate ways of measuring the costs and returns of implementing the various types of employee benefits, so that legal and platform practitioners can better prioritize services to meet worker needs.

- **Green light hubs / worker rest areas.** The temporary nature of gigs makes workers lack many forms of physical support, and inadequacies in our public infrastructure lengths their already extensive list of occupational hazards [382]. While we can hope that gig work speeds up the development of these public sector services, there are no such guarantees in the near future. As an alternative, participants suggested for platforms to build more green light hubs [2] to provide workers physical locations for rest and (mutual) support (3.3.3.1).

- **Follow worker recommendations in redesigns.** Conversations with diverse stakeholder groups increase our chances of addressing a broader set of needs and enables us to approach more practical and realistic designs, since redesigns of interactions between platforms and workers should involve **conversations between platforms and workers**. One worker pointed out how "Renee interacts everyday with Lyber, and so the solutions need to come from their interactions" (W1). As future platform designers and legislators work towards meeting the needs of workers, they should take heed to directly involve gig workers voices in the redesign process.

Cautions In ranking and prioritizing worker benefits and programs, platforms and regulators may default to **short-term and unreliable solutions** as low-hanging fruits, which workers rejected. Hence, designers and providers should focus on the development of sustainable and reliable benefits/service offerings. On the other hand, there is a risk of **further encumbering workers with additional labor of devising solutions** for their own problems. Instead, collaborators should prepare optional solutions for gig workers to choose from when involving them in redesigns.

2 https://www.ridester.com/uber-greenlight-hub/

4

TOWARDS INDIVIDUALIZED POLICY & TECH GIG WORK INTERVENTIONS

In light of stakeholders' calls for increased policy and regulations shared in the above workshops, we synthesized related legal and policy documents, existing labor laws, recent state bills, as well as research from HCI and policy to determine necessary amendments and additions to current labor regulations. Previous studies from various disciplines reported on the limited social [224, 410, 421], technological [196, 240], and regulatory [103, 145, 155, 361, 370] support available for laborers to contend with the adverse conditions of gig work — which include intense competition [26, 223], low wages [133, 203, 409], job precarity [16, 368], and physical hazards [18, 171].

Underlying these problems is the ambiguous legal classification of gig workers-their status as independent contractors provides flexibility in the time and location of work, but at the expense of typical employee rights to unionization and collective bargaining or benefits such as health care and paid time off [19]. In response to such concerns, many turned to the redesign of regulatory policies [75, 361] and platforms [15, 191]. However, many existing proposals suggest broader advancements that uniformly benefit the entire gig workforce without considering individual workers' unique constraints and priorities [175]. Such general, all-encompassing solutions overlook the diversity of gigs and the population of workers who complete them. Many different categories of gig work exist [106], and along with them unique occupational hazards and worker needs [18]. While gig workers may bear the same risks as others doing similar work outside of platforms (e.g. taxi drivers), they do not share the benefits and protections typically afforded to employees.

In this chapter, we urge policy and platform designers to consider more targeted and personalized policies and features to support the unique needs of individual workers (in lieu of universal benefits and solutions), who undertake a wide variety of tasks types and occupy diverse and intersectional backgrounds. For example, policymakers of the U.S. can amend existing codes and introduce new legislation to provide workers with collective bargaining power, protections against discrimination and retaliation, as well as specialized bills for addressing particular working

needs of different types of gig workers. On the platforms' end, engineers and designers can implement features and services that target and accommodate individual needs, increase worker agency, and in general improve worker well-being and welfare. Outside of platform initiatives, technological advancements such as automation can assist workers with tax filing, financial tracking, contract writing as well as promoting individual well-being.

4.1 BACKGROUND

4.1.1 *Diversity of Gig Services and Participants*

Gig work is multifaceted and encompasses many service industries, ranging from physical labor such as construction work to digitally deliverable services such as logo design or software development. While some primary attributes (e.g., placement platform or spatial/temporal flexibility) unify and define all forms of gig work, further classifications can identify multiple variants and categories. Some studies broadly divide gig work into its physical and remote counterparts [120, 174]. For example, De Stefano distinguishes between crowdwork – platforms such as Amazon Mechanical Turk or CrowdFlower that mediate the remote execution of microtasks – and app work – intermediaries such as Uber or TaskRabbit that connect workers to tasks performed locally, including transportation, cleaning, and various other errands such as food delivery [358]. Duggan also introduced capital platform work as a third variant, characterizing the work of online sellers who use digital platforms such as Etsy and Airbnb to share individually-owned capital with consumers [106, 254]. In addition to task-based classifications, a literature review by Watson et al. also profiled different groups of gig workers: the Gig Service Provider (e.g., Uber, AirBnb, TaskRabbit app workers), the gig goods provider (e.g., online sellers such as Etsy or RedBubble), the gig data provider (e.g. crowdworkers like AMT or Google Surveys), the Agency Gig Worker (where contractors are assigned work through an intermediary agency), and the Traditional Gig Worker, which includes roles such as substitute teachers, comedians, babysitters, photographers, and musicians [402].

Each of the above gig work variants require a distinct set of protections and resources. In addition to work-related specializations, workers also diverge from one another in terms of demographics. Recent surveys show that gig workers tend to be younger, male, Hispanic/Black, more likely to be educated, and live in urban areas

compared to traditional workers [138, 407]. In contrast, an older report from BLS in 2005 showcased an older and more white gig workforce [171]. Within each category of gig work, however, there are more subtle differences: independent contractors tend to be older and whiter, workers on online platforms tend to be male, and women are more likely to engage in capital platform work [87]. This diversity of demographic and occupational characteristics (and the associated intersection between groups) necessitates the development of targeted policies and platform features that address the specific work needs of each group. In the following sections we outline the current state of challenges faced by gig workers as well as existing forms of regulatory support and budding policy initiatives to address such issues.

4.1.2 *Challenges and Inequalities in Gig Work*

Currently, gig workers of the United States are exposed to various financial, safety, and health risks while lacking access to many forms of necessary social, technical, and legal support. Chapter 3 suggests that platforms are unwilling to implement programs and features to improve working conditions due to the high costs involved, and that policymakers tend to favor one-size-fit-all solutions that apply to all gig workers to ensure inclusion and avoid segregation. However, not only are such homogeneous solutions hard to devise, they will not meet the individual needs of gig workers, and platforms cannot be expected to provide the benefits required by each individual worker. Below, we outline some key concerns and priorities for specific subgroups of workers, and subsequently propose ways of expanding existing U.S. policies and platform support to address such shortcomings.

Occupational Hazards of (Physical) App Workers App workers performing physical work (e.g., ride-sharing, delivery services, contractual construction work) need safety precautions and safeguards, access to bathrooms, and flexibility in determining where they work (by setting a maximum radius of travel etc.). A survey of 4,000 gig workers conducted by UCLA found that 37% of delivery drivers have suffered an accident while on the job [271]. To make matters worse, drivers are disincentivized from taking protective measures, such as using dashcams, as passenger discomfort with surveillance can lead to poor ratings, which are important inputs to platforms' rating systems [7]. According to NIOSH, delivery drivers face a higher risk for work-related motor vehicle accidents compared to workers in other occu-

pations [279]. Many cases of violence likely go undetected, but the Markup has identified 361 ride-hail and delivery drivers as victims of carjackings or attempted carjackings over just the last five years alone [209]. Cleaners, caregivers, and TaskRabbit workers also face the dangers of entering strangers' homes to offer their services [18]. These workplace hazards are exacerbated by the lack of training and on-site supervision expected in traditional work arrangements.

In addition to physical safety risks, psychological and physical work demands placed on app workers further expose them to health risks [208]. Studies of mortality and psychological morbidity studies have shown that workers in nonstandard, gig work arrangements are at higher risk of physical and mental injuries than workers in standard industrial work environments [171]. Empirical studies have also found that job insecurity (a typical characteristic to contingent workers) has a negative impact on health and well-being [90].

Conditions of Online Gig Work Unlike location-dependent app workers, online-based workers like freelancers are more likely to deal with uncertainty in payments and opportunities [36, 394] and invasive monitoring [304].

Freelancers experience platformic management when their performance evaluations are documented in ranking systems (which depend on client reviews), as well as extensive oversight when their keystrokes and active time are recorded [393]. In addition, international clients subject freelancers to long and unusual work hours [351, 352], which increases emotional exhaustion, leads to a blended work-life balance, and undermines life satisfaction. Finally, freelancers are responsible for their own reputational management, which can entail extensive time spent on building profiles and maintaining positive relationships with clients [174, 394].

Crowdworkers face similar challenges of self-management and long working hours. However, they must additionally endure the challenges of unfair pay [21] and wage theft, as their payment relies on the approval of requesters and a relatively large supply of laborers makes their services fungible and easily replaceable [190]. Such imbalance of labor supply and demand also creates meaningless, menial tasks as well as low pay and recognition [110, 217].

Online goods providers are more vulnerable to hikes in transaction fees, or competition from large corporate companies [406], although they also face the challenges of low pay, algorithmic management, and the pressure of reputation upkeep through rating systems [30]. For peer-to-peer sharing platforms such as AirBnb, reviews constitute yet another performance metric that workers must work to maintain [229].

Finally, due to invisible platform policies, online sellers often have to negotiate to defend that their products amount to "handmade" commodities and familiarize themselves with intellectual property laws to defend against infringement [318].

Reinscriptions of Inequality in Gig Work **Gender** pay gaps are reported in both crowd work and freelancing [105, 108, 124, 243], requiring women to work more hours on platforms to make up for the differences in pay [24]. In addition to unfair remuneration, occupational gender stereotypes are perpetuated in various gig work sectors around the world [134, 409]. However, due to caregiving and other domestic responsibilities, women are less able to fulfill the long working hours demanded of freelancers [3]. To top it off, harassing behaviors such as verbal abuse, stalking, or bullying are more likely to put women at risk [326]. The lack of public or platform-enforced anti-harassment policies have led women workers to resort to "brushing it off" when harassment does occur [249], or to use usernames that don't reveal their gender [206].

Despite the disproportionate participation of Black and Hispanic populations in gig work, occupational segregation and **racial discrimination** remain prevalent [113]. On AirBnb, profile pictures have resulted in Black hosts charging 12% less than non-Black hosts [112]. In an experimental study of hypothetical hiring decisions, Black candidates were 16% less likely to be hired [235]. A 2021 survey found that White workers were less likely than their white counterparts to earn from multiple types of gig jobs (48% vs. 30%), to feel unsafe while completing jobs (41% vs. 28%), and to receive unwanted sexual advances (24% vs. 13%) [138]. There is also evidence of disparities between goods providers on Craigslist and eBay, where a White person's hand in product photos helped garner higher prices than a Black one [326].

Socioeconomic factors may underlie many existing inequalities in the gig economy [348]. Compared to low socioeconomic status (SES) areas and the suburbs, services such as UberX and TaskRabbit were found to be significantly more effective in dense high-SES areas [374]. AirBnB workers tend to have higher education, higher income, and strong ties in the labor market, forming a barrier to entry for individuals of lower socioeconomic status [189]. These findings are noteworthy because studies point to the potentially detrimental impacts of SES on late-life poor health outcomes, such as aging and mortality [132, 294].

A discussion of inequalities would be remiss to not consider the dynamics of intersectionality. Workers perceived as women on TaskRabbit (especially white women) received 10% fewer reviews, and Black (men) received significantly lower ratings;

Black men on Fiverr also received 32% fewer reviews [151]. While past studies have substantiated claims of racial, gender and socioeconomic biases, we lack understanding (and therefore encourage future investigations) around gig works' impacts on other vulnerable groups, such as the disabled and older populations, as well as intersecting inequalities (e.g. the gendered experiences of workers in low- and middle-income countries) [20, 206].

4.1.3 *Existing Initiatives and Preliminary Policies*

Many of the work-induced challenges described above have fueled legislative concern in the US, where the state of California leads the nation's disagreement around labor laws. In January of 2020, the Assembly Bill 5 (AB5) amended the state's labor laws to expand the definition of an employee so as to reduce the chances of employers misclassifying regular workers as independent contractors. The bill was subsequently mandated by courts and extended labor protections like paid leave to an estimated one million people [283]. However, in the November 2020 state election, a ballot initiative (which cost platforms more than 200 million in campaign funds [356]) was passed to exempt app-based transportation companies from AB5 [184]. In August 2021, the initiative was declared unconstitutional and unenforceable by a county court judge [6, 137], but proponents of Prop 22 subsequently appealed the ruling in December 2022; they are expected to receive a decision from the California Supreme Court [417].

Other states also strive to bring more benefits to gig workers. In March 2022, Washington state governor Jay Inslee signed the Engrossed Substitute House Bill 2076 into state law (in effect by January 2023), which guarantees minimum trip payments, workers' compensation, paid sick leave (one hour earned for 40 worked hours), as well as a resource center to educate workers on received benefits [123]. A pair of proposed ballot initiatives would guarantee Massachusetts drivers benefits such as minimum wage, per-mile expense reimbursements, a health care stipend, paid leave, workers' compensation, protection against discrimination, as well as a right to appeal terminations. At the federal level, a bipartisan group of legislators from the US House of Representative introduced a federal bill in July 2022 that would make it compulsory for platforms to provide a written summary of worker benefits, allowing workers to reject assignments and conduct multi-platform work, affording them rights to privacy, safety and leave as described in the Family and

Medical Leave Act, as well as protections against client discrimination, retaliation and harassment [349].

Besides initiatives to guarantee worker benefits, a plethora of classification tests are getting developed and adopted to assess the appropriate classification of workers. Since 2019, California and nine other states have adopted (or are considering) the employee-friendly ABC test to avoid misclassification of workers as independent contractors [188]. More recently, President Biden also proposed a national rule to test whether a gig worker could be considered an employee based on factors the amount of control workers have over how they conduct work as well as the opportunities to increase earnings by offering new services [338].

4.1.4 *Gaps between Worker Needs and Existing Policies*

The existing bills and proposals take many large-scale issues (e.g. workers' compensation and paid leave) into consideration, but they do not make provisions for the needs of specialized communities, excepting rideshare drivers. Many subgroups of workers await targeted policies to assist with particular dimensions and issues of their work – working mothers need paid maternal leave while disabled and marginalized workers require public accommodations for meeting various health and safety needs. For instance, our past work eliciting the perspectives of multiple stakeholders found platforms to resist the implementation of worker benefits, advocating instead for worker-initiated collective actions, and that existing public infrastructure failed to provide for basic working needs of gig workers [175]. Platform reluctance to provide benefits stemmed from the fear of being imposed a legal employment relationship with the worker (as consistent with prior work [157]). On the other hand, these workshops also revealed how regulators preferred all-inclusive solutions to special accommodations (e.g. universal healthcare or universal basic income) to minimize the risk of excluding (potentially vulnerable) segments of the population, and avoided personalized solutions as they pose potential threats to worker privacy [175]. However, worker participants of the workshops voiced desires for customized solutions to meet individual needs, the agency to leverage multiple platforms or conduct their own financial planning, as well as to avoid classification as employees [175]. Finally, the investigation of an "indie" food delivery system by Dalal et. al. uncovered how platforms that prioritize local contexts over transnational scales offers unique affordances and possibilities for workers [84].

While an argument might be made for an omnibus bill that includes all benefits and protections to address needs of all gig workers [157], such a tendency toward all-encompassing policies and benefits have the downside of being very broad, leading to a high cost associated with their implementation and major labor revisions. Cost is already a major reason for platforms' inhibition against implementation of benefits [175], and also contributes to the lengthy process of policy implementation [183]. Presenting specialized policies that target specific issues can reduce the legislative burden in terms of which committees and jurisdictions to involve, potentially allowing for the earlier and faster presentation of highly-prioritized benefits.

4.2 ENVISIONED ADVANCEMENTS

Prior work has highlighted the need for a third category of workers to lift legal ambiguity, improve working conditions, and increase market efficiencies [157]. Currently, workers can choose among the binary categories of the formal employee or the independent contractor. But attempting to force the newer and more informal working arrangements of the gig economy into such pre-existing categories limits real and potential economic benefits of short-term, contractual workers, and recent findings show that multiple involved stakeholder groups advocate for the establishment of a new legal class of workers [175]. Harris and Krueger terms this third class the "independent workers", and argues for their various social and economic benefits [157]. In the following, we examine existing models of relevant (and sometimes specific) policies at the local and federal level in the US and propose ways in which they can be extended, improved or adapted to benefit other groups of gig workers as well.

4.2.1 *Policy Innovations*

Power to Collectively Bargain Currently, gig worker communities are fragmented and blocked from socializing and forming a collective identity due to a variety of factors including platformic design, legal constraints as well as fears of platform retaliation. The main legal impediment for collective bargaining among gig workers is federal antitrust law, which states that "Every contract, combination ... in restraint of trade or commerce ... is declared to be illegal.", hence "Every person who shall make any contract or engage in any combination or conspiracy hereby declared to be illegal" (15 U.S Code § 1). These laws were codified in an attempt to outlaw monop-

olistic practices, so as to keep a free competitive market with low prices and high quality. Since gig workers are largely classified as independent contractors rather than employees, antitrust laws prohibit their efforts to collectively organize and bargain – any of their attempts at collective action can be treated as illegal cartelistic behaviors by courts. However, legal employees hold a "labor exemption" from antitrust liabilities since "The labor of a human being is not a commodity or article of commerce", and so "Nothing contained in the antitrust laws shall be construed to forbid the existence and operation of labor ... organizations" (15 U.S. Code § 17). Employee efforts to collective action and unionizing are further protected by the National Labor Relations Act, which states that "Employees shall have the right to self-organization, to form, join, or assist labor organizations, to bargain collectively through representatives of their own choosing, and to engage in other concerted activities for the purpose of collective bargaining or other mutual aid or protection" (29 U.S. Code § 157).

We argue that gig workers, much like formal employees, should also be granted exemption from antitrust laws since many of the necessary benefits and protections they require for work (outlined in above sections) can be easily negotiated once workers gain power to collectively bargain. Prior work revealed that regulators strongly supported workers to collectively bargain for their needs [175], and such arrangements would empower workers to protest unfair working conditions, as well as benefit societal welfare at large by facilitating more efficient and rapid allocation of market resources. Furthermore, workers would more rapidly gain access to benefits (as compared to the time-consuming process of implementing specific legislation), and different groups of workers can have the flexibility and agency to prioritize benefits according to specific working needs. For instance, individuals completing gigs in food delivery and ridesharing are more likely to bargain for workers' compensations and bathroom access whereas freelancers and crowdworkers might negotiate for higher wages. Such benefits negotiated from worker-initiated action are more flexible and efficient than policy amendments as they can be more quickly negotiated and updated. The exemption can be applied to gig workers a few different ways: a new, third federal category of workers can be created to adapt labor laws to the changing nature of work, gig workers can be reclassified as employees, or workers can be directly granted exemption on a case-by-case basis.

Specialized Policies for Food Delivery In September 2021, the New York City Council took leading steps in improving the welfare of food delivery workers by

passing six bills that provide them benefits and protections through actions from the service platforms as well as a city agency [283]. In terms of actions from the city, Bill Int No. 2294-2021 requires "the Department of Consumer and Worker Protection to study the working conditions of third party food delivery workers", and "based on the results of the study ... no later than January 1, 2023, the department shall by rule establish a method for determining the minimum payments that must be made". Regarding payment, Int. No. 2296 mandates that platforms "shall not charge or impose any fee on a food delivery worker for the use of any form of payment" (thereby removing additional fees) and that that worker will be paid "for work performed no less frequently than once a week". With respect to tips, Bill Int. No 1846-2020 prohibits platforms from "solicit[ing] a gratuity for a food delivery worker ... unless such third-party food delivery service discloses, in plain language and in a conspicuous manner ... amount of each gratuity that is distributed ... whether such gratuities are distributed immediately ... and whether such gratuities are distributed in cash". Furthermore, the bill states that "For each transaction ... [the worker] shall be notified of how much the customer paid as gratuity", and overall platforms must disclose to workers "the aggregate amount of compensation ... gratuities earned", essentially requiring transparency for tips. To increase worker agency, Bill Int. No. 2289 states that workers will be provided "the ability to specify: the maximum distance per trip ... " as well as parameters that allow workers to "not accept trips that require travel over any bridge or ... tunnel". Finally, bills 2298 and 2288 and equip workers with physical accommodations: Int. No. 2298 mandates that "a toilet facility is available for the use of food delivery workers lawfully" on premises of food service establishments (i.e. restaurants), provisioning workers with access to necessary bathroom facilities, and Int. No. 2288 makes "available insulated bags to any delivery worker who has completed at least six deliveries for the company".

This exemplary model addresses specific needs of gig workers in New York City and we believe that it could be applied toward many other locations and sectors for a similar effect. For instance, grocery deliverers such as Instacart shoppers complete adjacent work, and can also benefit from the transparency in tips, set maximum distance per trip, access to bathrooms, as well as provisions of insulated bags. The requirement to pay workers at least once a week can be broadly applied to many worker types, including crowdworkers, online sellers and freelancers. Finally, workers in other critical industries of the gig economy (e.g. ridesharing or healthcare) can similarly benefit from a specific and targeted set of public policies [245].

Anti-discrimination Protections Many suggest that labor platforms provide income opportunities and increased mobility for disadvantaged workers who are otherwise incapable of engaging in full-time jobs (e.g. mothers, students, or individuals from marginalized and undereducated communities), offering them income through low-entry gigs as well as low-cost services [41, 67]. But as marginalized community members become increasingly involved in platformic and precarious work [95], they are also more exposed to risks inherent to short-term precarious work. Thus, policy amendments must adapt to the changing nature of work so that individuals participating in gigs can access equal opportunities and necessary protections.

For comparison, legal employees are well protected from discriminatory employment practices by federal statutory protections enforced by the Equal Employment Opportunity Commission. For instance, Title VII of the 1964 Civil Rights Act forbids employers and employment agencies from refusing "to hire or to discharge ... or ... discriminate against any individual with respect to ... compensation, terms, conditions, or privileges of employment, because of such individual's race, color, religion, sex, or national origin" or "to limit, segregate, or classify ... employees or applicants ... in any way ... deprive any individual of employment opportunities ... because of such individual's race, color, religion, sex, or national origin". Beyond restricting discriminatory hiring and firing practices, sections of Title VII also cover actions related to promotions, compensation, training decisions, job shift assignments, merit systems, or disparate impact cases, among others [378].

On the other hand, gig workers are only granted limited protections due to their current status as independent contractors. In particular, Section 1981 of the 1866 Civil Rights Act states that "All persons ... shall have the same right ... to make and enforce contracts, to sue, be parties, give evidence, and to the full and equal benefit of all laws and proceedings for the security of persons and property as is enjoyed by white citizens" [1], thereby prohibiting race-based discrimination when making, performing under, and terminating contracts. A subsequent amendment by Congress clarified that Section 1981 applies to private (as well as state) instances of racial discrimination "in all forms of contracting, no matter how minor or personal" [234]. While important, this section is severely limiting in protecting marginalized populations of gig workers as it only allows individuals to bring federal claims if platforms discriminate on the basis of race, but not other characteristics such as

1 Where "make and enforce contracts" includes the making, performance, modification, and termination of contracts, and the enjoyment of all benefits, privileges, terms, and conditions of the contractual relationship.

gender, age, disability, religion or ethnicity. In order for such protections to reach the various marginalized populations, we propose gig workers should also be protected under federal employment laws against discrimination, and similar to the right of collective bargaining, this can be achieved through either worker reclassification, a new class of workers, or case-by-case applications.

Expansion of Anti-retaliation Protections Wage theft refers to situations where clients fail to pay for work that has been completed or pay less than the agreed-upon amount. This can have serious consequences for workers, including financial strain, loss of income, and reputation damage. For employees, the Fair Labor Standards Act (FLSA) ensures rights such as minimum wage and is enforced by the U.S. Department of Labor [117]. The FLSA also provides employees anti-retaliation protections, so that employers cannot take adverse actions (e.g. firing) against employees who report misconduct or violations of labor laws.

Unfortunately for gig workers, by 2016 nearly two-thirds of platforms included a forced arbitration agreement, which requires workers to submit disputes or reports of violations to arbitrators instead of to court, which means that workers cannot bring their own lawsuits to recover unpaid wages or other damages [289]. Furthermore, almost all of these agreements included a class action waiver, which bans workers from bringing their claims as a group in arbitration, even if the claims are borne of the same unlawful workplace practices. Thus, we suggest the creation of a private right of action for gig workers, so that individuals can pursue legal remedies if their rights under the FLSA are violated. Online gig workers (e.g. crowdworkers and freelancers) are especially vulnerable to wage theft or delayed payments due to the digitally mediated nature of their work, and thus would benefit from an expansion of such anti-retaliation efforts to protect their rights to speak up and report unfair treatments.

4.2.2 *Technological Gaps*

While implementing public or platform policies can lead to significant improvements in working conditions, we also recommend some technological advances tailored toward individual workers that can be developed alongside policy. These proposed technological improvements can either be integrated into platforms (as in the case of in-app customizations) or exist as external resources (financial planners, automated

tax-filing). Unlike the quality-of-life improvements that policy amendments/additions may bring, the technical innovations, features and extensions might only result in incremental changes. Nonetheless, personalization is most feasibly achieved at the individual level, and technological approach centering end-users may constitute the most suitable and practical way of addressing users' diverse preferences [240].

Platform-initiated Features Many of the above measures are implementable by platforms even if not required by policy mandates. For instance, increased transparency in gratuity and frequency in pay disbursements can benefit many workers of the on-demand and online sectors. In addition to fair practices in remuneration, platforms might consider systems that tailor toward worker preferences and schedules. Customizations may be implemented for workers to express their desired schedules and tasks preferences – the choice of opting out of deliveries that requires crossing tunnels/bridges constitutes one such personalization. On top of tailored options, in-app earnings projections can also assist individual workers in conducting personal financial planning. As gig work is making earning opportunities available to otherwise unemployable individuals (e.g. mothers, students, disabled persons), it is of increasing importance to elicit and subsequently accommodate each workers' unique needs, priorities, constraints, and context.

Developments Designed for Individual Well-being After gaining an understanding of workers' needs and objectives, platforms (or outside efforts) can incorporate various features to help improve individual well-being. For example, past work by You et. al. has developed a "social sensing" probe that shares drivers' personal health data with their significant others so as to increase awareness and establish accountability for maintaining well-being [422]. Zhang et. al. has similarly investigated how data probes (interactive data visuals) can surface individual workers' well-being and positionalities, which affect working strategies [425]. Such developments, combined with nudges and reminders, can help workers collectively resist irregular schedules as well as long working hours.

While some protective measures against late or non-payment are already in place (e.g. escrow), dynamic or smart contracts offer another way to protect worker wages. Smart contracts that self-execute and auto-enforce based on predefined conditions can help with the lack of transparency and wage theft, allowing freelancers to automatically receive payments that trigger when the conditions are met, reducing payment conflicts. Time and effort required to manage contracts will also decrease,

helping mitigate long work hours. Finally, there is an opportunity gap for automation since independent contractors are required to file quarterly tax payments per year – AI-powered assistance with financial tracking and tax codes could help alleviate this burden, freeing up time and effort.

Part III

CROSS-PLATFORM DATASHARING TO ADVANCE PEER SUPPORT & POLICY

Several factors impede progress on furthered regulations and policymaking of the gig economy, including an absence of unified worker communities and the lack of access to work data that document existing labor conditions. In this third part, we design, develop and deploy a tool that support workers in forming collective communities, share information to each other and supporting stakeholders (e.g., advocates, union organizers, policymakers), and eventually leverage this collective data to influence more effective policy decisions.

5

TOWARDS WORKER-CENTERED POLICY VIA DATA-SHARING COLLECTIVES

In Chapter 3 we identified through codesign workshops that multiple stakeholder groups advocated for infrastructures supporting worker cooperatives and labor laws advancements/reforms. Meanwhile, a growing body of research related to platformed-based labor within HCI and CSCW point to the potential for data sharing tools to facilitate worker collectivism [49, 178, 240, 359], advance advocacy efforts [236, 281] and data governance [52, 424], as well as inform relevant policy decisions [425]. Calacci advocated for Digital Workerism (worker-led data-driven research and design of governance tools to shift power back to the worker) [49], Zhang et. al. suggested the use of worker data to create data probes for designing systems supporting worker advocacy [425] and policymaker interactions [427], while Hsieh et. al. encouraged individualized policy advancements for democratizing gig work across task domains [173], as well as power-aware designs for approaching sustainable data collectives [178]. Efforts by researchers and grassroots worker groups to facilitate datasharing showed promise for meeting the data needs of gig workers and policymakers: the Shipt Calculator helped workers track pay and combat wage theft by allowing workers to share pay data with each other in aggregate [50]. Fair.work allows workers to publicly rate the working conditions of platforms using surveys [147], while Stein et. al. explored whether participatory design can help workers develop counterhegemonic data collectives [359]. However, there remain gaps amongst existing bodies of work around (1) what (shared and stakeholder-specific) initiatives and policies can worker datasharing help workers and policymakers advance (2) concrete data needs that policymakers and workers have for promoting such labor rights, as well as (3) practical challenges that stakeholders foresee in conducting and governing datasharing systems..

To understand the policy priorities and data needs of policy domain experts and workers across domains, as well as their concerns regarding potential practical challenges around collective data-sharing systems, this study took a two-pronged approach, inspired by prior techniques that designed for worker needs, preferences and wellbeing [96, 355]. First, we conducted semi-structured interviews with 11 policy

domain experts from the U.S. (policymakers, policy implementers, advocacy groups, and a policy researcher) to gather policy priorities as well as feedback for designing a worker-centered data-sharing system. Subsequently, we engaged with 14 gig workers (from four task domains) in the U.S. and beyond in co-design workshops to explore and deliberate on whether their policy priorities aligned with those of policy domain experts, as well as preferred design choices for worker data sharing.

RQ 1 Which policy initiatives around gig work conditions are supported by both workers and policy domain experts, and which are unique to each group?

RQ 2 What concrete worker-shared data is needed to advance such initiatives?

RQ 3 What are anticipated challenges and preferences that worker and policy domain stakeholders have regarding the practical implementation of a datasharing system?

This chapter aims to (1) expand the community's understanding of data needs for policy initiatives and data-sharing preferences, (2) identify alignments and differences of policy priorities between workers and policy domain experts, so as to further progress for future policy collaborations, and (3) map out practical challenges around worker datasharing as anticipated by both stakeholder groups, so as to guide and inform future designs of datasharing systems.

Our findings show that both stakeholder groups sought 1) data to understand pay practices and (unpaid) work time and 2) more attention toward the issues of discrimination and safety. However, distinctions remain—for instance, policymakers emphasized a need to further understand and measure stressors on (care-giving) workers, but workers themselves prioritized learning strategies for dealing with such stressors through the sharing and learning of qualitative experiences. Complementing these initiatives with participants' preferences around diversity, trust and ownership, we propose design guidelines for data-sharing systems that incorporate perspectives of both stakeholder groups, as well as reflections on potential challenges around worker data integrity and policymaking.

5.1 RELATED WORK

5.1.1 *State of Unregulated Gig Work*

The unregulated nature of gig platforms has produced an extensive list of labor issues entangling gig work conditions, including rising inequalities [105, 108, 112, 114, 124, 206, 235], precarity [13, 102, 409], as well as health and safety hazards [68]. Inappropriate classification of workers as independent contractors (i.e., non-employees) constitutes one major loophole that platforms abuse to circumvent provisions of standard benefits and protections (e.g., unemployment insurance [99, 133], minimum wage [387], right to unionization and collective action [158, 201]) typically afforded to employers [300], leading to poor work conditions and exploitation [19, 77, 89]. Moreover, platform intentionally suppress workers' understanding of labor rights [344], pointing to a need for policy interventions to reshape the current landscape of gig worker protections. Meanwhile, regulation at the city and state levels remain scarce, especially in legislative and administrative processes [75]. In particular, state legislation — which are often targets of platform lobbying efforts [74] — frequently preempts city and local regulation, causing legal scholars to advocate for updated legal standards for the 21st century workforce and stronger labor law enforcement [31]. Despite widespread recognition of the lagging regulations surrounding gig work, it remains unclear which of the identified issues around working conditions lie at the intersection of (1) what are most urgent to workers and (2) what policymakers can and strive to address.

5.1.2 *Countering Unjust Platform Practices: The Potential of Data*

Amidst the lack of clear policy or regulation to protect workers or hold platforms accountable, researchers increasingly point to the promise of data to rectify information asymmetries and strengthen collective worker campaigns. Khovanskaya et. al. asserted that in the absence of bargaining rights, workers need to collect their own data as evidence of injustices (e.g., inequitable pay practices) to advocate for labor issues such as fair wages [211]. Workers of Zhang et al. [426] shared desires to engage in data investigations (e.g., collective auditing) to analyze platform incentive structures for manipulation. In follow-up studies, Zhang et al. [425] first created data probes to help workers examine their rideshare data and uncover instances of

platform manipulation, and subsequently explored how policy-related stakeholders would leverage them for demystifying problematic platform practices (e.g., work and wage assignment algorithms) [427]. In a similar vein, Calacci and Pentland [50] engaged in worker-led auditing to reverse engineer logic behind changes in Shipt's opaque commission determination algorithm. Uniquely, Do et al. [98] explored how workers may harness counter-data through *sousveillance tools* to monitor those in power and increase platform transparency.

While data holds potential for supporting worker protections, current tools for data collection and analysis advance worker-centered policies and initiatives in limited ways. For example, while third-party developers have created apps to help gig workers track their work data, these center around individual tax reporting purposes (e.g., Gridwise, Stride, and Everlance all help workers log metrics such as mileage, jobs worked, and expenses incurred). Meanwhile, researcher-created tools are often narrowly scoped (e.g., to one platform [50]) or aim to help workers surface (collective) concerns but lack strategic alignment and features to directly influence policy change [337, 404, 425]. Thus, we currently lack an understanding for how tools can (1) support scalable harnessing and aggregation of worker data for informing related worker initiatives and (2) align such collected data with policy and regulation to enable wider-reaching change.

5.1.3 *Towards Data Collectives that Respect Workers Needs & Workflows Across Platforms*

To approach helping workers harness data for initiatives while ensuring alignment with policy and regulation capabilities, we draw inspiration from recent research around collective data contributions and data donations. While not specific to gig work, Li et al. [237] and Vincent et al. [396] suggested the potential for technology users to leverage their data and resist company practices (e.g., privacy infringements, biases in AI systems), by facilitating "conscious data contributions" wherein individuals donate data towards a specific campaign. Relatedly, the concept of "data donations"—user contribution of their own data for *academic* research—is also being explored, in domains like social media [265, 319, 423] and healthcare [34, 364]. Research here primarily focuses on understanding user motivations for donating [210], potential selection bias of donations [220], and infrastructures for secure and trustworthy collection [38, 57, 423].

Importantly, the gig work context presents additional elements to factor in when considering data collection, such as a diversity of task domains (each involving its own unique set of data types), a broad range of labor issues and initiatives where aggregated data can be applied, and several involved stakeholder groups — both platforms and consumers hold power over and collect data from workers, risking worker (and possibly consumer) privacy and agency. A multi-platform social media analysis from Sannon, Sun, and Cosley [336] found gig workers to experience intrusive data collection and surveillance not only from platforms but also customers. Around policy development, Kahn et al. [202] showed how privacy concerns of impacted communities deviated what's expected by privacy and development experts, suggesting a need to (re-)align preferences of higher-power groups with those of experiential experts. To more comprehensively understand practical implications of worker data contributions (e.g., privacy concerns, power dynamics with consumers/platforms, and (un-)intended impacts of policy developments), it is imperative to involve workers when making design decisions around worker data contributions, especially when such data are meant to eventually impact policy.

As a first step in this direction Stein et al. [359] held co-design sessions and surfaced rideshare drivers' preferences for contributing, collecting, and using data—in other words, collective data infrastructures—including "collective wikis" and "new app", involving a simple, separate application with mechanisms to support data collection, sharing, and governance. However, by only engaging with impacted drivers, this approach risks sidelining the preferences of other worker groups or stakeholders who are, or may become, involved in worker advocacy. Hsieh et. al. engaged with workers, advocates, regulators, and platform employees to surface priorities of each group around worker rights, but these workshops covered a broad space of policy, service and technology solutions, instead of focusing on collective datasharing infrastructures [175]. Furthermore, the expanding diversity of gig work domains call for closer examinations of how regulation can be improved across sectors [173], especially since risks and responsibilities vary widely across platforms [336], and the lack of governance between occupations can differentially impact how workers across sectors experience such risks [25, 259, 377]. This study extends these works to codesign for worker data exchange and knowledge sharing in a way that meets policy priorities and data needs of both stakeholders groups — workers and policy-domain experts.

In sum, the existing bodies of work has yet to identify (1) policy and regulatory advancements around gig work conditions prioritized by workers and policy experts,

(2) how worker datasharing can scalably support such advancements and (3) ways of accounting for practical implications of datasharing by workers across a diversity of domains/platforms. This study aims to bridge these gaps by engaging with both policy experts and workers across four gig domains/platforms to identify their shared (and misaligned) priorities, data needs for meeting such priorities, as well as considerations and preferences for practical impacts of worker datasharing across multiple platforms.

5.2 METHODS

To inform the design of a data-exchange platform, we conducted semi-structured interviews with policy domain experts to gather which aggregate worker statistics are useful to advancing policy for gig work. Then, we led co-design workshops with gig workers to understand their motivations and concerns around collective data sharing, following the precedence of works that examined hospitality work and underserved job seekers [96, 355]. With policy domain experts, we chose interviews to focus on open-ended discussion and discovery about their policy efforts. For gig workers, we deliberately held co-design workshops to allow space for participants of various backgrounds and experiences to share preferences and ideas together, so as to allow workers to collectively deliberate on design decisions for a data-sharing system that meet collective goals of a diverse worker population.

5.2.1 *Recruitment and Participants*

Stage 1: Interviewing Policy Domain Experts Through contacts from the research institute Metro21, we recruited 11 over-18, US-based policy domain experts to semi-structured interviews (Table 15). For this study, we consider anyone who makes or influences policy as a policy domain expert. To the former, this includes individuals in government roles who directly play a hand in implementing, writing, or passing policy (P2-4, P7-11). To the latter, this includes those in roles that often conduct research and advise on policy (e.g., academics as P8) or who work directly to support impacted constituents (P1, P5-6). Advocacy groups in particular play an important mediating role by addressing workers' direct needs and then translating these concerns into initiatives for policymakers to pursue. To gather both local and

national-level insights, we intentionally recruited participants from city-, county-, and federal-level offices.

Stage 2: Co-designing with Gig Workers For gig worker co-design workshops, we recruited 14 US-based, over-18 active gig workers through a combination of Reddit posts, word-of-mouth, and previous study participants (Table 16). Using a pre-screener survey, we recruited workers based on types of gig work and demographics: rideshare and delivery drivers to represent more popular sectors of gig work while petsitters and freelancers account for perspectives of those performing more niche tasks. Demographically, we intentionally oversampled from underrepresented populations to explore the impact of intersectional identities, and no information was collected regarding participants' prior experiences of sharing data with other researchers or organizations.

ID	Level of Govt/Work	Policy Jurisdiction	Organization/Office	Policy Priorities
P1	City	Advocacy Group	National Council of Jewish Women	Gender equity, pay equity, making a fair living wage, social education
P2	City	Policy Implementer	Dept of Mobility and Infrastructure	City infrastructure and mobility, roadway standards
P3	City	Policymaker	City Council	Discrimination protections, worker protections
P4	County	Policy Implementer	Dept of Human Services	Health, housing, employment, education, income and asset building, civic engagement, community involvement
P5	National	Advocacy Group	United Steel Workers	Labor organizing, workers' rights
P6	National	Advocacy Group	United Way	Employment, increasing access to resources, addressing barriers to income and employment
P7	City	Policy Implementer	Mayor's Office	Workers' rights, labor organizing, supporting marginalized workers
P8	N/A	Policy-Cited Academic	Carnegie Mellon University	Psychological contracts, understanding worker-platform relationship
P9	National	Policy Implementer	Federal Reserve Bank	Economic mobility, workers' rights and protections, workforce development
P10	City	Policy Implementer	Dept of Mobility and Infrastructure	AV policy analysis, city mobility
P11	City	Policy Implementer	Mayor's Office	Workers' rights, supporting marginalized workers

Table 15: Overview of Policy Domain Expert Participants

5.2.2 *Protocol and Study Design*

Stage 1: Interview Protocol with Policy Domain Experts As policy begins to govern data and AI systems, we sought to understand how a worker-centered data-sharing platform would impact public infrastructure while bridging the research-policy gap. Each of the 11 semi-structured interviews involved one to two policy domain experts, and was organized into general themes of 1.) understanding interviewees' goals and policy processes, 2.) data to support interviewees' decision-making, and 3.) platform and data governance. To help participants generate ideas and make decisions on relevant worker data, we prepared and presented a list of potential data types, divided by occupation (e.g. rideshare, petsitting). For example, rideshare driver participants saw data types including time/date/location of trips, driver wages, and total paid by passenger while freelancers saw data types like Job Success Scores or customer review ratings. We asked interviewees to 1.) decide whether such data would be helpful and 2.) generate additional pieces of useful worker data and 3.) share rationales of how they would leverage the data. Finally, we ask for participants' opinions about the best way to manage the platform from a policy perspective "without sacrificing data producers' [gig workers'] control" over their data contributions [237].

Stage 2: Study Design with Gig Workers With workers, we held a total of four co-design workshops (with 3-4 participants per session), where each focused on a specific type of gig work: freelancing [F], food delivery [D], ridesharing [R] and petsitting [W]. Sessions lasted 90-120 minutes, and participants were compensated at $60/hour. We verified active gig working status through screenshots or live showings of profiles. Each workshop consisted of four sections focusing on 1.) incentives for data sharing, 2.) types of useful data, 3.) sharing preferences, and 4.) platform and data sharing concerns. To understand worker experiences and data needs, we formed new questions with participants after introducing sample questions and issues generated based on previous findings [173, 175, 426]. Then, we kept workers' answers to experience- and need-related questions in mind as we collectively probed their desired stakeholders and data types to contribute. At the end (to prevent priming workers' responses to earlier topics about data), we introduced initiatives *informed by the previous interviews* (5.2.2) to learn more about participants' thoughts, opinions, and experiences as workers across various intersections.

For each workshop activity, participants created sticky notes on a Miro board and ranked these stickies alongside prepopulated notes. Rankings were determined on a rotation of participant emoji reactions, clusters on a linear scale, and groupings via quadrants. All prepopulated data was specific to the type of gig work each workshop focused on. We share our protocol and study materials in supplementary materials. During the workshops, we collaborated with workers to identify data types they felt comfortable sharing, their preferences for methods of sharing (via file uploads, automated processes, etc.) as well as concerns and reservations against data-sharing.

ID	Platform	Status	Tenure	Race	Gender	Immigration	Education
F1	Upwork	Part time	7 years	Black / African American / Sub-saharan African / Afro-Caribbean	Man	N/A*	Bachelor's
F2	Fiverr	Part time	2 years	Indigenous American (American Indian / Alaskan Native)	Man	Citizen	Associate's
F3	Upwork	Part time	3 years	Middle Eastern / North African (MENA)	Woman	Citizen	Grad School
D1	UberEats	Part time	1.5 years	Black / African American / Sub-saharan African / Afro-Caribbean	Woman	Citizen	Undisclosed
D2	UberEats	Full Time	6 years	Black / African American / Sub-saharan African / Afro-Caribbean	Woman	Permanent Resident	Associate's
D3	Amazon Flex	Part time	7 months	East Asian	Male	Permanent Resident	High School
D4	GoPuff	Full Time	5 years	White, European	Undisclosed	Citizen	Bachelor's
R1	Uber	Full Time	Undisclosed	Southeast Asian	Man	Citizen	Associate's
R2	Uber	Part time	6 years	Black / African American / Sub-saharan African / Afro-Caribbean	Non-binary	Citizen	Associate's
R3	Uber	Full Time	> 2 years	Black / African American / Sub-saharan African / Afro-Caribbean	Woman	Citizen	High School
R4	Uber	Full Time	4 years	White, European	Man	Citizen	Bachelor's
W1	Wag	Full Time	8 months	White, European	Woman	Citizen	High School
W2	Rover	Part time	7 years	White, European	Woman	Citizen	Bachelor's
W3	Rover	Part time	3 years	South Asian	Non-binary	Citizen	Bachelor's

Table 16: Gig worker participant demographics

5.2.3 *Analysis*

All interviews and workshops were recorded on Zoom and later transcribed using *Rev.com*. We used a qualitative thematic analysis approach [297] to analyze both the interviews and workshops. To begin analysis, we adopted an open coding approach on the interview and workshop transcripts where one researcher independently generated codes, applied at sentence or paragraph levels [262, 295, 297, 346, 363]. At least one other team member then cross-checked the initial codes for each interview and workshop transcript, where no less than one of the coders was present in the corresponding session. During this process, both coders remained receptive to uncover as many new codes as possible, while keeping in mind our research questions around worker data sharing preferences and policy advancements for improving work conditions. Coders met on a weekly basis to 1) develop a system of assigning IDs to participants while preserving anonymity and 2) discuss and resolve any disagreements about the initial codes. Next, we iteratively combined the resulting 1593 (1022 interviews & 571 workshops) unique codes into thematic categories, wrote descriptive memos, and built an affinity diagram from the bottom-up to draw connections between categories [32, 58]. This analysis generated 118 first-level themes, 17 second-level themes and four third-level themes, which we report on below.

5.3 FINDINGS

Policy domain experts expressed interests in various prioritized initiatives — e.g., expanding equitable access, approaching fairer pay practices, and reducing work-induced stress — as well as excitement about worker-based data sharing, describing how worker statistics can help advance related policies, especially if they are aggregated to better inform funding resources and program development for workers (P1, P6, P7, P11) and is also less prone to manipulation by ill-intentioned actors (P5). Workers similarly advocated for safety, equity and fair pay practices, but they additionally yearned to learn experiences and strategies from other workers – this inclination toward qualitative datasharing matches the desire of policy stakeholder participants, who wanted to leverage **qualitative accounts** to help them understand job quality and workers' stories (P1, P7, P8, P9).

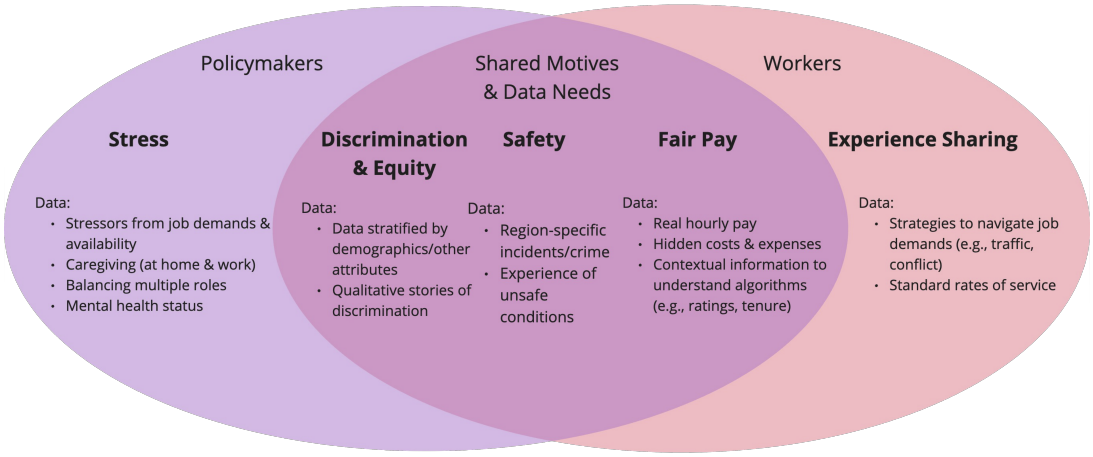


Figure 2: Summary of Main Findings: Initiatives policy domain experts and workers desired to support with data collected through a data-sharing system. Center of diagram demonstrates three shared initiatives between the stakeholder groups.

We organize these findings by first presenting the three initiatives of interest shared by both stakeholder groups (5.3.1), followed by interests that primarily pertained to policy domain experts (5.3.2.1) or workers (5.3.2.2), and lastly the practical preferences and anticipated challenges that participants expressed around future worker datasharing collectives (5.3.3). In each section, we first discuss results from interviews with policy domain experts, followed by insights gathered from workshops with workers — to remain consistent with the chronological order of how the the study was conducted.

5.3.1 *Initiatives & Data Needs Shared Among Stakeholders*

5.3.1.1 *Equity & Discrimination*

Policymaker Rationales for Prioritizing Equity Policy domain experts most commonly prioritized equity among other initiatives, both locally and nationally. At the city level, P3 (a local council person) mentioned their work expanding on existing

national anti-discrimination policies: "already in most cities across the country, it's illegal to discriminate on the basis of sex, race, religion so these just add on to the list [of protected attributes I would advocate for]". At the national level, P2—whose office works to influence federal policies—shared how "the federal government right now also has a very strong equity focus." Equity was brought up with respect to **several protected groups**: female, disabled, and undocumented workers. Both P8 and P7 worried about the potential for gig platforms to exploit already vulnerable populations, especially since "a lot of people who are gig workers are in marginal positions" (P8), while P9 sympathized with gig workers whose lack of English fluency became a "negotiating tool by employers to underpay or sometimes not even pay them." To protect female workers, P1 specifically described how their organization examines "gender equity— understanding specifically women who are doing part-time work, ... the demands ... where supports are lacking for women", whereas members of the mayor's office recounts how "the city has historically really looked from a procurement standpoint around minority and women-owned businesses" (P7). Meanwhile, P6 works to provide support to "workers with disabilities ... that either are working or get any Medicaid or assistance programs".

Worker Concerns around Discrimination Worker experiences reflected concerns around traditional forms of discrimination, as well as factors unique to the with each work domain: workers from matching-based marketplace platforms (freelancing & petsitting) worried about common factors for biases such as race, gender and sexual identities while those providing rideshare services described the potential domain-specific impacts of car models, ***gender***, ***sexual identities***, and ***age***. Food couriers described how ***spoken languages*** and ***immigration status*** may help or hurt earning prospects while rideshare drivers interestingly relayed inequitable treatment based on ***car model***. Freelancer F1 reported "a lot of [cases with clients who] actively discriminate ... [by putting up] job posts that say 'no Indians, I don't want Pakistanis, I don't want people from Southeast Asia' ... and some others could do it in terms of the choice of freelancers that they hire". Food couriers like D1 worried about impacts of sociocultural factors: "speaking multiple languages helps a lot because ... down the road you'll interact with several customers and it matters a lot", while D2 points out the disadvantages of immigrants face: "if ... based on your immigration status you do not have that driving license, you have to use another means (e.g. a bicycle) [but] then that means you wouldn't pick deliveries that are long distance." Petsitters like W5 expressed similar concerns about discrimination based on demo-

graphic factors since "I have a visibly ethnic name, [so] I sometimes wonder whether experiences with these platforms ... are affected by ... being perceived as foreign or frankly not being white ... [since] the majority of clients are white, especially when you get into more affluent neighborhoods." W3 also wondered about beginner pet-sitters who "have an ethnic name ... visibly non-white or visibly queer or out as trans on your profile [to know]: Is it statistically indicated that your earnings are going to be less, or your safety is going to be more compromised?" while W2 questioned "if you are part of the LGBTQ community, how does that affect your decision making and ... how people hire you?" Rideshare drivers uniquely mentioned the differential impacts of car model and year on both platform and clients. Speaking to platform discrimination, R1 claimed that "if you have a newer year or a newer model, of course they [the platform] prioritize [rides to newer cars] over an older car". R4 offered an example where "my buddy just started renting through Tesla ... he's seen a significant increase ... even with the $600 a week rental charge".

Ways of Understanding Equity & Discrimination with Worker Data The equity concerns shared by policy domain experts motivated them to use data for investigating whether discrimination is occurring to gig workers at the aggregate level, as well as how such discrimination breaks down across demographics to understand whether vulnerable groups –ethnic and gender minorities, as well as those with disabilities (P3, P6)– are experiencing the impact of discrimination disproportionately. P2 and P5, for instance, suggested analyzing gaps in compensation and work assignment across demographics to measure discrimination while P2, P3, and P5 mused whether data such as worker ratings and worker's acceptance/cancellation rates could reveal racial prejudice of customers against drivers: "I've seen research showing that when people get information, sometimes they'll cancel things based on driver's background " (P2). P5 contemplated the mechanics of algorithms: "Are there ways that the work is either assigned or accepted or offered that are discriminatory?" Relatedly, P6 and P7 wanted to assess whether negative customer reviews may coerce workers into accepting unsafe jobs or conditions, which may require narrative accounts from workers.

While gig worker participants were interested in learning about the showed similar interest in learning the aggregate demographics of their fellow workers, they also yearned to hear about their peers' personal and anecdotal experiences with discrimination. For example, D1 wondered how **spoken language capabilities** of drivers impacts jobs. D2 believed presenting policymakers with disaggregated statistics on

worker safety and pay disparities (by demographics such as race and gender) could make evident patterns of discrimination, which may lead to policy action. R4 imagined an experiment where four co-located driver friends all made themselves available on the app at the same time: "the first person who gets the ride, [if] they have the newer car ... [then] is the rate [of receiving rides] from the first person higher than the other three on average?" With metrics on ride offers received by workers of similar/different backgrounds (or similar rides by drivers of different backgrounds) can help identify, elucidate and alleviate the discriminatory impacts of (on-demand) gig work.

5.3.1.2 *Fair Pay: From Subminimal → Livable → Fair & Profitable Wages*

Why Policymakers Focused on Fair Pay Policy domain experts also stressed the importance of fair pay, a criteria requiring (1) workers' earnings to meet a livable minimum wage and (2) be appropriately compensated for their services and expenses incurred along the way. P4 related using income to assess workers' self-sufficiency: "we do have a measurement of living wage work, so workers [can determine] ... if they're earning income that's under a living wage." P1 also explained how their organization's "primary focus on the policy side has really been on **fair pay** – (i.e.) creating an environment where folks who are working in a gig economy can make a living based on the work that they do, and make a fair wage."

The **practice of tipping** is one subtle way of undermining pay equity that policy domain experts worried about, especially for traditionally disadvantaged groups. P2 expressed concern that "some of the argument for having minimum tipped wages in places is because of racial and other variables that influence tips beyond the service that was provided." In alignment with recent literature [249], tipping can also condition women into tolerating harassment – P7 posed a dilemma where if a client "wants to pat you on the butt and you're a woman – are you going to say 'knock it off,' or are you going to say 'Eh, I can probably skate there. I think my tip is going to be bigger'." Ambiguities associated with tipping on platforms can aggravate biases – P7 expressed frustration that "I don't know what [are] rewards and punishments from the platform in tipped work."

Invisible labor is a well-documented phenomenon among gig work [148, 258, 334, 358], and thus **wage theft** (i.e., the practice of underpaying work or not paying workers for certain parts of completed labor) is a covert but direct method of labor exploitation. Although workers are aware of the risks inherent to platform work,

they remain helpless during times of financial precarity, especially when they bear many undocumented and indirect burdens such as "the expense and the cost to them as an individual to maintain a car" (P9). The integrated and often undocumented nature of caregiving work can subject workers to **invisible and unpaid labor**. P9 recalled "specifically of a person who talked about a care job where they were not compensated," and emphasized the difficulty of navigating such situations – "what happens in that instance? How do you have any ability to negotiate? Do you go to a third-party resource? ... There is so much ... domestic and care work that [doesn't get paid, because it] is essentially [a] gig that isn't necessarily 'I'm in this person's house every day' but is 'every now and then I pick this up or I pick that up'."

Worker Perspectives around (Un)Fair Wages , which (re-)calculates pay based on data obtained through intensive worker surveillance [104, 373]) often result in aggressively low and sub-minimal wages. Workers explained concerns about sub-minimal wages due to platform practices of aggressively low and often algorithmically-determined prices. Recent literature has characterized this profit-maximizing strategy [104] as *algorithmic pricing* wherein platforms use machine learning algorithms to (re-)calculate prices based on a number of parameters [219, 301], including data about workers obtained through intensive surveillance [104, 373]. . Petcare and driver participants described two instantiations: upfront and dynamic pricing.

Driver participants explained how wage calculations were once calculated with time and distance expended upon task completion, before platforms introduced **upfront pricing**, which assigns rides with predetermined compensation, in name of improving transparency. However, drivers hypothesized that this enables platforms to vary their commission rates and assign sub-minimal wages, citing observations of drops in overall compensation for same or more completed work. R4 explained, "Now they give you an 'upfront price', which is typically extremely, much, much lower than what the customer paid ... around 60%, is what Uber takes ... and they [dis]guised it through the lens of, 'oh, you're gonna get to see what you get per ride ahead of time.' " Not only are upfront prices sub-minimal, workers are also rarely compensated for their extra efforts if the task takes more time or travel than original estimations (R1).

Dynamic pricing is another feature platforms use to arbitrarily change prices based on demand and supply — leading to worker concerns around wage fairness and exploitation. D2 protested "sometimes it might not be fair ... maybe there is lots of work, but the pay is a bit low because they might have used the demand strat-

egy", which makes them wonder "how might the platform be exploiting workers or customers through dynamic pricing?" R4 worried platforms could even be enacting wage ceilings on workers, believing "the dynamic pricing and their fees on average will not let you make more than $36 an hour", although currently they "don't have a way to validate that data point". Dynamically-determined prices can also cause misleading estimates: Petsitter W1 explained how earnings projections can differ from actual wages received: "[the algorithm will say] it costs $16 for a 20 minute walk, but then it's really $10 [or] it's $36 for an hour walk, but then we get $21."

Finally, workers vehemently call for policymakers to provide **accessible education about the financial risks** and responsibilities of gig professions . Currently, there is a significantto mitigate the current lack of financial understanding amongst gig workers around income structure, taxation, and metrics they should track and monitor. This knowledge gap enables platform-side exploitation, as "a lot of gig work in general prey on people not being financially educated or not being able to forecast what is my actual earning going to be from this? How am I going to set aside money for taxes on all of this?" (W3).

Ways that data can reveal insights around fair pay: Policy domain experts wanted data to understand whether workers are making a **livable wage** through gigs and to what extent the workers are **compensated appropriately**, often referencing a desire to view how many hours (P1, P6) and how many jobs (e.g., multiple platforms or jobs) gig workers have to take on to make a sustainable wage (P1, P4, P6, P7, P8, P9) or "get to a certain threshold of desired income" (P4). In particular, participants wanted data to explore 1) the hidden costs and expenses workers assume themselves and how it impacts earnings and 2) the amount of paid time compared to actual time spent working. Around **expenses**, policymakers wanted to know what types of costs are incurred and how they cut into net earnings (P1, P2, P6, P9). P1 suggested using this information to better educate people about whether gig work can earn a livable wage, and P9 wanted to assess these metrics of real work profits against platform claims about potential earnings: "[Platforms]'ll be like, you could make this much a week, but we're not accounting for the costs." In terms of **working time**, participants were highly concerned about how much workers spend on unpaid labor: P5 suggested measuring the extra labor performed by freelancers that are not stimulated in an original contract, as well as the scoping work required to procure a contract. For rideshare drivers, P9 mentioned documenting how much time workers spend commuting to or waiting on a passenger. Regarding the unpaid time of

delivery drivers, P2 mused, "If they're theoretically making a lot on a delivery but they have to idle and drive around for 30 minutes in between, how good of a gig is that?"

Workers primarily suggested using data for achieving two goals related to wages: 1) deciphering algorithmic pricing tactics of gig work platforms, 2) calculating metrics to understand earnings and devise strategies for improvement and 3) spread awareness and advance safeguards around low rates (and the consequent long hours). First, workers envisioned combining **contextually specific information** alongside historical data to understand algorithmic pricing. For example, W2 suggested gathering data about how many other workers were solicited for the same task because the "[platform] suggests that you reach out to more than one sitter after you message the first sitter" – such stats can help workers reverse engineer whether/how platforms use demand and supply data points to set upfront or dynamic prices. Historical work data can also support D3's suggestion to analyze how dynamic prices vary during times of high demand. Second, workers described leveraging data insights for furthering their understanding and improvements around earnings, given the high likelihood of platforms continuing with algorithmic pricing. F1 and W2 envisioned a transparent system for "tracking your income, the fees that you're paying and taxes" so workers can ensure they are not "running the entire operation at a loss". Related income variables would include a diverse array of **non-financial information** (e.g., number of jobs completed, completion rate, reviews, cancellation rate, acceptance rate, etc) alongside standard pay and tipping rates.

Workers also suggested specific metrics from a data-sharing system to help them assess profitability, such as F3's wish to view "hourly rate of service" and R4's desire to see average pay broken out by attributes including "ride, ride type, tenure, etc". Multiple workers also emphasized the importance of **ratings and reviews** to secure future work, thereby ensuring financial stability, but expressed uncertainty about *how* these metrics impact them – leading to a need for aggregate insights. D2 proposed collecting and analyzing how worker ratings and completion rates affect the chances for getting more work, while W3 wanted to leverage historical work data to identify whether any past client reviewers were "high value or high yield"—leading to subsequent work—as a basis for refining their work strategies (W3). Lastly, to support education around worker's financial risks, worker participants suggested insights on working conditions to support the creation of workplace health standards for gig work. D1 felt that if policymakers had access to worker data on the "number of hours worked per day/week", policymakers could "establish regulations

that can prevent us from working and ensure proper breaks . . . which helps reduce burnouts and health issues". In addition, workers desire for a system that displays income, fees, and taxes, so as to give room for informed financial planning as well as support related education.

5.3.1.3 *Safety: Overcome Power Dynamics & Physical Risks, Account for Worker Reports*

Policy Domain Experts' Concerns on Worker Safety As non-employees, gig workers lack access to resources for ensuring safety while on the job, they "don't even know where to go if there's a safety issue" (P9). The lack of adequate worker provisions has not gone overlooked "at the state DOT [Dept of Transportation] level", where regulators like P2 are "caring about licensing and crash history of people that are getting employed" platforms accountable – and also challenging the accountability of platforms: "What does that look like in terms of the companies protecting them from bad situations?". Policy domain experts brought up a wide variety of safety hazards including the dangers of accidents on the road: caretakers staying in someone else's home, and women working overnight shifts. Since workers can provide a broad range of services, P9 notes how each type of work can entail "very different safety concerns", and there's a stark contrast between "I'm worried my bike's gonna get hit" and "I'm worried about a passenger pulling a gun on me" and "when you're in someone else's house". Socioeconomic factors further compound the risks since "when you're in somebody's home, [there] is the social distance between the worker and the environment" (P8).

Worker Experiences of Safety Risks In each workshop, workers, *especially those of marginalized genders*, expressed that work platforms lack concern for physical worker safety. Participants along specific intersections shared a distinct fear over the impacts of societal marginalization: is "safety is going to be more compromised" due to having "ethnic name/non-white/queer/trans on your profile?" (W3). Workers further observed how the burdens of accounting for safety is shifted onto them (away from platforms/employers), increasing their vulnerability: "There's a safety concern, and it feels like the onus of that safety is put entirely on the individual sitter . . . to ensure that you're safe" (W2). The fact that platforms and clients wield the power of future job opportunities over workers (via task cancellations, ratings/reviews, or slower new assignments) can lead to **work coercion** where workers are compelled to accept unsafe working conditions to ensure good ratings for work and income stability. For

example, workers felt compelled to continue working when ill: W3 explained that a petcarer's profile can be negatively affected if they have to cancel multiple bookings, even if due to sickness. R4 shared that rideshare drivers feel obligated to accept rides with pets, even if they're allergic, due to the risk of deactivation, which offers no opportunity for rebuttal. F1 told us how pressures to uphold reputation causes freelancers to bid to jobs with terms and conditions that encourage overwork.

Workers also shared a prominent concern around physical safety imposed by **uneven power relations with clients**. Since platforms prioritize clients over workers for revenue, clients can easily exploit the power imbalance to harm worker safety. According to W3, workers are subjected to background checks but *clients are not*, allowing them to create new profiles:

> "A friend who does services in the metro Atlanta area [had an experience] where there was an owner who had ... undisclosed cameras and he was asking specifically young women to do house sits. And so, she reported this and obviously was allowed to terminate the sit ... Later, she noticed that the person created a new account using the long version of his name, and she also saw that same dog under a different client."

Finally, power differential contributes to workers being pressured to accept invisible work outside of their original assignment's scope. W2 explained petsitting operates in a legal "gray area" so "there's a lot of invisible work and no ability to delineate scope of work". W3 added reading about cases where "people are being asked to do stuff like clean houses or provide childcare or do other things while they're being only booked on this platform for pet sittings."

Data needs to promote safety: Policy domain stakeholders P2 and P9 were interested in using data to improve transparency on current safety standards, incidents, and concerns workers have, as well as set future standards of safety for gig work. P2 explained that, "delivery driving [is] a job that does not get the credit for being as dangerous as it is," and wanted to survey workers on how safe they feel doing their jobs. From workers, P9 wanted to understand the **experiences of workers who have felt unsafe** as well as "were they able to be resolved? Did [the worker] know of a resource to go to?" From the platform, P2 wanted data about **safety incidents** that have jeopardized workers and more transparency around platforms' policies and trainings in place to protect workers. P2 pointed out a desire to set safety standards,

including procedures for reporting incidents and support measures to help affected workers return to work.

Workers wanted information to not only understand what and how frequently safety incidents are occurring, but also to empower them in safety-oriented decision-making. To achieve this, they suggested combining **safety data, reports** from gig workers on safety incidents, and other types of gig work **data specific to their geographic region** to generate relevant insights. For example, R4 suggested gathering reports of carjackings and associated locations from rideshare drivers to support awareness of other drivers, as well as analyzing patterns of drivers declining trip requests by neighborhood in conjunction with the neighborhood safety metrics to draw attention to regions drivers' feel unsafe working in. To inform their decision-making, workers wanted "learn about how other gig workers navigate in less secure areas" (D4)—with D4 and R3 suggesting this could be done through sharing with one another experiences of safety at different drop-off locations. Though they will still feel pressure to accept certain trips they are wary about, having this qualitative, experiential data can help workers feel more prepared.

5.3.2 *Stakeholder-Specific Initiatives & Data Needs: Stress & Experience-Sharing*

5.3.2.1 *Policy Domain Experts' Concerns about Stress*

Policy domain experts identified a variety of factors that pile onto gig workers as stressors: the need to navigate between different roles, a lack of temporal stability, as well as the shortage of financial and mental resources. In particular, participants expressed concern around the stress imposed on gig workers with caretaking responsibilities, including 1) those who give care to their own family members or 2) workers in caretaking gigs.

The **high variability of schedules** in gig work contributes to financial and mental strain, trading off with flexibility and agency since workers' earnings depend critically on consumer demand (P7, P8, P9) — this forces workers to accept most gigs during times of low demand, regardless of personal constraints. P8 empathized with "already time-starved" workers, who are then further deprived of "time [and] distance [when] spent driving idly and unpaid" because platforms pay workers for the effort of the gig itself, but not the effort spent searching for gigs (P9). To overcome the work precarity, some might take on a **multitude of roles** to meet financial needs, but workers serving multiple clients can then encounter stressful situations.

"If you're working two different jobs with two different employers and there's a conflict, you have to figure it out, [and] that is very stressful for people. Plus, it's kind of an indication that the job you're doing is inadequate in terms of living wage." (P8).

Caregiving is a stressful and often-overlooked form of work, causing many caretakers to leave the industry in favor of higher-paying jobs. P1 illustrates how **caregivers receive meager pay for stressful tasks** —"if a childcare worker can make $15 an hour, but they're spending all day . . . changing diapers and dealing with the emotions of children and kids screaming" then it's no wonder that we have a shortage of childcare services." Participants also expressed concern for workers with caregiving duties within their own families, especially since the nation currently lacks systemic support for working parents. P1 pointed out "the high cost of childcare that isn't subsidized by the government" — a result of "the federal requirements for just employment . . . [being] not evolved in that space when it comes to . . . parental benefits" (P2). Consequently, the lack of "access to childcare for moms" (P2) "is forcing more and more women to go back into the home and leave the workforce" (P1).

Data needs to understand and support stressed workers: Some participants wanted data to understand longevity and quality of life for workers, though P9 recognized that such data "don't quantify very well". P1 and P7 sought accounts of why workers began gig work, if they view it as "a stepping stone" or "something they see themselves doing kind of indefinitely" (P1), and "what happens to them after they get here" (P7). P8 was curious to use data to assess job quality and living conditions, "I'm always thinking about, can I live like this?" To **quantify work precarity**, participants wanted to investigate factors that lead to fluctuations in worker wages — some suggested quantitative measures — whether seasonal or holiday fluctuations affect the profitability and stability of gig work (P6), likelihoods of receiving tips is, and proportions of a worker's income that comes from tips (P3, P4).

To support caregivers, participants wanted to use data to understand the toll of gig work on mental well-being. P1 and P5 imagined quantifying the precarity a worker experiences with their stress levels by assessing the consistency of workers' schedules, hours worked, and the availability of work. P9 explained that for jobs like caretakers or cleaners, insufficient notification could leave workers scrambling to find childcare in time to commute to a client's location. P2 and P3 desired to know whether workers have access to work benefits like childcare and healthcare: "all should have access to even . . . minimal benefits . . . so people can get healthcare and remain healthy and support a family". P1 explained her interest in the correlation of

stress on the tenure of a job for working mothers or childcare workers, "we do find that information about the experience on the job, or the amount of stress, directly correlates again to the opportunities that women, and in specific, working moms, have in terms of choosing to do certain types of work or not." To that end, P1 wanted **both qualitative and quantitative data** to analyze whether people "stay in certain gig work or move on to something else that is of equal pay and potentially lower stress and more possibility for future growth."

5.3.2.2 *Worker Desires to Exchange Strategies, Experiences and Context for Advocacy*

Workers often asked about and shared experiences and understanding of platform features and functions during sessions — such exchanges may also be facilitated by a data-sharing system. Generally, workers exhibited a desire to learn from others' experiences and strategies. Driver R2 was keen in "see[ing] if there are some people who are experiencing quite the same [as] what you're experiencing and how ... to better deal with some stuff that come[s] up along." Through sharing, workers can teach each other work-related knowledge such as "learning about fuel consumption of a certain vehicle ... you might decide to change to that more efficient vehicle" (D2). Meanwhile, D1 sought advice on how to deal with being busy during peak hours: "How do they navigate when it's peak times ... and they're not available?" For petsitting, W2 sought wisdom on how taking discounts impact earnings: "from an overall community perspective, understanding what happens when you discount would be really beneficial". Petcare and freelance pay rates can vary based on the quality and types of services, leading workers to seek insights from others regarding **standard rates and pricing strategies**. W2 recounts looking up "what other people are doing in terms of how to set your prices competitively" so they can emulate them. Freelancer F2 hoped to learn standard rates from more senior workers: "if a senior is charging maybe some kind of fair amount, then you want [use that] to determine the amount you charge" (F2).

Additionally, there is a noticeable gap between the knowledge of many workers and available protections: workers may encounter situations that seem to "violate some kind of worker [right, i.e.] not having access to a restroom in your workplace ... there's no education on that," leaving them in unfair positions of not knowing what to do (W3). Workers also saw value in training programs that cover these areas, in addition an understanding of how such education would impact work earnings and satisfaction (D1). Beyond education, workers call for advocacy contextualized

by gig work to advance rights and protections, as policymakers fall so far removed from gig labor that they "don't even know what to ask" to support worker-centric initiatives (R4). At the moment, there is "zero responsibility [on the platform-side] ... they do what's necessary by law and the rest of that you're just on your own" (W2). Without strong or accessible resources to uplift them, workers are subject to disadvantageous positions in favor of platforms' bottom-line (R4). Under these conditions, workers wish to provide policymakers context on unique struggles (e.g., unfair wages, violations of privacy, lack of fiscal knowledge, burnout, health issues) that incur physical, mental, and financial harm (R4, W3, D2).

How data can support sharing of strategies, experiences and context: Interviewees indicated broad interest in accessing other workers' experiences and ways to learn the ropes of a gig job quickly and build a profile for themselves. For this, workers desired to **learn working strategies** such as specific delivery routes to know how others navigate insecure areas (D1, D4), "how other workers handle difficult situations [or] how they take their orders" (D1), information on "traffic conditions, or road closures or any other factors that can impact my travel time", which would even enable them to practice "an alternative workflow" where "by taking that data and seeing where everybody's working, you don't go there ... [which] can be a competitive advantage" (R4). To understand expectations, W1 and W3 wanted to know projected commute times for certain neighborhoods while F1 wanted geographic locations to understand the cost of living standards. Combining such geographically-specific information with the **rates others charged for services** (F3, W3) and "what other people ... would charge extra for ... and ... would consider the standard" (W2), can help workers set their own standards for service rates.

Workers' suggestions of insights and data related to the prior sections also apply here for creating educational programs and advancing policy or regulation around worker health and safety. For instance, workers' suggestions for data around metrics and stories about workers' safety and discrimination experiences (See Section 5.3.1.3) could be shared with policymakers for crafting formal rights or protections for gig workers against platforms. Access to this large scale dataset would provide insights into the health and wellness of workers, and the amount of workload they are responsible for, key cornerstones in asserting worker causes.

5.3.3 *Practical Considerations: Worker Diversity, Privacy & Trust, Ownership & Access*

When prompted, participants raised several practical concerns they can foresee around worker datasharing systems. Policy domain experts worried about how the term "gig work" is too broad to accurately capture the diverse experiences of workers on the ground. For workers, such diversity of task domains and workflows produced divergent preferences on *how* to best upload data. While privacy preferences were never discussed in full detail, both stakeholder groups emphasized the importance of establishing trust by providing (1) clarity around what privacy policies are, (2) effective communication when there are changes (3) ways of opting out, as well as (4) transparency around who gets to access certain data. Relatedly, worker participants offered perspectives on which stakeholder groups (i.e., peers, policy domain experts), while policy domain experts discussed potential institutions/organizations who might be good candidate for owning the data(-sharing system).

5.3.3.1 *Diverse Worker Types → Varied Preferences for Data Upload Methods*

Policymaker participants explained how the language around gig work varies significantly between researchers, policy experts, and the public. P9 stated that the general public's perception of gigs consists of platform-based work but not childcare or intermittent work, which is seen as "under the table" work, whereas the Fed considers gig work to be all forms – job to job, temporary work, tutoring – not just platform-based gig work. Inconsistencies between the perception around different gig work task domains can hamper grassroots activism, and the catch-all term "gig work" runs the risk of **generalizing nuances** between platforms. P9 learned to be explicit about task types when talking to gig workers, who often do not use the term to self-describe: "How would you talk about work like TaskRabbit or DoorDash? We [gig workers] would say TaskRabbit and DoorDash." Certain platforms give way to worker cultures with differing financial obligations. Due to differences in "zones of city employment" (P7), even workers on the same platform can experience financial differences. Yet, insights can be drawn by comparing platforms from various angles. While there is a "different exchange of resources" (P8) between caregivers and deliverers, they are algorithmically managed much like rideshare drivers (P7). Caregivers and petsitting – both considered care-based gigs – have drastically different levels of service variation (P7) and legal ramifications (P9). Meanwhile, asset-based platforms like Airbnb tend to contribute toward supplementary income, whereas "people who

did like TaskRabbit or Uber were using it as primary income" (P9). When compared to physical gigs, remote freelancers face less safety risk but are more at risk for theft of services (P9).

The different types of tasks gig workers engaged in affected their preferences on what gets shared, how it is submitted, and how often it is to be uploaded to the platform. We provided workers with examples of data formats, e.g., app screenshots, CSV files, and automatic data point connections. One popular preference that workers across domains shared was the idea of automatically collecting and uploading data through an app for convenience and reduce the strains of manual upload (W2-3, D1-3, F1-2, R4), although R4 raised the concern that manually uploading data could impact data quality if drivers "cherry pick [their] good weeks and not [their] bad weeks or vice versa". On the other hand, some workers prefer to manually upload their data on a sparser schedule due to security concerns (F2). Others preferred manual upload due to job specificities. As a freelancer, F3 was accustomed to updating their clients daily to set expectations and receive feedback, so thus preferred daily data uploads. As a pet sitter, W2 preferred a monthly schedule as there is "some seasonality" to the job and this real-time data collection would cause "a drain on [their] account and phone".

Workers also explained their **preferred device for data uploads**. Most wanted to use their phone and computer to upload data formats of texts and emails for convenience (R1, R2, R4) or ease of customization (F2, F3). D1 proposed an offline app as an alternative to a website as it "allows you to share data without getting connected to the internet". R4 preferred using CSV files, but was unsure if other drivers are tech savvy enough to follow the same process, suggesting app screenshots can make for a better user experience for other drivers.

5.3.3.2 *Privacy and Trustworthiness*

When prompted, policy domain experts exhibited minor to no concerns around privacy violations. Given the information will be presented at an aggregate level, P3 "would not be concerned about [reveals of] identifying information". The only exception to this is when the system wants to apply privacy-preserving techniques like k-anonymity to "a smaller specific company and the identifying information was obvious because there are so few workers." Similarly, P5 believed that "the safeguards put in place by the academic institutions to be able to do surveys are pretty good generally," so there are no specific concerns about privacy as long as necessary

consent is obtained from the participating gig workers. P5 further clarified that the policymakers should only have access to the system data through "packaged white paper" and not the raw data. On the other hand, there are some concerns over the workers' trust in the system, depending on who owns the data. Particularly, P9 questioned "do workers feel differently about providing their data to the Department of Labor?" because their interactions with workers revealed that "sometimes [workers are] uncomfortable . . . about being in a conversation with the Federal Reserve."

5.3.3.3 *Privacy and Trust*

In our conversations with workers around privacy, they expressed the need to understand a data-sharing system's policies around privacy and data ownership before engaging with it. Workers often explained establishing trust and a system's privacy policies going hand in hand (R3, F2): "You have to trust them with your data to ensure that [they] would keep it private" (F2). People worried about data being shared (R4, D2), sold (R1), or leaked (F2, W2, D1) to nefarious actors who would misuse it. W1 and W2 were specifically nervous over location data, especially if released to past problematic clients. Participants also wanted to ensure they maintained full ownership over their data, including the ability to revoke data access should they change their mind (D2). Relatedly, W3 wanted a data-sharing system to avoid scope creep—continually changing terms and opt-out conditions—which would burden the worker to regularly review terms and conditions and learn how to manually opt out of new data collection: "A lot of times [now] is you're discovering that the latest terms and conditions you had to accept automatically opted you into data collection for AI and then you have to manually go and figure out how to get out of it."

Workers often asked about and shared experiences and understanding of platform features and functions during sessions — such exchanges may also be facilitated by a data-sharing system. Generally, **workers exhibited a desire to learn from others' experiences and strategies**. Driver R2 was keen in "see[ing] if there are some people who are experiencing quite the same [as] what you're experiencing and how . . . to better deal with some stuff that come[s] up along." Through sharing, workers can teach each other work-related knowledge such as "learning about fuel consumption of a certain vehicle . . . you might decide to change to that more efficient vehicle" (D2). Meanwhile, D1 sought advice on how to deal with being busy during peak hours: "How do they navigate when it's peak times . . . and they're not available?" For petsitting, W2 sought wisdom on how taking discounts impact earnings: "from an overall

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Additionally, there is a noticeable gap between the knowledge of many workers and available protections: workers may encounter situations that seem to "violate some kind of worker [right, i.e.] not having access to a restroom in your workplace ... there's no education on that," leaving them in unfair positions of not knowing what to do (W3). **Workers want training programs** covering these areas as well as an understanding of how such education impacts their earnings and work satisfaction (D1). Beyond education, workers call for **advocacy contextualized by gig work** to advance rights and protections, as policymakers fall so far removed from gig labor that they "don't even know what to ask" to support worker-centric initiatives (R4). At the moment, there is "zero responsibility [on the platform-side] ... they do what's necessary by law and the rest of that you're just on your own" (W2). Without strong or accessible resources to uplift them, workers are subject to disadvantageous positions in favor of platforms' bottom-line (R4). Under these conditions, workers wish to provide policymakers context on unique struggles (e.g., unfair wages, violations of privacy, lack of fiscal knowledge, burnout, health issues) that incur physical, mental, and financial harm (R4, W3, D2).

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5.3.3.4 *Stakeholders Who Should Share Ownership & Access Data*

Currently, there is no consensus among policymaker participants on which entity should have control over collected data. Instead, we outline below their rationales of support for and against particular groups as owners.

- Many supported the idea of giving **gig workers** back the control over their own data (P1, P3-7). However, P4 and P5 worried that workers may not have the bandwidth to develop and maintain the platform.
- Some participants (P1, P4-6) suggested **researchers/universities** as candidates for owning the data platform. But P4 raised the concern that universities might not "maintain this [the research project] on an ongoing basis," whereas the data platform would need a permanent home, plus there are expected scaling difficulties because "one research institution . . . may have a lot of trust where [they] are and may not in [different locale]" (P9).
- Participants (P1, P4-7, P9) also brought up a variety of **(labor) advocacy organizations** as potential owners. For potential owners, P9 recommended "intermediary labor organizations or groups that have trust that would make workers less reticent to share their information", while allowing the Bureau of Labor and Statistics to access "regular data on gig workers" as "many institutions that do research on labor . . . are extremely reliant on [the BLS]." P6 would want to share such a system with their leadership team to "put in [their] channels with partners and with community members." However, entirely handing

> over management and governance to advocacy groups runs the risk of political biases, since "advocates are generally very subjective . . . I would be concerned about more biases . . . or the way that the data is aggregated." According to P2, asking platforms to directly provide the data would result in "a rosy picture that is inaccurate."

Instead of governance and ownership by a single stakeholder group, participants suggested a **shared ownership between multiple stakeholders** (e.g., workers, advocates, government agencies, and neutral third-party organizations). P8 believed that a data-sharing system should strike "balance between workers, designers, policymakers, employers . . . to weigh in on this because their perspectives are different, but also each can learn from the other." Similarly, P7 wanted advocate-worker hybrid governance, where advocates provides infrastructure, but the data-sharing system is controlled by "worker governed entity . . . structured as . . . Limited Liability Company (LLC)" where "a lot of seats [are] given to gig workers."

While worker participants did not actively express interests in self-owning the datasharing system, they did hold opinions on whom they prefer to share data with. We summarize below the stakeholder groups they might consider sharing with, the types of data to share with each, as well as rationales and motives for allowing them such access.

Peers Most participants approved of sharing aggregate data but not individual data with peers, primarily due to concerns related to competition. D1 described "if my peers can have access to the same data and insights that I have, they may target the same high demand opportunities that I normally rely on. And things will lead to reduce the amount of my earnings." Those willing to share individual data expressed a sentiment to help others ("I'm learning from them, they're learning from me" –R2); acceptance if data sharing is an equal exchange (F2); approval for sharing data with those from different cities, preferences or work patterns (W2, D2); or had no specific concerns preventing them from sharing de-identified individual data (W2, F1). D1 provided an interesting perspective of willingness to share her data in exchange to view others' as a way to motivate herself: "If you are the best, and I want to be like you, I have to push myself. So it's like a motivation or a challenge."

Policy domain experts R4 wanted policymakers to have access to individual and aggregate data to properly investigate worker concerns: "I think policymakers should have an idea of how egregious the rates ... the fees that Uber charges." However, most others preferred to only allow policymakers to use aggregate, group-level data, due to concerns of exploitation (D2, W3, D1), or government micromanagement (F1). They viewed aggregate data as sufficient for specific initiatives they wanted policymakers to focus on, including wage theft (F3, D4), worker safety or worker and passenger discrimination patterns (F3, F4), and equitable job allocation (W2). D2 and F2 emphasized sharing data disaggregated by demographics with policymakers to center inclusivity: "that would help in them making a collective decision ... they come up with a solution for everyone" (F2). W2 shared one hesitancy about how to ensure data integrity, suggesting that off-app transactions can skew data patterns: "You're not necessarily getting the full picture. Someone might Venmo me a tip ... how would you collect that data and how would that affect how it looks?"

Other stakeholders A few participants also mentioned sharing varying levels of data with customers, family, and even lawyers for awareness purposes. D2 and R4 wanted customers to see data related to platform tactics: D2 described being on the receiving end of customer complaints over high prices and fees, and giving them access to data to understand charges could ameliorate this. R4 suggested that sharing data with riders on "what we get paid versus what they pay" could advance efforts for platform transparency by "creat[ing] an uproar from the customer side of the house" to pressure platforms. Interestingly, F2 and D2 both suggested allowing gig platforms to access their data, D2 elaborating it would be necessary for "assigning accounts or doing the maintenance of the app or website".

5.4 DISCUSSION

In our study, we learned about priorities workers and policy experts share, separate goals they emphasized, and their ideas for how a collective data tool can support these. Based on our findings, we first share design implications for data-sharing systems that enable worker and policymaker alignment on worker initiatives. Then we reflect on practical challenges and considerations (e.g., privacy, trust, ownership and transparency) for creating a data-sharing system.

5.4.1 *Designing Datasharing Tools for Common and Distinct Priorities*

Supporting Shared Initiatives: Identify Data Types, Build Public Awareness & Affect Policy Our results indicate that workers and policy domain experts share common ground on the following set of worker issues: *Discrimination & Equity*, *Fair Pay* and *Safety*. This reciprocated interest suggests that for these issues, worker-centered tools can be developed to 1) enhance multi-stakeholder investigations into what data (types) is most important to collect, 2) strengthen awareness-building and educational programs, and 3) help draft language for policies and standards. We offer recommendations of how to practically approach such objectives for the three initiatives participants aligned on.

5.4.1.1 ***Leveraging Qualitative Data to Pinpoint Drivers of Discrimination.***

While both stakeholder groups described the need for traditional demographic data to investigate occurrences (e.g., race/gender pay equity), workers also emphasized the potential of non-traditional factors for signalling risks for inequitable treatment and discrimination: W3 and W5 worried about the impact of "visibly ethnic names" on earnings, while D2 pointed out how immigrant delivery workers must resort to more risky modes of transport (e.g., biking), in lieu of obtaining driver's licenses. Such qualitative on-the-job experiences can generate novel metrics and critical (but previously overlooked) factors for policymakers to enhance their understanding of discrimination and inequities. So that when they draft the policies that Van Doorn, Ferrari, and Graham [389] calls for at the intersection of immigration and employment regulations, they can accurately account for the often latent experiences of workers at the margins.

To strengthen efforts against discrimination and inequities, researchers can focus on tools that facilitate collaboration between policymakers and workers in identifying **key attributes of their work to track**. For instance, in response to worker's desires to hear about each others' personal anecdotes (5.3.1.1), one design could implement a **multi-stakeholder-facing interface to enable experiential reports** of discrimination by workers to policy experts. On the workers' end, individuals may record qualitative narratives of their experiences, and additionally create tags for (parts of) posts to signal unexpected, biased and alarming aspects of their work that may serve as potential measurements of discrimination. On the side of policy experts, narratives/stories can then be surfaced and grouped by tags, or even sorted

based on preferences expressed by worker groups (via voting through mechanisms such as likes or upvotes), so as to help policymakers identify concrete experiential evidence that reflect workers' or their own priorities.

5.4.1.2 *Educating & Raising Awareness on Factors that Impact Fair Pay.*

While the idea of identifying and aligning pertinent data to reveal discrimination patterns can also apply to *Fair Pay*, policy experts and workers also indicated interest in using data to support educational programs on fair pay to help workers understand if and how they can earn a livable wage doing gig work.

For instance, both W3 and P1 (and prior works [175, 330]) viewed financial data as valuable for providing immediate benefit to workers (for understanding risks and whether livable wage conditions are met) and policy experts (to support drafting and passing of legislation) while minimizing time and effort required to collect data at scale.

Thus, work tracking systems that ask for data contributions from workers should go beyond collecting data around expenses and time-tracking to also help them directly answer questions around meeting basic financial needs such as "Am I making enough money?". This can be achieved through both **visualizations of statistics** and descriptive overviews of financial data — examples include personalized and straightforward summaries (on a task-by-task basis or across timespans) about how much they are netting, detailed but **digestible breakdowns of costs and earnings**, or estimations of gross earnings based on similar historical instances. Such features should be made available to workers regardless of whether they partake in training. However, their value might be enhanced for some workers if paired with training workshops on topics like financial and algorithmic literacy, as well as gig work risks more broadly (5.3.1.2).

Workers also highlighted the knowledge gap that riders and policymakers have about how basic platform operations, suggesting the need for educational programs or tools that can (1) **inform *policy experts*** about how underlying algorithmic practices (e.g., dynamic/upfront pricing) perpetuate *Fair Pay* issues that workers experience such as subminimal compensation (2) **alert the public at large** about such phenomenon. Towards the first point, a data-exchange platform can gather worker anecdotes and data that serve as content (or at least resources) for such educational programs, in line with Zhang et al. [427]'s findings on how worker data probes can assist with educational efforts for policymakers. Towards the second, data can be

used to raise public awareness as a spur for policy or regulation creation. For example, as D2 and F3 suggested, visualizations and aggregations of historical data (possibly through interactive tools) can help show the public the extent to which platforms overcharge customers and undercut workers, thereby raising awareness and public outcry that can motivate policy advancements around fair pay and platform transparency.

5.4.1.3 *Exposing Power Asymmetries that Threaten Worker Safety.*

Participants (of both stakeholder groups) pointed out the **power differentials of platforms and clients over workers**. For example, a poor client rating can keep workers from getting future jobs, while platforms can limit work opportunities through slower new assignments or even deactivations. The combination of pressures from higher-power actors often forces workers to accept jobs despite unsafe or unfair conditions. Corroborating prior work [249], disruption, privacy, we observe client harassment as an additional relational factor where that puts female workers at higher risk (5.3.1.3). Unlike other discussed initiatives, policy experts indicated a direct link between *Safety* and the use of data towards creating worker-centered labor and safety standards. This desire aligns with existing efforts to establish clear-cut modes of recourse for gig workers who have had their employment suspended due to client accusations. However, such mandated standards are currently only pursued in a handful of states (e.g., Washington State [1], Colorado [2]) and are usually specific to rideshare drivers.

In light of such shortage of regulations, and building upon the discourse in Zhang et al. [427]'s about using worker platform data to inform policy language, datasharing tools should help workers and policy experts collaborate on drafting and pushing policies that hold platforms accountable for safer and more just labor standards — such regulations can provide further resources and transparency for workers experiencing unfair deactivation and suspension, caused by factors such as client accusations. Towards understanding workers experiences with safety, P2 suggested surveying workers to learn about the incidents they face and resources platforms provide to protect them. In addition to gathering survey and experiential data from workers, we also recommend for worker datasharing tools to go further and build

1 https://lni.wa.gov/workers-rights/industry-specific-requirements/transportation-network-company-drivers-rights/resource-center-and-deactivations

2 https://leg.colorado.gov/bills/sb24-075

a communication channel between workers and policy experts — a shared space where both groups can come together to craft and evaluate language being proposed for establishing safety standards or related policy.

Balancing Stakeholder-Specific Concerns Despite alignments on several prioritized issues, the two stakeholder groups each raised a divergent concern not emphasized by the other. Policy experts wished to understand gig workers' experiences with stress from work and how platforms may exacerbate this (*Stress*). Workers wanted practical assistance to hone their work strategies (*Experience Sharing*). We describe considerations when addressing non-overlapping interests of stakeholders by expanding on these two cases.

5.4.1.4 *Probing at Latent Worker Needs Raised by Non-Worker Stakeholders.*

While workers themselves may not have the bandwidth to self-assess the impacts of their labor on stress levels, perspectives from policy experts (in addition to existing bodies of work [36], bSah) helped elucidate the potential need to increase awareness and measurement of such higher-level factors. We maintain that a data-sharing system should actively and directly elevate the goals that workers specifically raise, but this priority on stress exemplifies a case where a datasharing system can leverage insights of stakeholder groups that support workers to help them explore, uncover and become aware of their own latent needs and desires. One feature to support such explorations (while minimizing intrusions to workers) is a **data collection request form** that would require experts to give explanations on what initiatives their requested data is intended to support when they ask for access. This would act as a mechanism that serve the dual purposes of allowing policy domain experts access to data for worker-centered policy while giving workers agency to deliberate on initiatives that they likely care about but are previously unaware of.

5.4.1.5 *Spotlighting Worker Experiences & Strategies.*

Workers (understandably) expressed strong desires for practical assistance (e.g., work strategies), but these do not always align with big picture policy initiatives. However, it is still of foremost importance to design for worker-specified goals regardless of whether they overlap with priorities of other stakeholders, since (1) they are the end-users and impacted population of datasharing tools and (2) meeting such priorities offer workers incentivization for engaging in datasharing.

In this study, workers expressed yearnings for *Experience Sharing*, emphasizing the need and value of qualitative information—anecdotes about clients, psychological well-being support, and answers to frequently asked questions. This suggests potential value in creating systems with capabilities for sharing experiential data. Integrating and extending existing spaces where workers already engage in experience-sharing (e.g., platform-specific sub-reddits, uberpeople.net) [412, 421] is one alternative that reduces upfront effort, but recent work showed how their loosely-organized nature makes it difficult for others to understand and uptake shared narratives [420]. Since several worker-participants already identified typologies of sought content (e.g., advice on setting prices and dealing with difficult clients, emotional support via "ranting" posts), we recommend designing **new mechanisms for sharing experiences to cater to needs specific to gig workers** (e.g., search functions, compartamentalization of topics, scaffolding based on expertise).

5.4.2 *Reflections of Ongoing Challenges*

Despite our suggestions for how researchers can design tools that align efforts of stakeholders supporting worker-centered policy, there remain challenges when creating and implementing data-sharing tools.

Complications with Data Integrity One interesting challenge surfaced from worker workshops was that workers' heterogeneous preferences for sharing data might lead to issues in data integrity. Maintaining data integrity is important for ensuring usefulness and representativeness for policymakers (a point raised by W2). Yet, we learned about certain work practices and data contribution methods that can degrade data integrity. For example, one petsitter workshop revealed how workers *want to* take clients off the app, but such actions would lead to higher manual effort from workers to collect and input work information. The overheads of manual data entry may dissuade workers from contributing, posing challenges to the representativeness of the data. Personal informatics research characterized this challenge in data tracking/entry as "lapsing" [115] whereby upkeep often "de-motivates" users from logging data or results in reduced granularity of data logged [65, 115, 238]. The costs of manual entry can limit data collection for workers who lack adeptness with technology or time to contribute. W3 discussed how most of her off-app clients are "financially strapped" or "tech savvy"—missing out on worker data associated

with these situations can misrepresent or under-represent the needs of lower socioeconomic households, causing second-order effects on actions such as policymakers' decisions for initiatives. Other design considerations for data integrity include ensuring all data sources are captured for multi-app platform workers, developing a methodology for non-automated work data collection that reduces worker burden while maintaining data quality, and validating truthfulness of data.

Generating New Forms of Invisible Labor It is also important to recognize the invisible work that workers perform when contributing non-automatable work data. Asking workers who are already data laborers [237] to perform tasks in addition to their jobs (potentially even while they are working) can impose unnecessarily stress—a factor that developers should consider early on to mitigate. Relatedly, researchers might also consider ways the design of data-sharing tools can 1) make current invisible labor practices visible to policy domain experts, and 2) alleviate existing invisible work. To the first point, we reflect that worker participants' responses for data they seek hints at invisible labor they currently perform, such as payment management [381]—e.g., pay transparency variables to understand algorithmically determined wages (5.3.1.2)— and care labor [314]—e.g., experiences of others to get tips on handling difficult customers (5.3.2.2). One idea to address this is centering these forms of data on a policy domain expert dashboard to raise their awareness about workers' most critical initiatives to prioritize. To advance the second point, we recommend exploring data-sharing features that enable workers to intuitively and efficiently navigate, search for, and retrieve qualitative information.

Privacy Implications of Data Collection & Sharing While many policy expert participants did not express deep concerns about the privacy, security, and ethics practices of a data-sharing system, and most worker-participants conveyed a willingness to partake as long as the system ensured anonymity, this does not preclude risks. We speculate that this might be a result of participants' lack of familiarity and experience contributing to data donation tools — it can be difficult to imagine and consider related concerns with data privacy when one doesn't have practical experience engaging with civic tech or data activism. D2's desire to revoke data and W3's concern around scope creep remind us to critically consider privacy and ethics criteria when designing worker tools, including how to obtain informed consent and ensure true data ownership. For example, if new data is required as evidence for policy, what consent mechanisms should be in place for new data collections, and

how should workers be responsibly informed about risks, benefits, and burdens of the new ask? While identities can be anonymized, workers from places with sparser data contributions could face higher risk of identification if their demographic or location data became exposed.

Considerations about privacy of *client* data also arise. In some cases, client data may be necessary to support initiatives such as *Fair Pay* and *Discrimination & Inequities*. Relevant data can include the payments customers made to platforms to investigate *Fair Pay* or the ratings they gave to workers to investigate instances of *Discrimination*. Maintainers and owners of datasharing systems must strike a balance between the goals of (1) collecting and protecting of client data with (2) securely and correctly linking it to corresponding worker data. Additionally, sensitive client data could be shared unintentionally within qualitative experiences that workers write about. Such risks can be especially pronounced in caretaking domains, where workers might accidentally include identifiable information about clients when sharing experiences with other workers, especially in cases of safety compromises, such as the case described in 5.3.1.3.

Additionally, we reflect that our academic conceptualizations of privacy may have limited our ability to surface workers' privacy concerns. Recent work by Kahn et al. [202] points out that whereas "privacy domain experts" such as academics often view privacy concerns as violations of privacy laws, consent, monitoring and surveillance. Yet, "experiential experts" (in our case, workers) may recognize privacy violations in other ways such as social stigmas around shame and jealousy. Vashistha, Anderson, and Mare [391] echoes the importance of exploring workers' concerns around privacy, so that we may situate understandings in relational and experiential contexts that surface localized attitudes and expectations for data-sharing privacy protections. One emerging technique that may mitigate such risks to consumers is the potential of leveraging AI-powered obfuscation techniques to help end-users preserve privacy [270]

6

GIG2GETHER: CROSS-PLATFORM DATASHARING TO UNIFY & DEMYSTIFY WORKERS

In Chapter 5, we ideated with workers and policy experts to identify relevant initiatives that datasharing can support, as well as practical considerations to guide the development of datasharing systems that effectively exchange information among stakeholders for advancing collectivism and policy. In the HCI and CSCW communities more broadly, the recognized need to share information and build solidarity among gig workers has prompted calls toward worker-centered data collectives [49, 98, 178, 179, 359]. However, most gig workers lack practical experience with intentionally contributing personal data for purposes of building collectivism or informing policy initiatives, leaving an open question of whether workers themselves would be motivated to engage in data-sharing. Despite existence of prior systems that focused on building collectivism through data/experience-sharing within specific gig work communities [50, 332], we are unaware of research exploring how workers engage with a cross-platform data-sharing tool situated within their everyday workflows.

In this chapter, I describe how we took an initial step to address this gap by building and evaluating a prototype data-sharing system aimed to connect active workers from three gig platforms. Based on design requirements (§6.2) derived from related literature, we constructed early wireframes and subsequently conducted pilot testing with workers in our target domains to ensure alignment with worker preferences and refine usability. This multi-stage design process culminated in Gig2Gether (§6.3), a prototype system enabling US-based workers from three gig platforms to (1) engage in cross-platform mutual support through data- and experience-sharing, so as to promote larger-scale solidarity and cooperation (2) track and reflect on experiences and statistics that report on aggregated and specific experiences of subpar working conditions as well as (3) strategize and plan for improving their gig careers. Beyond surfacing possible cross-platform worker interactions, reactions and unfulfilled desiderata, Gig2Gether is intended to eventually serve as a portal for exchanging knowledge, insights and resources between workers, advocates and policymaking experts.

Through a subsequent field study (§6.4) with 16 gig workers across three platforms/work domains, we surfaced three main themes around how gig workflows can integrate data-sharing for empowering collectivism and advancing policy. First, the exchange of experiential strategies and challenges allowed workers to engage in cross-platform mutual aid, individual tracking of financial data enabled them to reflect on and plan work, while potential shared tracking of aggregated statistics helped them imagine use cases of collaboratively reasoning about platform mechanisms and rates. Second, workers expressed willingness to share both aggregated statistics and qualitative accounts of lived experiences with other stakeholders, for purposes of helping inform policy creation, especially around issues of safety and wages. Third, we overview how data-sharing integrated into workers' varied workflows, describing practical challenges that inform desires of future affordances as well as requests for additional metrics and data. Finally, we discuss and reflect on new and foreseeable practical challenges unveiled (§6.6.2), potential implication for advocacy and policy influence (§6.6.1), as well as ways that data-sharing can complement existing and alternative means of worker empowerment (§6.6.3).

6.1 RELATED WORK

Recent efforts coalesced around 1) the potential of worker data for making evident the conditions imparted by algorithmic platform practices and 2) the importance of concrete policy and regulation that ensure strong worker protections. Below, we describe how related works center our vision and design of a worker-centered data-sharing platform to meet needs of workers (across platforms) for self-tracking, mutual aid, and policy advancements.

6.1.1 *Demands of Gig Work Across Platforms*

A burgeoning body of work investigating gig work surfaced challenges emerging from platform-based gigs, but most of these studies examined issues with respect to a specific platform, thereby revealing challenges that apply to only one domain of work — e.g., safety hazards in ride-hailing and food delivery [23, 68, 287, 288], wage theft in care work contexts [73, 264, 266], or irregular schedules in online freelancing [98, 174, 394]. Such platform-specific focuses limit insights on whether uncovered stressors generalize to other contexts — similarities in such experienced challenges

can serve to unify workers across platforms. Interventions for unifying gig workers is especially necessary since they often do not self-identify as gig workers, and instead use platform-specific terms (e.g., Uber driver) to self-describe [179]. In the few cases where multi-platform analyses were conducted, studies revealed how platforms shared higher-level risks (e.g., privacy, financial, psychological, gender biases) [92, 249, 336] — most of which benefit from further discourse, reporting and exposure — collective actions that a data-sharing tool can help facilitate.

While the burdens of gig work surface differently across platforms, underlying causes of work challenges are often similar: a lack of labor/safety standards and regulation gives way to unbridled worker exploitation through algorithmic management [104, 163, 232], gamification tactics and information asymmetries [55, 327, 426], and an absent collective worker voice that stifles public awareness of harms [8, 73, 266]. In the US, gig workers are typically classified as independent contractors – resulting in limited policy or regulatory protections over work conditions, making workers compulsory to managing a bevy of logistical obligations related to self-employment: fulfilling tax requirements [4, 76, 290, 375] through self-tracking of earnings and expenses [165, 310], conducting unpaid labor to find, procure and scope gigs in times of precarity [14, 252, 394], assuming costs of work-induced injuries (in lieu of workers' compensation and health insurance) [68, 175, 287, 288], managing psychological costs to working alone [142, 410, 421], and so on. Such similarities in overarching causes of challenges to gig work suggests an opportunity for technology interventions to build solidarity between the currently fragmented and scattered worker communities.

6.1.2 *Individual Tracking & Sensemaking → Mutual Aid & Collective Decision-making*

In the absence of peer support and higher power actors who assume or share the structural risks and challenges inherent to gigs, workers are left to their own devices to manage various accountabilities and obligations [84, 165, 341]. Studies documented two main ways that workers understand and manage work: on their own through self-tracking, or with peers via online groups/forums. Recent work at the intersection of HCI and Personal Informatics revealed how gig workers currently (or might in the future) self-track to (1) protect themselves from the platform [336] or customers [98, 273] (2) comply with tax obligations [290, 375] (3) understand how algorithms operate [98, 425] and (4) comprehend and improve their own earning

patterns [165, 179, 425] using tools such as data probes in addition to apps designed for tracking fuel, time, tax, mileage [1] and generalized gig work assistance [165]. For instance, Mystro a commercial tool affording rideshare drivers the agency to auto-decline work across platforms that do not match their expressed preferences (e.g., earning rates, duration of gigs, work locations). Gridwise and Farepilot provide workers data-driven insights about in-demand locations, while Stride assists with tax filing.

While such tools act as resource providers and (sometimes automated) assistants, they fall short in providing workers with social support or strategies in times of need. Thus, to overcome the atomized nature gigs [420, 421] and find a sense of "community", workers also leverage online forums (both pages and groups on general-purpose sites like Reddit/Facebook and platform-specific sites like uberpeople.net) to share strategies [367] and information [232, 420] so they can hypothesize and collective make sense of underlying platforms' algorithmic mechanisms, solicit advice and social connections [201, 307], as well as rant and commiserate [336, 421]. In addition, online video tutorials (e.g., vlogging) are emerging as a more effortless way for workers to learn about existing strategies and work conditions [61, 302, 413]. However, the loosely-organized structure of general purpose forums (and video sharing platforms) makes them ineffective for sensemaking [420], while platform-specific sites limit worker's abilities to discern unifying challenges shared across domains from characteristics that uniquely afflict workers of a single work context/platform. Furthermore, "Online forums are built to aid workers with a sense of immediacy, not to quantifiably or qualitatively monitor request patterns or worker grievances over time" [201], making them ill-suited for purposes of collective bargaining or identify-building.

6.1.3 *Gaps in Current Approaches toward Worker-Centered Datasharing for Policy Change*

Recognizing the potential of worker data to support workers' sensemaking and auditing of platform algorithms, researchers and worker groups increasingly turn to worker data exchange tools as a means to unify and empower gig workers. Taking a first step in considering how data collectives can mitigate information asymmetries of gig work, Stein et al. [359] used participatory design to deliberate on variants

1 Tracking apps include Fuelio and GasBuddy (for Fuel), Traqq (for time), Stride (for tax), as well as MileIQ, Everlance and Triplog (for Mileage)

of data collection institutions with rideshare and delivery drivers, exploring methods of *data leverage* (also covered in [396]), *governance structures*, and *access control*. Through the lens of care ethics, Do et al. [98] used mockups with Upwork freelancers to uncover needs for relieving emotional strain, finding legitimate gigs, and measuring/managing invisible labor; they also surfaced the importance of ensuring that newly created sousveillance tools[2] do not generate additional invisible labor for workers. Calacci and Pentland [50] partnered with a delivery worker organization to build the Shipt Calculator, which audits the platform's wage determination algorithm by allowing workers to share work wage data and subsequently aggregating it to calculate changes in commission rates. Related organizations (e.g., Worker Info Exchange[3] and Worker's Algorithm Observatory[4]) formed to help platform workers collect data and investigate algorithmic decisions. To help workers explore and contextualize surfaced data patterns with their positionality, well-being, and experiences, Zhang et al. [425] created data probes—interactive visualizations from Uber driver's data. To identify where worker needs meet feasible policy changes, Hsieh and Zhang et. al. [179] interviewed policy domain experts and conducted co-design workshops with gig workers to understand their shared and distinct priorities, in addition to how data can help meet such objectives. While these works surfaced key design requirements for envisioned data-sharing tools, the lack of a working prototype functioning under realistic working conditions constrains the degree to which such studies can identify and confirm the concrete and practical desires and challenges of workers when integrating such hypothesized data-sharing systems into their everyday workflows.

Among systems that leveraged data to support platform-based workers in building collective bargaining power, a few were employed and embedded into everyday workflows of platform-based laborers: the recent Shipt Calculator solicited pay data from workers via a SMS bot to measure aggregate changes in different rollouts of the pay algorithm [50] while the seminal work of Turkopticon solicited worker-contributed ratings of crowdwork requesters to surveil and hold them accountable from below (i.e., sousveillance) [190]; follow-up work with Dynamo directly solicited ideas for action around issues surrounding labor in Mechanical Turk, and subsequently supported workers to form publics and mobilize towards action for such

2 whereby workers (under surveillance) monitor those in positions of authority (i.e. requesters/platforms) by collecting data about them

3 https://www.workerinfoexchange.org/

4 https://wao.cs.princeton.edu/

ideas [332]. By working with only quantitative data around pay, the Shift Calculator constrained understandings of worker struggles to a singular data type. While Turkopticon and Dynamo help unify workers to surface a diverse set of issues for impacting policy changes, the study context focused narrowly on a platform for online crowd work — the challenges of which diverge significantly from those afflicting workers of other gig work contexts, especially those who perform labor offline.

Finally, prior works explored how to leverage worker data to advance driver-centered policies. Parrott and Reich [293] published a formative economic analysis of working conditions and wages of drivers in New York City using Uber and Lyft app data, subsequently proposing a minimum wage standard for drivers that was adopted in the city. This data-driven strategy to assess the need for a driver minimum wage policy has been replicated in Seattle [320] and Massachusetts [192]. Non-profits and other researchers also followed this template on smaller scales, using data from worker surveys rather than app data (due to data access restrictions) [236, 260, 261, 400]. In follow up work to [425], Zhang et al. [427] explored how workers' data can support policymakers and policy informers, surfacing their potential to 1) inform policy creation, 2) support lobbying efforts, 3) help worker organizations grow member strength, 4) aid regulatory efforts [5]. To complement these previous approaches that aggregated quantitative data, this work aims to facilitate information exchange and collaboration between worker communities and supporting stakeholder groups so as to bridge fragmented worker communities and simultaneously advance policy. Further, we strive to develop such mechanisms in a way that highlights key insights and context on critical work issues such as safety and discrimination, as outlined Chapter 5.

6.2 DESIGN REQUIREMENTS FOR WORKER-CENTERED DATA-SHARING TOOLS

While we recognize the populations of workers who complete gigs but do not use gig platforms to procure them — e.g., contractors belong to LLC's or other small businesses, as well as artists or musicians who leverage other means of networking to acquire gigs — we do not consider such groups to be under the scope of this study, since their job acquisition process do not require individual workers to interact with a gig platform as an algorithmic intermediary.

5 One example is a nascent regulatory effort around algorithmic pricing investigations

6.2.1 *Design Requirement 1: Center Worker Needs & Goals to Advance Policy Initiatives*

Most related studies exploring designs of tools for building collectivism through data contributions approached the issue with worker-centered and participatory design methods [179, 359, 425]. Several of such studies suggested that identifying and accommodating diverse worker needs requires workers to share both statistical and contextual data around their working conditions [173, 427], in a way that meets their current individual goals and workflows, while ensuring they retain agency (i.e. data control) over what they share, how often they share, and who they share to [179, 359]. In the following three sub-requirements, we detail how such works surfaced needs to respect existing habits and preferences of workers while supporting data contributions that promote self-assessment and policy advancements.

DR 1.1: ***Support Quantitative and Qualitative Data Sharing*** *for Impacting Policy*

As 6.1.1 details, gig working conditions are riddled with issues that vary across platforms, although "even workers on the same platform can experience . . . differences" [179]. While some challenges (e.g., low and unfair pay [50], long and irregular hours [233]) can be observed through quantitative data, many other factors that critically contribute to unpaid/invisible labor — e.g., emotional stressors in care work [179, 267], discrimination [334], compromised safety standards [371] — can only be captured via qualitative forms of data that descriptively report the issue within its applicable contexts. While quantitative data help stakeholders directly measure effects of algorithmic management on outcomes such as hours of engagement and pay [50], narrative accounts help generate [179], document and raise awareness around new, nuanced and contextual factors that contribute to invisible labor and hidden risks [278], especially given the rapidly-evolving nature of platform policies and algorithms [44]. In particular, Zhang et al. [427] highlighted the potential of worker-centered tools to "spotlight workers' lived experiences" and bring oversights in labor regulation "to the attention of regulatory bodies". Thus, an effective data-sharing tool should provide avenues for both quantitative and qualitative data contribution.

DR 1.2: ***Provide Trust via Privacy, Security, and Data Control***

Within online communities where identity disclosures are optional, establishing trust is well-known problem that remains prevalent [83, 332]. To provide trust and safety to users who contribute their personal work data, a data-sharing tool should

be equipped with appropriate security precautions to protect their data and policies, as well as configurable privacy options.

In prior investigations, gig workers prioritizing **security** concerns cited fears of "backlash, harming reputation, and legal consequence" [98] from platforms such as "breaking platform terms of service" or retaliation tactics like "shadow bans" [359], while others worried about releasing locational data to "past problematic clients" [179]. To minimize risks of security breaches such as these, some recommended techniques like "anonymization, aggregation and perturbation of data" [359], in addition to ways of affording workers the "ability to revoke data access" [179]. Hsieh et al. [179] further found workers to generally prefer sharing "aggregate data but not individual data with peers, primarily due to concerns related to competition". Hence, all quantitative data should be anonymized while qualitative data should have anonymity-preserving sharing options, and no worker accounts should not have permissions to view identifiable personal work data of peers. Additionally, a data-sharing mechanism should guarantee workers sufficient choice over the granularity of detail in what data they upload, length of data persistence, who they share their data with, as well as an agency over whether they may contribute quantitative or qualitative data.

Around **privacy**, workers of related work found "trust [to] go hand in hand with privacy policies" [179], therefore a data-sharing tool should remain transparent about how uploaded data get used by the system. We note that despite the close ties of privacy to trust, attempts at eliciting privacy requirements uncovered a paradox where although "workers were aware of the risks of sharing data" [336, 359], they "were largely unconcerned with their likelihood" [179, 359], suggesting that without a working prototype of a data-sharing system simulating the in-situ experience of contributing and uploading on a daily basis, "it can be difficult to imagine and consider related concerns with data privacy" when workers lack "practical experience engaging with civic tech or data activism". This further underscores the importance of transparently disclosing to workers the types of data collected and how it gets used by the system.

***DR 1.3**: Support Heterogeneous Worker Goals and Workflows*

Prior investigations found differences in workers' workflows and goals, creating "divergent preferences on how to best upload data" [179] and "no consistency on the types of data" to upload [359]. Additionally, Hernandez et al. [165] found that work-

ers integrate "multiple tracking tools" for income tracking and planning in their work routine to "learn what the job is like, determine if their jobs are worth continuing, know how much they're earning, monitor productivity, and manage work/life balance". While the objective is not to encourage all workers to use every available feature, the system should provide workers multiple methods of data upload, a variety of worker-centered features to support different incentives, as well as incorporate and centralize financial-tracking features, to accommodate a more diverse set of financial workflows and goals. For instance, while some Uber drivers might be curious about their estimated earnings for particular Quests, others might simply want to track their earnings per trip [425] — workers should have methods for keeping track of both units of work.

6.2.2 *DR 2: Facilitate Worker Collaboration & Cross-Stakeholder Resource Sharing*

While gig workers already engage with online forums [421] and self-tracking tools [165] to exchange experiential knowledge for furthering their understanding of platforms and their own work, we are unaware of existing online space(s) that are designed for workers across gig platforms and domains to contribute to a shared data repository, or that connect workers to existing resources. Below are four key guidelines for creating digital environments for gig workers in a way that fosters collectivism and organizes resources that are of benefit and use to workers.

DR 2.1 : Encourage Contributions that Inform Key Labor Initiatives While prior works [175, 179, 425] identified shared concerns around gig work that both policy experts and workers considered priorities (e.g. equity, fair pay, safety) data surrounding those topics are scarce to nonexistent, due to platforms' reluctance to share. To rectify this data deficit, Hsieh et al. [179] recommended using qualitative data such as "personal anecdotes" to pinpoint drivers of discrimination, "digestible breakdowns of costs and earnings" to educate and bring awareness to workers (and the public at large) about whether they making above minimum wage, and "communication channel between workers and policy experts" to facilitate worker reports of power imbalances with clients via data like "cancellations and safety reports" [359].

DR 2.2 : Connecting Workers to Resources of Other Stakeholders As self-employed individuals, gig workers shoulder several resource accountabilities (e.g., financial,

network), in the absence of organizational support [165]. In discussions with policymakers and advocates, Hsieh et al. [175] received many pointers from organizations and advocates for resources targeted to gig workers, including "employee assistance and job training programs". Unfortunately, there is currently no centralized space for disseminating such information. Possibly driven by a fear of factors like competition and spam content, gig workers are disincentivized from constructing open, Wikipedia-like portals where they collectively gather and use "data, insights and contextualize information" around work conditions [359]. A data-sharing tool should serve as a portal for connecting workers to such known resources.

DR 2.3 : Multi-Domain Support & Worker-Accessible Tools As described in 6.1.1, gig work span a variety of work domains [224, 267, 353], making it crucial for a data-sharing tool reach workers providing different services, especially since "The different types of tasks gig workers engaged in affected their preferences on what gets shared, how it is submitted, and how often it is to be uploaded" [179]. To accommodate the heterogeneous workflows, workers needs and data types involved with varying gig domains, data-sharing systems should offer options that give workers the agency customize sharing preferences — e.g., formats of data to upload, and what devices to upload from. For instance, Calacci and Pentland [50] pointed out how workers performing physical services like grocery shopping often "do not own a desktop computer, so any solution had to be easily accessible from a mobile device", but workers offering digital services (e.g., online freelancers) may prefer desktop solutions that embed into their existing workflows. Thus, a data-sharing portal that caters to both online and offline service providers should be accessible via both phones and laptops.

DR 2.4 : Empower Collectivism & Cross-Stakeholder Communication While the value and necessity of achieving "effective representation and collective bargaining for workers in the gig economy" is widely recognized in research [45, 52, 178, 411], the online and individual nature of work isolates workers from peers [142, 410, 421], making gig work collectivism the 'holy grail' of the community. In order to truly connect workers in a network that benefits themselves instead of platforms [410], the tool should allow for communication between gig workers, including those across platforms. Additionally, the system should also open up collaboration to higher-power stakeholders such as policymakers and advocacy groups to "find ways of maximizing their ability to support gig workers" [175].

6.3 GIG2GETHER

Based on an iterative design process, we developed Gig2Gether: a worker-centered data-sharing tool with capabilities for uploading work data, viewing personal and collective work trends, sharing stories about work, as well as planning work and taxes. Built as a web app, Gig2Gether accommodates workers operating from various devices (laptop, mobile, & any device with web-browsing capabilities). The app consists of a frontend built with SvelteKit and backend (database, storage and analytics) supported by Firebase.

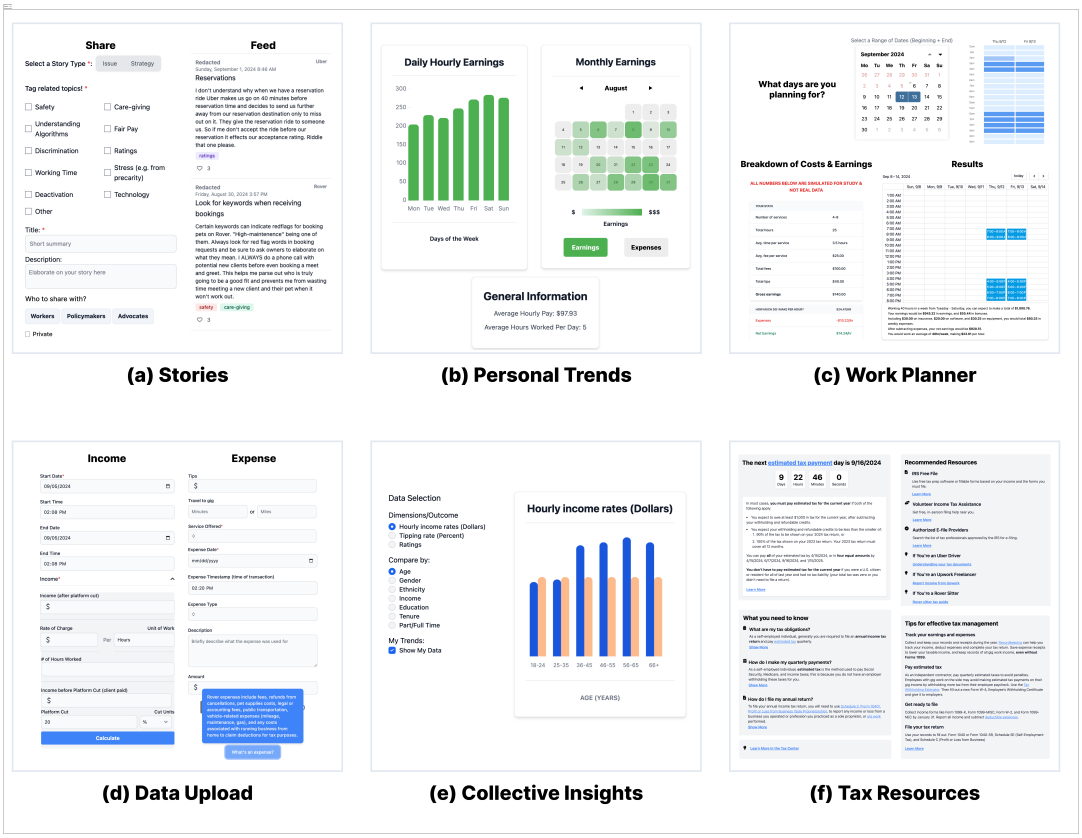

Figure 3: Screenshots of Main Gig2Gether Features: Story Sharing and Feed (a), Income and Expense Uploads (d), Personal Trends (b), Collective Insights (e), Work Planner (c) and Tax Prep Resources (f)

Users can leverage the system to plan for, record and reflect on work at various stages of a job. Before a gig, workers can use the planner to predict future earnings and set work goals. After finishing a task, workers can store and share its associated earnings, expenses and stories. After uploading data for the recently completed task, workers can view and reflect on personal work trends, or use collective insights to grasp macro-level statistics about comparable or contrasting worker populations. Between gigs, workers can leverage the 1) *story feed* to learn about strategies or recent work conditions reported by peers, 2) *tax page* to peruse resources that support fulfillment of tax obligations or 3) *profile page* to reflect on their history with the platform or record repeatedly incurring expenses.

6.3.1 *Exchanging Stories: Qualitative Data Sharing*

One of the intentions of Gig2Gether is to maintain a community for gig workers to share their own experiences with peers as well as policymakers and advocates, so as to help alleviate social isolation. To fulfill this objective, the Stories panel allows users to read and post about strategies and issues related to their everyday work. When sharing stories, workers are required to choose related tag(s), which are currently prepopulated with themes identified from Section 6.2 Design Requirements for Worker-Centered Data-sharing Tools.

Share Story Each story must 1) be shared as a strategy or issue, 2) be associated with at least one tag, 3) contain story content via a title or textual description, and 4) have a selection of desired viewing audience – this can include other worker users of the system, policymakers, advocates, or be entirely private (i.e. visible only to themselves). Optionally, workers can include an image or video to provide additional context. See the share story page on the left of Figure 3(a).

Story Feed The story feed provides a place for workers to exchange stories with peers on Gig2Gether. At registration time, users are advised to choose a username that will be viewable to other users of the system, and each post is associated with the user only through the username. Posts can be filtered by the story type (Issue or Strategy), as well as by work platform (currently Uber, Rover or Upwork). Gig2Gether allows for cross-platform user interaction – users can currently view and "like" posts via thumbs-up buttons. Commenting is currently unsupported, in

the absence of an established moderation structure. The feed is chronologically ordered – most recent posts appear first; an example can be found via the right side of Figure 3(a).

The story feature serves to meet **DR2.4** since users can view data and strategies with other workers, support others' stories, as well as share strategies and insights gathered surrounding platform policies and functioning. By ensuring that workers have agency to configure desired viewing audiences of each shared post, and keeping users associated to their stories with only usernames, the stories feature also aligns with **DR1.2**. Tags encourage the sharing stories related to initiatives of interest to policymakers, in observance of **DR2.1**.

6.3.2 *Upload of Gig-related Earning & Expense Data*

One key feature of Gig2Gether is to help workers keep track of data surrounding their gigs so they can remain financially accountable. Below, we outline how workers of the three domains/platforms can upload income and expense entries.

Income For Rover and Upwork users, Gig2Gether currently only supports manual data entry. In the income form, a worker can upload information pertaining to time spent, earnings (including the platform cut and tips), as well as information specific to job types, such as time spent travelling to house sits (Rover) and experience levels (Upwork). An example for the Rover manual upload is shown at 3(d).

Uber users can manually upload data about Trips or upload CSVs that contain platform-collected data about their trips. The *Trip entry form* gathers information on the time spent, income, distance travelled, Uber fees, surge fees, as well as other specific items detailed in a Trip receipt. Finally, Uber allows drivers to download CSV files containing information on lifetime trips, payments and app analytics. Workers have a space to keep track of such information with Gig2Gether, offering a more expedited way of seeing personal work trends.

Expenses Workers can manually input details about incurred expenses related to gigs. To add an entry, users must enter the date and cost amount, while fields such as expense type, description and a photo uploads are optional for their own notetaking. Refer to 3(d) for the expense upload page for Rover workers.

In response to **DR1.2**, income and expense uploads require only a small set of information: date, length and type of work, as well as income amount for income entries while expense entries only require data and amount of expense. This way, workers retain agency over to choose the fields to share or track about income and expense entries. To further address the data control requirement, Gig2Gether provides manage data pages for users to view, modify and delete and story, expense, and income uploads at any point. In the income uploads, drivers have options to submit data manually or streamline the process by uploading their CSV's, in adherence to **DR1.3**. Finally, the custom form fields of expense and income entries for each platform complies to multi-domain support outlined in **DR2.3**.

6.3.3 *Viewing Work Trends*

To further educate workers about their own work, as well as insights surrounding other gig workers, we created two pages for workers to view both personal and collective trends, outlined below.

Personal Trends To stay informed about earning patterns and work hours, workers can overview earnings, expense, hourly earning rates and hours worked in the "My Trends" page. Based on income and expense entries that users uploaded (process described in Section 6.3.2), workers can view hourly and weekly earning trends, daily earnings by month, as well as summary statistics such as hourly pay and worked hours. The design of the hourly and calendar data visualizations in "My Trends" were informed by the personal data probes (in particular the Hourly and Calendar probes) from Zhang et al. [425]. The Personal Trends page is displayed in 3(b).

Collective Trends In addition to personal metrics, workers can also view aggregate information about other Gig2Gether users via the "Collective Insights" page. At the time the study was conducted, this page is populated only with mock data rather than real data that workers inputted to protect the privacy of our small pool of test users. However, the page does include charts and options for dimensions of input (hourly income rate, tipping rate, and ratings) as well as demographic information to breakdown each dimension by (age, gender, ethnicity, income, education, tenure, and part/full-time work). Users can additionally compare their own data

point against any breakdowns displayed. Refer to 3(e) to view the Collective Insights page.

Both personal and collective trends map directly to the **DR1.1**, and once collective trends is populated with real user data, all inputs will be anonymized to protect workers' privacy (**DR1.2**).

6.3.4 *Planner*

Work Planning Currently, Gig2Gether offers a prototype of a work planning feature that would inform its about predicted future earnings based on planned hours of work that users input and historical data. Currently, the Planner takes in a range of the days a user plans to work in, as well as hours they plan to work on those days, and displays a simulated summary and breakdown of what predicted earnings might look like. The current implementation of the Work Planner is displayed at 3(c). In the future, the Planner would populate the earning projections using users' historical data and work trends or patterns. Implementation of the Planner was guided by **DR1.1** to help workers gain personal statistics, since predicted data is directly based on the user's history of uploaded information. The Planner is also based on the design, inputs, and outputs of the Planner data probe from [425].

6.3.5 *Additional Features*

Tax Preparation In adherence of **DR2.2**, the tax page features resources for part-time and full time workers, guides from platforms, as well as general information about filing. It tracks the next tax day for eligible workers, in addition to providing information, resources, and tax preparation tips. To view the Tax Resources page, refer to 3(f).

Multi-Domain Support Story sharing allows for cross-domain communication between users, following **DR2.4** to inspire a gig worker collective. Additionally, workers have access to a variety of tax resources for all gig work domains. This helps workers who work multiple types of jobs to reference domain-specific tax resources for all three gig platforms (supported by Gig2Gether).

6.4 FIELD EVALUATION METHODS

To assess the practical application of Gig2Gether in the daily working lives of various gig workers and how it can assist them in gathering evidence of issues to share with policymakers, we conducted a field study with 14 gig workers across the three domains. Workers were asked to use the system for 7 consecutive days, in addition to 1-hour onboarding and exit interviews.

6.4.1 *Recruitment*

We recruited gig workers through various channels, including r/Upwork, r/RoverPetSitting, and r/Uber subreddits. In addition to Reddit, we posted on city-specific Nextdoor and Craigslist, reached out to participants from prior studies and handed out flyers to Uber drivers in-person at airports. Interested individuals were required to complete pre-screening surveys to ensure eligibility and diversity in work types, locations, and experience levels. Selected participants then completed a consent form and a pre-study questionnaire to gather demographic information. In total, we recruited 16 gig workers from different platforms (8 Uber drivers, 5 Rover petsitters, and 2 Upwork freelancers) with varied experience levels, as shown in Table 17. Onboarding sessions and exit interviews were conducted via Zoom. Participants received up to $200 USD as compensation, which included $30 for onboarding, $140 for the field study ($15 per day for 7 days plus $35 for optional tasks), and $30 for the exit interview.

6.4.2 *Onboarding Interviews*

The field study commenced with a one-hour, one-on-one onboarding session to introduce participants to the study. At the beginning of each session, we guided participants to complete an income form for one of their recently completed tasks (e.g., an Uber trip, a Rover Task, or an Upwork job) while they screenshared. For the remainder of the session, we introduced the rest of the features of Gig2Gether. Participant's screenshares and real-time interaction allowed for immediate feedback and clarification. At the end of each session, we detailed the study's minimum requirements and optional tasks – a copy of consent form, which includes the payment structure, was

ID	Age	Gender	Ethnicity	Tenure	Education	Household income	Gig Work Status
Driver-1	45-54	Male	White	2-5 years	High school/equivalent	$25-50k	Full-Time
Driver-2	45-54	Male	White	0.5-1 year	Bachelor's	>$150k	Part-Time
Driver-3	45-54	Male	White	1-2 years	Some college, no degree	$50-75k	Part-Time
Driver-4*	45-54	Male	White	>5 years	Some college, no degree	$25-50k	Full-Time
Driver-5+	35-44	Male	Asian	2-5 years	Professional degree	>$150k	Part-Time
Driver-6	45-54	Male	Asian	>10 years	Some college, no degree	$25-50k	Part-Time
Driver-7	25-34	Male	Hispanic/Latino	2-5 years	Bachelor's	$50-75k	Part-Time
Driver-8	35-44	Male	Asian	>5 years	High school/equivalent	$25-50k	Full-Time
Driver-9	35-44	Male	White	>5 years	Bachelor's	$75-100k	Part-Time
Freelancer-1	45-54	Female	White	<0.5 years	Associate's	$25-50k	Part-Time
Freelancer-2	25-34	Female	White	>5 years	Professional degree	$100 - 150k	Part-Time
Petsitter-1	35-44	Female	White	>5 years	Some college, no degree	<$25k	Part-Time
Petsitter-2	18-24	Female	White	0.5-1 year	High school/equivalent	<$25k	Part-Time
Petsitter-3	25-34	Female	White	2-5 years	High school/equivalent	<$25k	Full-Time
Petsitter-4	35-44	Female	White	>10 years	Bachelor's	$100 - 150k	Part-Time
Petsitter-5	25-34	Male	White	0.5-1 year	Master's	$100 - 150k	Part-Time

Table 17: Participant Demographics.
Our driver, petsitter, and freelancer participants engage with Uber, Rover and Upwork, respectively.
* Driver-4 dropped out after onboarding due to concerns that his participation would violate Uber policies.
+ Driver-5 dropped out after onboarding due to personal reasons, preventing him from actively uploading data.

also sent to each participant via email. The daily task requirement rewards participants $15 a day for completing one of:

1. Upload entries on **expenses** incurred (e.g., gas, pet supplies, office supplies) or **incomes** earned, which include
   a) Trip for Uber
   b) Income forms for Rover or Upwork
2. Share a story

To earn the bonus, participants were expected to complete the daily task each of the 7 consecutive days, in addition to completing the following actions at least once: 1) Plan upcoming work, 2) View personal trends, and 3) Like another participant's story. Optionally, Uber drivers received the secondary option of earning the bonus by uploading a CSV of historical trips in lieu of the three actions stated above.

6.4.3 *Exit Interviews*

We conducted one-hour semi-structured exit interviews with each participant. Questions of the protocol focused on the key features of Gig2Gether—such as data uploading, trend analysis, storytelling, and the planning tool—as well as participants' overall experiences. Additionally, we tailored questions to the records of participants' daily interactions with Gig2Gether, including stories shared and uploaded income/-expense entries.

6.4.4 *Analysis Method*

To investigate workers' interactions with our system, we took a mixed-methods approach to 1) aggregate quantitative statistics about usage such as counts of stories/uploads shared and 2) qualitatively examine onboarding and exit interviews. For the quantitative data, usage reports were fetched and aggregated directly from the system backend, after which minimal calculations such as averages were performed. For the Zoom-recorded interview transcripts, three researchers conducted open coding to to identify concepts, themes, and events.

6.5 FINDINGS

Below we report on our study findings, broken down by themes: first we describe the role that Gig2Gether played in participants' workflows as well as (current and imagined future) use cases regarding the tool; next we give an account of workers' stance on the system as a means to share data with policymakers and the types of information they prioritized to share; finally, we present new considerations for a worker data-sharing system as surfaced from participants' use of Gig2Gether during the field study.

6.5.1 *Worker Data-sharing in Practice: Exchanging Support & Insights While Managing Individual Finances*

During onboarding, participants expressed initial reactions to how they envisioned using features of Gig2Gether. In exit interviews after the 7-day field study, workers shared further details about existing and desired use cases. In the following, we present findings about how participants used features of Gig2Gether using contextual details they revealed during interviews and usage metrics gathered from the system.

6.5.1.1 *Solidarity & Collectivism via Experience & Data Exchange*

Many workers described *Stories* as a unique feature distinguishing Gig2Gether from other data-tracking or -sharing apps they use. Though not everyone shared, many workers found it reassuring to read others' stories, since they get to **learn that they're not alone in experiencing hurdles** at work: "I really like the fact that there's stories, and you can check out what everybody else is dealing with. So you feel like: Oh, I guess it's not just me that's feeling like they're ... be[ing] cheated" (Freelancer-1). Freelancer-2 shared the desire of wanting to connect with others, because "You can really feel siloed as a gig worker sometimes, so it's cool to see other people's experiences". When first reacting to the story feed during onboarding, Petsitter-5 immediately expressed resonance with a story: "I have similar feedback ... I'll be adding a story shortly, because it's hard to get [jobs on Rover] versus ... WAG. Yeah, definitely want to talk about this." A few workers specifically pointed out the content and attitudinal contrast of Gig2Gether's story feed with other gig work forums: "the subreddit is really just a lot of sharing ... but not necessarily useful [content] ... but

[Gig2Gether] offers tools" (Freelancer-2). One participant even expressed considered sharing stories to initiate collective action against Uber:

		Authors's Work Contexts			
		Driver Stories	*Petsitter Stories*	*Freelancer Stories*	Total
	Total Authored	15	11	1	27
	Mean Stories / User	2.143	2.2	0.5	N/A
# Likes	*From Drivers*	13	**10**	0	23
	From Petsitters	**10**	10	0	20
	From Freelancers	**1**	0	0	1
Share to	*Workers Only*	2	1	0	3
	Policymakers Only	0	1	0	1
	Workers + Policymakers	1	0	0	1
	Workers + Policymakers + Advocates	12	9	1	22
Story Type	*Strategies*	10	8	0	18
	Issues	5	3	1	9

Table 18: Story statistics across platforms. *Note how workers of all platforms expressed interests (through likes) for a comparable number of stories in their domains as in others — e.g., drivers liked 10 stories from petsitters, in addition to 13 stories from other drivers*

> There's a lot of things that I would like to share, but most of them are political. So like: we should all get together, fight back against Uber . . . [but] I didn't know how political I could be [on the Story feed].

Several participants shared a displayed level of **interest in other platforms** supported by Gig2Gether—either they had prior interest or developed interest for how to start work on another platform after reading others' stories. In both cases, workers found value in reading about others' experiential strategies and issues. This interest in other platforms' users' stories was reflected in usage metrics (see Table 18), which show how platforms' workers expressed support (via likes) for a comparable number of stories in their own domain as from other domains (likes from other platforms are bolded). Petsitter-3 is now considering both Uber and Upwork as extra sources of income: "I did [like] one [story] from Upwork because I was actually looking to work there at some point . . . I saw a lot of pointers that people gave for Upwork, and I was like, 'You know what? I'm gonna definitely keep that in mind.' "

Collaborative Examinations of Algorithmic Speculations & Rate Standardization Although the *Collective Insights* page was not yet populated with real user data, it sparked ideas and hope in participants for what could be revealed with aggregated data. For instance, Driver-2 expressed excitement about the potential of **answering popular speculations** about effects of having a Tesla on Uber earnings: "[on] the Reddit Forums for Uber drivers, people are always asking 'if I buy a Tesla (or if I get an XL) what should I expect as far as [how much] my tipping [were] to increase, or hourly income to increase?' So this is actually pretty cool". In addition to large differences such as car model, Driver-7 wondered whether small gestures such as amenities can affect earnings: "car model ... [and] the type of amenities that the driver offers". On Rover, Petsitter-2 also wished to confirm her own observation-based hypothesis that "vets have a lot more repeating customers ... they also tend to be the more expensive ones". Beyond helping workers decide the type of services to offer, participants also saw collective insights as a tool to help them **set rates of charge for services**. Petsitter-4 expressed how

> I would love to see [earning statistics] broken out by urban, suburban, rural ... [because] that's the biggest difference in how sitters operate ... it's a entirely different game. Right now I'm urban, I have a radius of two miles and I walk to all of my bookings, whereas a rural sitter might have a radius of like 10 miles, where they'd have substantial costs in terms of travel time and driving ... [So urbanization would impact how] I set my pay rate.

Driver-3 similarly wondered about fare price difference across geographic regions: "The only [additional breakdown I'd want] ... would be your region ... I noticed different fare prices of getting out of the city".

In online freelancing, platforms offer a wide variety of job categories, thus Freelancer-2 desired to find out about differences between and intersections of categories: "I work in healthcare but a lot of the work I do on Upwork is writing, it would be interesting to see ... [the breakdown or] an overlap of both categories." Freelancer-2 also offered the idea of breakdowns by disabilities: "physical and mental disability, might also be a good differentiator there".

6.5.1.2 *Financial Tracking: Self-Logging → Reflections & Planning*

Streamlined Financial Tracking Participants described Gig2Gether as straightforward ("simple" and "easy") to use when manually entering information. While var-

ious third party apps emerged over the years to help workers track earnings, expenses, and tax obligations — as noted in §6.1 and by workers such as Driver-1 – some participants (particularly from non-driving domains) preferred Gig2Gether over such apps for its simplicity: "I like this way better, because this is for gig workers, and the other is more of the financial crap that I don't like having to deal with, but I do [have to]" (Freelancer-1). Petsitter-5 also enjoyed the simplified experience of viewing his financial data: "this is better than [Rover. There] it's just too complicated. And I love seeing how data is simplified [here]". Although rideshare driving often accumulates a larger volume "gigs" in a day than petsitting or freelancing, D3 (who does not currently use tracking tools) expressed a similar desire to using Gig2Gether: "I don't always remember everything, but I can keep it all just between the Uber and my head. But I would like to use a simplified [tracker]—another platform like you guys are presenting now."

	# Shared Stories	# Total Words in Stories	# Liked Stories	# Income Uploads	# Expense Uploads	# Trends Visits
Average	1.93	231	3	8.57	1.42	4.5
Median	1	108	3	6.5	1	4.5
Max	5	1493	11	41	7	9
Total	27	3235	42	120	20	63

Table 19: Descriptive Statistics on Stories, Uploads and Trends

Integrating Financial Reflections into Gig Workflows Beyond the initial income entries uploaded during onboarding, all participants entered additional income entries, and 9 of 16 uploaded expense entries – with one participant entering 7 expenses (see Table 19). Based on these uploads, participants reflected on the personal earnings presented by the Trends page. Driver-2 appreciated having the ability to review his work data: "I really liked the Trends section. Uber doesn't give trends, just reports. And the Trends helped to look back and choose the weekends and decide what times are best to work." During onboarding, (part-time) Petsitter-3 expressed similar excitement about being able to compare earnings across time: "Rover doesn't have something like this where you can . . . compare this year to last year." Driver-6 was excited by the ability to view his weekly data, and wanted to use the Trends

page to show his friends proof of earnings having gone down, e.g., from working the same amount of time, year over year:

> If I have this app, then I can show them the facts . . . this is this [amount] before, and this is now . . . it can actually affect if I still want to do this Uber thing, or I can tell my friends not to do it anymore. . . . Because this is data, this is like facts

Driver-3 went a bit further to imagine how historical data can help him plan for breaks:

> So you can cut out with Uber, cut out some downtime with the slow hours . . . actually have a break and not worry about missing anything. . . . [I could] look back to last year and say . . . September 1 was busy, and it slowed down at 10 o'clock . . . So you don't have to waste your time staying on the app

Driver-3 liked recording and seeing expenses displayed back, explaining how Trends could help him "streamline my expenses a little better . . . when I use plastic [cards to pay], I don't pay attention as much as you do when you're handing cash over . . . [but] with having your site up, I could just go back and refer to everything and say, 'Hey, maybe slow down on this' . . . when I'm going through expenses." In a similar manner, Driver-6 enjoyed entering his information at the end of a day that he had driven. In his 10 years of driving, he had never been compelled to try recommended apps from fellow drivers, but found it easy to use Gig2Gether to enter information and subsequently view Trends.

Freelancer-1 also shared the enthusiasm for potentially streamlining work processes such as tax filings: "This is super helpful. If [only] I would have had this when I was helping my husband with starting up his stuff . . . the whole tax thing was a nightmare for me". Petsitter-1 described her affinity for the tailored aspects of the tool by contrasting against how most similar apps frame gig workers as independent contractors, which misaligns with the reality of their work and earnings: "A lot of that stuff is like: 'Get *blah, blah blah* for your small business.' [But] I'm not a small business owner". Several participants talked about creating reminders to remember to upload their data, such as Freelancer-2 "a reminder in my calendar just to make sure I wouldn't forget" and Driver-3, who had to "set a reminder to make sure I did [uploads for daily tasks]". However, uploads can became a part of normal work routine—Petsitter-3 added it to the "housekeeping things I needed to do, and

it seemed to flow pretty naturally in with those reminders." In the same manner, Petsitter-4 also mentioned push notifications would help but were not necessary because "anytime you start something new, it's not habit yet . . . just have to get used to it".

Planning, Keeping up with & Achieving Earning Goals Although the Gig2Gether *Worker Planner* was only populated with mock data, participants were eager to incorporate it into their workflow, and resonated with the the planner's goal of helping them structure schedules for days and review earnings goals. Freelancer participants foresee themselves using the *Planner* to track true hourly wages after expenses: Freelancer-2 would use it to"keep things straight . . . [So I can compare:] I work this much this week. This is how much I uploaded [in earnings]", while Freelancer-1 would use it to check "how much I'm working, whether my expenses offset with the money I'm making. And see if I need to work more". Driver-3 envisioned using the *Planner* to help remember and plan around upcoming reservations, which can go as far out as 30 days: "I would definitely use it a lot, because of the reservation rides . . . tonight I have a reservation ride for [which] I can't remember [the exact time]". Petsitters held mixed opinions about the *Planner*, partially due to how Rover already provides a calender for bookings - we outline some suggestions they made in 6.5.3.1.

6.5.2 *Data Disclosures to Policymakers, Peers & Advocates*

Workers also envisioned several potential ways of impacting policy or mobilizing collective action for several initiatives, which we describe below.

6.5.2.1 *Openness to Data Sharing with Policymakers and Advocates*

Workers expressed strong support for Gig2Gether's mission of shedding light on their working conditions to policymakers: "This is a tool that's designed to bring exposure to policy makers . . . **to open the door between drivers and politicians** . . . now that could interest a lot of drivers right there." (Driver-1). Through shared stories, we note workers were willing to share their qualitative data with policymakers in 23 of 27 cases (Table 18). Beyond a willingness to share data with policymakers, workers also shared preferences for prioritized issues such as safety and wage concerns. With Gig2Gether, they hoped advocates and policymakers will "get out the realistic facts of the jobs" (Petsitter-1). Even when they were not sure how a

story or metric could relate to policymaking, participants exhibited a general desire for their data to simply raise awareness about their work conditions: "You could share that [data] because I don't think anything would hurt anyone. If anything, it'll maybe open some eyes up." (Driver-3).

6.5.2.2 *Story Feed: A More Reputable Source for Informing Policymaking*

When comparing the *Story* feed to other online forums they engaged with, participants considered Gig2Gether as a more credible source, which may make (1) policy stakeholders take it more seriously, and (2) workers more comfortable interacting with other workers. Petsitter-4 explained her rationale for increased trust in Gig2Gether:

> I would feel a little bit more comfortable that I was getting information from like verified sitters ... it would be weird for someone to sign up for an app to track their earnings, and then shit post in the community section of it ... It would be a community that would be obviously a little bit more verified, and then a little bit more serious ... [with members who are] committed to gig work, to a point where you're going to the trouble of tracking your earnings/expenses".

Sharing this sentiment of increased reputation/trust in Gig2Gether, Freelancer-2 postulated on its effects on policymaker perceptions: "I feel like ... they might disregard what they saw on Reddit ... [as] people venting online, people being bitter... but if it was coming from a more reputable forum ... They might take it to heart a little bit more." Driver-2 also compared it to Reddit, saying Gig2Gether represents a place with less trolls, where workers are "planning for more success". Meanwhile, Petsitter-1 shared her thoughts about the role of advocates in disseminating information about the platform: "[Gig2Gether and its insights] is the kind of thing that I think would be better spread through advocacy groups than through individual word of mouth "

Using the *Story* feed, workers shared more strategies than issues, with "safety" and "fair pay" emerging as the most used tags. For strategies, many workers talked about staying safe in the face of challenging client interactions (for Rover users, "client" can refer to the pet and/or its owner), such as Petsitter-1 when watching multiple dogs and Driver-1 when faced with trespassing customers. Experienced workers also shared strategies for improving earnings, such as methods for attract-

	Usage in Authored Stories			Total	**Story Type**		Total	**Liked Stories**		
	Driver	*Petsitter*	*Freelancer*	Usage	*Strategy*	*Issue*	Liked	*Driver*	*Petsitter*	*Freelancer*
safety	5	5	0	10	7	3	19	11	8	0
fair pay	5	1	0	6	4	2	5	3	2	0
care-giving	1	4	0	5	3	2	9	5	4	0
stress	1	3	0	4	2	2	6	4	2	0
technology	3	1	0	4	4	0	10	5	4	1
other	1	2	1	3	2	2	3	1	2	0
ratings	1	2	0	3	1	2	6	3	3	0
work time	0	2	0	2	2	0	3	1	2	0
algorithms	0	1	0	1	0	1	2	1	1	0
discrimination	1	0	0	1	1	0	1	1	0	0
Total	18	21	1	**39**	26	14	**64**	35	28	1

Table 20: Tag Statistics Across Platforms

ing repeat customers (Petsitter-2), testing platform features (Driver-2), recording unpaid work/time (Petsitter-4), or even a workaround for platform's evasions of small fees — by tracking them and filing small claims lawsuits (Driver-1).

In terms of issues, workers most commonly shared experiences of unsafe working conditions —such as a driver writing about a stressful trip to drive an elderly man in distress to the ER. Participants also shared frustrations around understanding how algorithms assign work (Drivers-3,7) and concerns of power imbalances with clients (Petsitter-2, Freelancer-1).

6.5.2.3 *Safety & Wages*

During exit interviews, we probed workers about how and which these shared concerns should be communicated to policymakers. Below we detail examples of compromises to their safety or pay.

Understanding Worker Safety When discussing safety concerns, participants referred to **physical safety** issues they face from riders (Uber) and pets and/or their owners (Rover), as well as **digital scams** (all platforms). We describe below the various physical dangers, since participants did not prioritize digital scams as a concern to share with policymakers.

Driver-1 described various factors that drivers might encounter "incidents . . . like physical assault, being disorderly, and causing damage to the driver's vehicle (this happens pretty often), passengers getting arrested out of the back of your car", which motivates him to use a channel such as Gig2Gether's *Story* feed to funnel the information to policymakers, since it "would be good to be able to report that somewhere centralized so that they can see there's a big safety issue." Beyond road conditions, safety risks can also encountered at strangers' homes "you're going into somebody's house, it's a vulnerable position to provide work" (Petsitter-4). Furthermore, both participants pointed out how many of the risks imposed on workers are one-sided to protect consumer identify and safety: "sitters are background checked, clients are not" (Petsitter-4), and Driver-9 related being required to pass"a pretty rigorous background check . . . Both initially, and then it happens randomly. Usually only once a year, but it . . . has been more often". Driver-1 described how prior to the #WHATSMYNAME movement, "the passenger would give their name to the drivers so that the driver knows that they have the right person", but nowadays drivers have no method of verifying whether they have the correct person, causing breaches of safety because

> You got young, beautiful women in their early twenties out there driving, and some big, burly dude opens the door [and asks] 'What's my name?' Whatever name she puts out, he could say yes, [and] she could disappear from that point.

Understanding Unfair or Unpaid Wages Participants of the three platforms described scenarios related to unfair or unpaid wages. Senior Drivers-1, -6, and -7 all lamented how Uber wages and incentives keep dropping over the years: "when Uber first started, we were making like almost $40 an hour. Now it keeps on going down . . . [on] the Quests right now, you just make make $15 on 20 trips . . . they're getting so greedy" (Driver-6) and "Uber has gotten worse, and this might be my last summer [with them]". For many of these rideshare drivers, gaining access to collective evidence is quintiessential for exposing the rapidly wage declines: "The reason why **this data is important is because we want to expose literally what we're making. We want these policymakers to see this**". Even more junior workers such as Driver-10 expressed desires to use the app to record subminimal wages: "some states . . . looked at it and said, this [wage] is not fair. So I think that's proba-

bly where I would use the data that's within your app to basically show, 'hey, here's what's really going on'. "

6.5.3 *New Data, Metrics and Features*

While research has explored workers' preferences for contributing data and how data can be used [179, 359], having workers test a prototype can allow them to surface important needs and opportunities that only arise from hands-on experience [325]. We found this to be the case where participants' use of Gig2Gether revealed important workflows to support, opportunities of insights to strengthen personal goals and collective action, as well as worker-to-worker interaction and anonymity preferences that would have otherwise remained unknown.

6.5.3.1 *Insights About Essential Workflows to Support in Data-Sharing Systems*

As participants described their experiences using Gig2Gether to log their work, they highlighted additional important workflows that must supported for them to obtain the most useful insights about their work and earnings.

Towards Complete & Automatic Data Uploads Several participants talked about taking gigs off-app (Petsitter-3, Freelancer-2) or working multiple apps (Drivers-1, 6, 7). For example, Driver-7 has shifted "90%" of his work to Lyft so the Trends page would not reflect all his gig work earnings. He currently uses an Excel spreadsheet to manually input his weekly summaries from both platforms but wants an app that helps him track both. By describing their experiences uploading data and viewing their trends, participants highlighted the importance that future versions of Gig2Gether support workflows of multiple apps and off-app work so the Trends page allows them a holistic and meaning view of net earnings and patterns.

Additionally, related to data completeness, several Uber drivers described a need for automatic data entry support (Drivers-1,7, 9), similar to existing third party apps (most of which require paid subscriptions) that emulate actions on Uber/Lyft such as accepting or declining ride offers [6]. Especially for full-time and long-tenured drivers, the volume of trips they accumulate can be substantial. Even though we offer a CSV upload option for Uber drivers to mitigate the process, drivers describing the many trips they complete a day and the normalcy of switching between apps highlighted

6 Examples include Mystro and Para, both of which are paid apps

the importance of automatically gathering their work data to support complete data insights. When asked about concerns around data privacy if their accounts were linked, drivers did not have any and were supportive of a more automatic option. On the other hand, we anticipated that Petsitters or Freelancers would not require an option of bulk data upload given the nature of their work, and correspondingly, they did not share a need for automatic data entry.

A One-Stop Shop For Understanding Profit & Filing Taxes Participants' descriptions of their experiences entering completed work and accumulated expenses also helped us recognize a possibly under-supported task in the ecosystem of gig worker tools: the tax-filing process. Driver-6 and Petsitter-1 described desiring a "one-stop shop", which for them translates into one tool that lets them pull all their data for purposes such as submitting to an accountant, IRS audit, tax filing, or if they're just curious: "a one stop shop [so] that I can see my progress. I can see how much I'm making per hour. I can see my expenses. At the same time that I can show it to my accountant. Or if there's an audit from IRS, that I can show this." (Driver-6). Mileage, in particular, was highlighted by both drivers and petsitters as an important metric for accurately calculating their expenses for filing taxes under the standard deduction: "I would like . . . [for this app to have] as opposed to them [other apps/forums] 'one stop shop', if it had the mileage." (Petsitter-4).

A couple participants described using a combination of apps to collect all the metrics related to understanding their work and filing their taxes. Driver-7 uses Stride to automatically track miles and Excel to manually log trip earnings. He expressed that Gig2Gether automatically tracking miles would complete the metrics he needed in a tool—mileage, earnings and expenses altogether. Driver-9 also shared using multiple apps for tracking mileage (Gridwise) and fuel expenses (Fuelly). He explained that Gig2Gether tracking miles would further motivate him to share the app with friends "I would recommend it, because it's more immersive than the other app that I use [especially if it can also be used] to track your mileage".

Not all participants desired this though. Driver-8 warned us against trying to expand Gig2Gether's features to fulfill a "one-stop shop", expressing worry around the risks of chasing down an endless pool of desired features. Instead, he encouraged us to pursue Gig2Gether as a tool for connecting workers with policymakers and advocates as this was the unique feature he had not seen in past applications.

Providing Context on the Planner While the *Planner* was primarily presented in Gig2Gether as a predictive tool to project weekly earnings, participants offered different ideas for how they wanted to use it by describing their current work planning process. For instance, though Uber's traditional model has been on-demand ride requests, they began letting riders schedule a ride request in advance—"Reservations". Driver-3 actively accepts these trips and wanted to use the planner to keep him accountable for reservations. Meanwhile Petsitter-2 wanted to use the *Planner* to keep track of the different pets she's booked to care for: "Say I got Ice or I got Henny . . . I put their names all throughout the planner . . . Because sometimes I get them back to back and it'll be like: 'Okay, wait, who's this one? ' " Petsitter-3 also entertained "the possibility to write in who I'm pet sitting for" and further suggested the idea of "being able to put in the address" to each entry.

Several drivers also highlighted their tendency to center their driving locations and hours based on events. Thus, they pointed out the utility of incorporating regional "events that would be in the city", but not bigger ones because Uber already keeps track of those. Driver-7 clarified how seeing events integrated into the *Planner* would help smooth out his current workflow, as right now he resorts to manually looking up such events himself, which can be time-consuming: "I have to go online . . . [to look up when], Chicago Cubs play . . . write down on calendar by hand the right time . . . ".

6.5.3.2 *New Metrics That Can Strengthen Personal Goals and Collective Action*

Net Earnings Insights: Achieving Personal Goals and Empowering Collective Action Reviewing quantitative metrics on Gig2Gether, participants talked about how these can help support their personal goals as well as ideas they have for advancing collective action. Uber and Upwork participants yearned to view their net earnings (Freelancer-1, Driver-1), so they can plan for and achieve work goals. For instance, Freelancer-1 wanted to "see how much I'm working with my expenses offset with how much money I'm making, and see if I need to work more". Beyond personal earning goals, Driver-7 wanted to leverage trends from earnings data to show other drivers unfair or demanding working conditions imposed by platforms, explaining how workers often focus only on gross income without critically assessing their expenses. For instance, he'd want a way to show drivers whose net earnings are below minimum wage—e.g., 15 hours to make $200. These statistics "give them an insight of what's going on . . . [that] they're not making enough money", so as to galvanize

them to strike against rideshare companies, because "in order to make a change, we [as drivers] have to get together" in protest.

"Downtime" and "Deadtime": Making Total Work Time Visible Participants also suggested additional metrics to improve workers' understanding about time they spend working that they might sometimes overlook. To optimize working time, they explained the importance of including metrics and visualizations that illustrate not only of hours actively booked on a job, but also hours that are unaccounted for, such as "downtime"—i.e., time spent waiting for work opportunities (Petsitter-4). Drivers also described wanting to record and view this "downtime" or in their case, a concept commonly referred to as "dead time"—time spent driving around for rideshare without a paying customer in the car. Drivers-1 and -7 both thought it was imperative for drivers to know the proportions of their paid time within total working time, which includes the paid trip as well as time spent driving to pick up customers and waiting to receive a request between paid trips.

6.5.3.3 *Ideas Around Additional Worker-Worker Interactions & Anonymity Preferences*

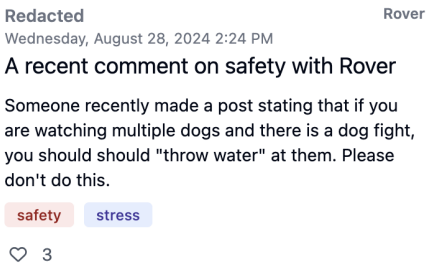

Figure 4: Petsitter-1's response to another strategy

Commenting & Reaction Options Currently, Stories have limited interactions: workers can post a story, read a story, or like a story. Participants held mixed feelings about new interactions: while Petsitter-1 was adamant against implementing additional interactive (commenting) features —"I don't think it's productive." — most expressed desires for comments and moderation mechanisms (Freelancer-1, Petsitter-3, Driver-2, Petsitter-5), .

—see Figure 4 for one petsitter responding to another. Petsitter-4 asked about capabilities for networking with petsitters—she did this previously and finds it helpful to be on a list of trusted contacts that refer each other to clients.

However, others wanted to prevent the Stories feed from duplicating behaviors on other forums such as subreddits or Facebook groups. Specifically, participants wanted to avoid off-topic posts or misunderstandings—"a lot of stuff gets taken out of context" (Driver-3). Petsitter-1 did not want further features added while others suggested limited interactions. Petsitter-4 suggested adding "Agree" and "Disagree" buttons. Driver-1 proposed that comments be allowed but only viewable by policymakers to mitigate worker disagreements: "let's say when a 'Driver A' posts a story...I've dealt with the same issue, I comment on that story. The other drivers would not be able to see my comment. But the policymakers would be able to, which means no online arguments amongst drivers". Driver-6 gave a unique idea to merge qualitative and quantitative data, and improve readers' confidence in the veracity of stories being shared. He uploaded Trip data and described an issue he faced with Upfront fare in the Notes field, and wanted to share this data with workers, policymakers, and advocates within the Story feed. He felt stories with real Trips attached could serve as proof or evidence that a story is not fabricated. On the other hand, Petsitter-5 did not believe pay information should be shared, but did encourage highlighting the photo and video sharing options more.

Anonymity and An "Edited" Trail. Several participants requested more anonymity and traceability on the *Story* feed, especially necessary once Gig2Gether is circulated and used more widely by different stakeholders. Though many participants were comfortable sharing stories with their usernames, others wanted strict anonymity, pointing out that they and others may use the same social media username across platforms. This could uncomfortably lead to being identified if peers of subreddit or Facebook groups join the platform and disagree with their stories (Petsitter-4). Driver-7 also wanted to share "political" stories but refrained because there was no way to post anonymously.

Drivers-1 and 6 both emphasized the importance of removing location information as well. Driver-1 asked: "Is there any situation that would cause the trip data to be visible to other drivers? For instance, would they be able to see what city these are in at any time? . . . That's a very, very serious concern." Driver-6 advised for Gig2Gether to automatically blur sensitive information, such as addresses, that workers might upload, explaining drivers often forget this step when posting screen-

shots on forums which risks privacy and security. Driver-1 also highlighted the need to maintain an edit trail for posts. Users have different reasons for editing stories—a few participants said they appreciated the ability to go back and modify typos. However, he was concerned if deceitful users were to abuse the current lack of an edited label to gaslight others. This feedback underscored the importance of ensuring robust privacy controls within the application.

6.6 DISCUSSION

Literature has surfaced what policy stakeholders feel gig worker data can be useful for—e.g., drafting bill language, communicating workers' platform experiences to colleagues [427]. Research has also reported several initiatives and related data metrics that policy stakeholders desire for supporting worker-centered initiatives—e.g., aggregate data to investigate unfair pay or discrimination [179]. Our study extends these insights with workers' initial impressions from using a data-sharing system intended to support individual goals and inform policymakers. First, we offer implications for how Gig2Gether could assist workers on supporting policy for *worker safety* based on the stories participants shared. Then, we explain ongoing challenges for building a data-sharing system that ensures anonymous and truthful sharing. Finally, we reflect over how to ensure data-sharing on its own is not conflated as a catch-all solution by imagining how a system like Gig2Gether can complement worker empowerment and collective action efforts.

6.6.1 *Gig2Gether: "A Door Between [Workers] and Politicians"*

Participants exhibited a weariness about whether actual policy or regulation would pass to improve their working conditions: "Except for you guys, no one is trying to help us . . . no one is trying to expose any of the issues . . . If there's an issue with a passenger, the politicians are all over it. But with a driver, [not so much]" (Driver-1). This skepticism for change is a natural barrier to the system reaching a critical mass of users before it can gain momentum in pushing forward policy initiatives.

However, participants were also **roused by the promise Gig2Gether represents as a vehicle for overcoming systematic challenges by enabling policymakers and advocacy groups access to data and issues workers face** for advancing change on labor protections and initiatives. In fact, although participants conveyed discourage-

ment that policymakers are more invested in addressing consumer protections than worker issues, we observed several participants discussed platform issues by explaining the negative impact on both workers *and* customers. For example, Petsitter-4 shared that Rover appears to be double charging fees on customers, and Driver-1 described how Uber's current verification policies puts drivers' and customers' safety at risk. [7] We also recall how Driver-7 suggested a new tag, "Political," for workers to use to prioritize which stories policymakers should see first. and explicit sharing settings that ask workers to share the information they just posted with policymakers and/or advocates could raise awareness for some participants about the potentials of policymaking and advocacy that can improve their working conditions. recall how Driver-7 suggested a new tag, "Political," for workers to use to prioritize which stories policymakers should see first, supporting workers' desire for such a portal between workers and policymakers and being heard. Though our field study period was limitated to one week, this is a nascent glimpse into how several participants used the platform to contribute policy-aligned narratives and suggestions. This leads us to wonder whether continued contributions to a data-sharing system can 1) gradually influence workers not usually inclined to participate in "political" initiatives, to re-frame their motivations for data contribution, and 2) foster cross-stakeholder collaborations for actionable policy goals.

Reflecting on workers' Stories also suggests to us Gig2Gether's potential as a mechanism to influence policy protecting gig worker safety—the top concern shared by workers in Stories—in meaningful ways. Most gig-worker legislation and regulations in the U.S. are on minimum pay standards (e.g., NYC, Chicago, CA, WA, MN, MA), and more recently data transparency (e.g., CO). Yet little exists for worker safety. Colorado's recent data transparency bill contains language around delivery worker safety, though the extent appears to require platforms to send the customer a nudge "to encourage the consumer to ensure driver safety upon arrival, including by ensuring a clear, well-lit, safe delivery path and ensuring all pets are properly secured." [1]. One of the more meaningful attempts was NYC's regulations for food delivery workers' physical health and safety: the text explicitly grants workers access to restaurant bathrooms and allows them to "set limits on travel over bridges or through tunnels and the distance between a restaurant and a customer".[8] Participants' stories on Gig2Gether were rich and *specific*, describing tactics for customers

7 We did not have a chance to ask if tying together worker and customer issues was unintentional or motivated by the belief this would garner strong policymaker attention.

8 https://www.nyc.gov/site/dca/workers/workersrights/food-delivery-worker-laws-faqs.page

trespassing property (Driver-1), experiences breaking up animal fights (Petsitter-1), clients violating Terms of Service (Freelancer-1). These were all serious scenarios that workers were unsurprised by — given their lived experiences — but are likely non-obvious for policymakers or the public at large. Taking inspiration from the example set by NYC's delivery worker protections, we propose workers' stories on Gig2Gether could be leveraged in bill writing to inform language and requirements that meaningfully protect workers' physical and mental well-being.

6.6.2 *Ongoing Challenges of Stakeholder Verification: Ensuring Anonymous, yet Truthful Sharing*

A data-sharing system that provides collective insights for different stakeholder groups must ensure both worker privacy (i.e., their data and identity in case of platform retaliation) as well as data reliability (i.e., that the contributors are real workers and the data is true and complete). Our pilots and field study were invite-only which allowed us to control access to only participants verified as qualified workers for our study. However, even with this closed system, we reflect on some challenges of securing a data-sharing platform faced by Gig2Gether and advocates or grass-roots organizations pursuing the same mission of data-driven insights towards worker well-being.

First, while building the system, we were unable to find platform APIs to link gig worker accounts and validate both worker identity and completeness of their platform data uploads. As noted by Dubal [104], third party data connectivity services exist [9], however these are expensive and have questionable data privacy and protection practices. Additionally, as our participants raised, manual entry would still be necessary for workers who accept off-app work. As discussed by Hsieh et al. [179], workers may take work off-app to make up for low wages on-app, which would be important for policymakers to be aware of to determine whether current gig work platforms are creating untenable wage conditions. During our field evaluation, we verified workers by asking them to share their worker-side app profiles over video during the Zoom onboarding session, but this process is not scalable. Outside of APIs or data portability services, there are limited fool-proof document-based methods to verify workers. For example, Upwork subreddit threads demonstrate this as an ongoing challenge even for clients trying to verify freelancers to hire. Finally, if

9 https://argyle.com/

Uber drivers could share the CSV files that they download from the Uber platform, this could be a more reliable method of verifying their identity and data because it would be difficult to fabricate such data. However, the other platforms do not have this data download as an option for workers and we did not want to put Uber participants at risk of deactivation by requiring them to upload this file a pre-requisite for participation in the study.

This leads to a related question for a publicly deployed system around the veracity of information. The challenges of affordable and accessible methods of data portability for participants to easily connect or upload their work data from different platforms will invariably affect the quality of collective insights and stories shared through the system as well as workers' trust in the data. One potential way of mitigating this for the Stories feed was suggested by Driver-6: Stories could be shared with related task-level data (e.g., a trip) as supporting evidence.

One caveat for data-sharing tools is Khovanskaya, Sengers, and Dombrowski [212]'s warning that creating new data tools, especially ones to be managed by a union, can potentially burden union staff rather than enable change. Indeed, despite how workers entrusted us (researchers) with data, and Petsitter-1's thoughts about how advocates should act as intermediaries for bringing a data-sharing more to the awareness of workers, it remains unclear how to address issues of ownership. Harkening back to a collaborative model proposed in [179], one could imagine involving researchers in the management of technical maintenance of tools but using them in collaboration with unions. For instance, researchers might explore stories and metrics together with union representatives and workers to create membership recruitment material they desire for collective action.

6.6.3 *Data-sharing as a Complement to Alternative Methods of Worker Empowerment*

We reflect that relying on data and policy as a standalone, catch-all solution should be cautioned against. Instead, we encourage researchers to consider creative alternatives and worker-driven objectives that would benefit if combined with data-sharing. We share two suggestions motivated by the different ways participants used or imagined using Gig2Gether, as well as prior research on worker empowerment and collective action.

6.6.3.1 *Informal Support Networks & Mutual Aid.*

Past work highlights the strengths of gig workers creating informal networks for mutual aid around purposes of companionship [308, 421], pooling financial resources [148, 345], as well as sensemaking and strategy sharing [269]. These efforts can and do exist outside of a data-sharing system, and we do not wish to overlook other forms of assistance by overemphasizing a solutionist notion of data. Uniquely, participants' use of and ideas for Gig2Gether's Stories feed suggests one way to complement worker mutual aid.

First, Petsitter-4's inquiry about networking with other petsitters on Gig2Gether reminds us that not all gig workers have a built-in community to lean on. Public online forums like subreddits have low entry barriers for seeking peers, but provide limited social connection— Reddit users are anonymous and do not undergo any verification. Meanwhile, mediums like WhatsApp groups and co-located gig workers can establish intimate connections, helping build necessary trust among workers for sharing mutual aid, but joining a group or finding peers to create one's own can be challenging.

We recall that participants found solidarity and reassurance in reading others' *Stories*, with some contrasting it as more productive and trustworthy than other forums due to its verified and "more serious" users. Promisingly then, we believe data-sharing systems like Gig2Gether could offer workers a different low-entry barrier option than Reddit that *does* allow for verification. This verification could help workers feel more comfortable and trusting of one another more quickly (akin to local Whatsapp Groups), an important baseline for successful social bonding. In this way, systems like Gig2Gether can be leveraged to strengthen workers' abilities to build personalized networks for mutual aid.

6.6.3.2 *Boosting Membership for Worker-Organizations.*

In the US, worker unions increasingly appear the news for activities related to collective bargaining (e.g., striking, calling for boycotts [322, 324, 418]) and policymaking (e.g., fighting against anti-union law or pushing for worker-centered laws [309]). In fact, across the board, the National Labor Relations Board (NLRB) report on recent data revealing how union petitions (i.e., requests to unionize) and support for unions to be on the rise [280].

Worker-organizing for platform gig workers has also gained traction, especially with the NLRB's 2023 reversion to a worker classification standard that offers gig workers a way to join unions [71]. Yet, it is unclear to what extent this has influenced gig workers joining unions or the impact across different platforms. Literature suggests that challenges in unionizing gig workers remain—Schou and Bucher [342] found that differences such as motivations and identities can lead to conflicting goals and hinder attempts at collectivizing, despite shared outrage over worker issues (e.g., wages). As a counter to those differences, worker-organizers have expressed interest in presenting workers with their data in formats like data probes to help them identify platform manipulation they perceive and incense them into formally joining unions [427] — echoing Driver-7's desire to use Gig2Gether for showing specific collective insights to workers around low wages to encourage a strike. Increasing membership would boost a union's financial power to create change as member dues are crucial for unions to operate successfully—e.g., organize campaigns, negotiate and enforce contracts, provide training and legal assistance [72].

Part IV

TOWARDS SCALABLE ADVOCACY

Breaking technological barriers between workers play an important role in unifying them toward common goals such as financial well-being and policy advocacy. But the power and bandwidth of workers alone is limited, especially when acts of resistance puts their financial and physical well-beings at risk. While Part II explored alternative futures with workers, platform designers and policymakers, this final part turn to gamified interventions as a means to garner consumers support and engagement in the advocacy for gig labor.

7

GAMIFIED DESIGNS TO DRIVE CONSUMER-LABORER ALLIANCE

In Chapter 3, our policymaker participants called for a shifted public perception of gig workers, one that overcome cultural stigmas as well as legal misclassifications. While Gig2Gether (Chapter 6) demonstrated the potential of a data-sharing tool to intervene in the current barriers obstructing information exchange among workers (and possibly policymakers), the perceptions of consumers remain one influential player of the worker-platform-client triangulation that we have yet to explore. Consumers shape worker conditions in significant ways, through expectations of service quality and pricing [430], ratings [268] and scaled collective political power [160]. But despite their influence, consumers remain largely unaware of the harsh realities workers face – Pew Research found that nearly half of Americans have never heard of the ongoing debate around the classification of ridehail drivers [10].

Meanwhile, many algorithmic management practices that platforms employ are deliberately opaque and undocumented, obscured from consumer perception and scrutiny. More inconspicuous tactics include (1) psychological strategies like gamification and ratings that manipulatively promote prolonged engagement and surveillance [54, 60, 366] (2) legal evasions of employer responsibilities and (3) undisclosed and unpredictable wage adjustments that reduce and minimize worker earnings [392]. A burgeoning body of work engage with workers to expose the hidden and undocumented risks of gig labor, offering worker-centered tools to collectivize and resist [180, 268, 425]. However, relying primarily on workers to push back against platform tactics and insufficient regulatory infrastructures can add to their vulnerabilities, financially, psychologically and career-wise. Consumers, on the other hand, have more capacity, resources and power to advocate for worker rights and conditions [263], but may refrain from broaching and contemplating these sensitive and uncertain topics in casual settings, such as a platform-mediated ride.

Gamification is one approach to motivate an audience to engage and empathize with serious but sensitive prosocial causes such as gender-based violence [329], interpersonal racism [379] and HIV prevention [166]. Specifically, persuasive game mechanics delivered through means of "embedded" messaging or interactive narratives

offer players immersive and empathetic spaces where they can learn about or experience driving conditions without being subjected to personally vulnerable positions. This study explores the potentials of game-based interventions as a boundary objects for mediating consumer education and discourse around the obscure and delicate dimensions of rideshare driving conditions. Previous works of persuasive games revealed their potential to transform players' attitudes and perceptions on serious social issues, while creating psychological distance between the player and intended message [81]. Leveraging techniques and frameworks from persuasive game design, we worked with rideshare drivers and passengers in a series of codesign sessions to explore whether gameplay interventions may transform passengers to understand, empathize towards, and advocate for the obscured realities of rideshare driving.

RQ 1 Which gamified experiences allow effective embedding of ridesharing concepts that drivers desire further advocacy for?

RQ 2 How can such playable interventions motivate consumer engagement and advocacy for the working conditions of rideshare drivers?

7.1 RELATED WORK

7.1.1 *Labor, Vulnerabilities and Consumer Knowledge Gaps in Rideshare Driving*

App-based rideshare services have proliferated in the US market since their introduction more than a decade and half ago, emerging as the largest sector of the on-demand economy [54], with more than 36% of the US adults having used rideshare services [199]. Pew research found that consumers with knowledge of the issue around driver classification were 20% more likely to desire further regulation of rideshare companies, yet the impact of this advocacy is limited by the lack of awareness – among 10 American adults, more than 4 have never heard about the debate, as of 2021 [10]. Meanwhile, public opinion surveys show consumers' conflicted opinions about the effects of platform-based gig work for laborers, with especially high ambivalence towards aspects of working conditions that are hidden from their purview – e.g., long-term consequences on career [160]. Consumer perceptions of a platform's working conditions also affect their use and recommendation of it, especially among users with more social consciousness [29].

Despite increasing concern, there remains a knowledge gap between consumer perceptions of gig work such as rideshare driving and comprehensive understand-

ing of the invisible risks, stressors, and vulnerabilities that drivers and other workers assume [176, 331, 372], along with unseen immaterial, emotional and logistical labor [100, 315]. Rating pressures (and their accompanying deactivation thresholds) represent one tactic that platforms leverage to discipline drivers [60]. Such reputational burdens coerce several forms of unpaid emotional labor from drivers, including expectations of maintaining a "friendly", "positive" and "respectful" attitude to please the passenger, regardless of how riders themselves behave [62]. But while drivers experience immense pressures to satisfy riders, passengers themselves may not be aware of the heavy implications that ratings carry [282, 315].

Workplace gamification is another psychological technique that platforms use to trick and coerce drivers to continue laboring under exploitative conditions [54, 306, 339] – which drivers resist [392]. Information asymmetries also deprive driver agency when platforms choose to withhold key details of a trip such as exact destination and fare [328]. The combination of such algorithmic management strategies and the consequences of intense competition (e.g., low wages, social isolation) creates immense psychological stress for drivers [23, 331] – who also deal with hidden health and safety risks from accidents on the road [247, 347], violence from passengers [250, 357], fatigue [198] as well as long-term consequences, including musculoskeletal and urinary disorders [23, 48]. However, many of these harmful but latent effects remain unobservable to passengers, while more delayed effects may also escape the notice of drivers themselves.

7.1.2 *Technological Advocacy for & Consumer Perceptions of Rideshare Driving*

Scholars at the intersection of HCI and labor studies made several attempts to leverage technological probes and interventions to surface and curb the harmful impacts of algorithmic management, as well as to advocate for and design alternative infrastructures that better prioritize driver well-being. Stein et al. [360] imagined alternative uses of their data and more plural sociotechnical infrastructures with drivers to uncover key design objectives surrounding privacy, agency and utility. Zhang et al. [425] invited drivers to propose algorithmic imaginaries that offer more worker-centered transparency, incentives and insights to drive well-being. Hsieh et al. [177] worked with multiple stakeholder groups to reveal need for platform-based changes, technological innovations as well as civic advancements such as more accurate public perceptions of workers. More recent studies stepped beyond co-design to reveal

the potential for data probes [425] as well as data-sharing tools [51, 53, 180] and collectives [178] to advocate and elevate worker priorities and objectives. But while these approaches demonstrated workers' shared motivations and offered techniques for collective accountability, sensemaking and decision-making, such interactions necessarily require effortful engagement and data contributions from workers, many of whom are locked into laboring for long hours to balance financial needs [409] with instability of job opportunities [**<empty citation>**], making it infeasible for them to engage in additional (uncompensated) interactions.

Meanwhile, the ways in which rideshare passengers perceive and interact with driving conditions remain relatively underexplored. But more than workers (service providers) or platforms, consumer behavior plays an indispensable role [160]. In particular, how consumers perceive the work conditions and quality of a platform's service directly influence their use and recommendation of the provided service [29], and such perceptions at scale carry immense political power [162], which platforms seek to influence. Recognizing their foundational role, Healy and Pekarek [160] raises the question of whether workers can "gain support from consumers they serve, altering the power in this triadic relationship?" In the space of food delivery, Meijer et al. [263] began probing this space by prototyping an interaction that provided users with their courier's demographic information during waiting time, which shifted users away from affective empathy, but toward compassionate empathy – an experience that incentivizes further prosocial actions to help others [230]. But while technology-mediated interactions show promise for fostering users' interpersonal empathy for individual workers, it remains unclear whether they hold the potential to cultivate consumer empathy in a way that motivates them to further care, take action and advocate for vulnerabilities that affect the broader, scaled ridesharing driving workforce – objectives that are related to but opposing the intents of "consumer empathization", which rideshare platforms adopt to establish legitimacy for their businesses [140].

7.1.3 *Gamification Techniques to Convey Driver Vulnerabilities & Experiences*

A key barrier to approaching the challenges of rideshare work is the sensitive and private nature of financial and emotional vulnerabilities [335], which can prevent consumers from learning about the hidden labor and logistics that drivers manage (§7.1.1). Gamified environments present a balanced opportunity for safe and inclu-

sive spaces that foster awareness of sensitive [207, 379], complex, and overlooked topics [313]. In the context of ridesharing, gamified interactions offer opportunities for (1) creating psychological distance with players, who can explore the working conditions of rideshare driving in fictional or virtual spaces without being personally subjected to vulnerabilities, and (2) simulating gamification tactics that platforms impose to exert psychological control.

Games design has historically functioned as a medium for promoting critical thinking and social consciousness around pressing societal issues, ranging from racism (e.g., *SimCity* [128]) to colonialism (e.g., *Civilization* [274]) to capitalism (e.g., *Animal Crossing* [40], *World of Warcraft, Second Life* [154]), including specific dimensions such as immaterial labor (e.g., *Mario* [321]). More intentionally, persuasive games leverage techniques such as procedural rhetoric (the use of rules, mechanics and decisions) to model and portray social systems [39], embedded approaches (e.g., distancing and intermixing) to address controversial topics, as well as empathy-building methods like narrative role-play (and role reversal [222]) to affectively and emotionally engage players in the perspectives of marginalized and constrained groups [82, 127]. In a related context, Popan, Perez, and Woodcock [303] attempted to leverage role-playing to foster empathy and mobilization among workers. However, targeting drivers as the primary player audience not only requires extra effort from already-burdened workers (§7.1.2), it also forfeits the opportunity to engage consumers, a population containing both potential driver advocates and future drivers – groups that can gain more (compared to drivers themselves) from knowledge on hidden risks and conditions of rideshare driving.

7.2 METHODS

7.2.1 *Phase 1: Goal Delineation through Literature Review & Formative Interviews*

Given our unconventional and interdisciplinary problem space (i.e. advocate and surface underexposed rideshare driving risks and vulnerabilities), intended audience (i.e. passengers) and goal (i.e. motivate passenger understanding and advocacy for drivers' labor conditions), we followed several key steps and cycles of the (Tandem) Transformational Game Design process [81, 380]. To begin, we delineated our goals of surfacing key conditions of rideshare driving to engage passenger understanding, empathy and advocacy through a review of relevant literature and games –

which we overview in §7.3.2. In parallel, we identified potential techniques and genres from scholarship on transformational, serious and persuasive game design that may support our goal of motivating passengers' perception change around rideshare driving conditions (§7.3.1). Next, we conducted formative interviews with a 2 drivers and 3 passengers to garner initial ideas and understanding around latent rideshare topics that drivers desire to communicate to passengers, levels of comfort and concern for a passenger-facing game addressing such issues, as well as preliminary reactions around (and suggestions for) potential game genres to implement.

7.2.2 *Phase 2: Iterative Game Prototyping*

Based on driver and passenger feedback from the formative study, we implemented three preliminary game prototypes (§7.4) and presented these to 7 drivers across two codesign workshops. During the sessions, we inquired about their prioritized rideshare driving conditions to share with passengers, probed for initial reactions and hesitation to prototypes and their conveyed concepts, and ideas for alternative game designs or concepts to embed that align with the overarching goal. After this first round of driver feedback on initial prototypes, we completed another round of goal delineation [380] by mapping relevant concepts in rideshare driving from the literature and highlighting concepts that (1) drivers prioritized communicating to passengers and (2) key issues and vulnerabilities that are under-exposed to riders. Leveraging drivers' feedback around game mechanisms from the first two workshops, we iterated on game mechanisms and prototypes.

Next, we invited passengers in a set of workshops that assessed their initial understandings and concerns around rideshare driving, gathered evaluations of prototypes based on several key heuristics, as well as hesitations and ideas for alternative interactions (both game-based and otherwise) that align with our study goal. To continuously adapt prototypes based on feedback, we also held two more workshops with drivers — DW4 & DW5.

7.2.3 *Recruitment*

During our formative interviews, we recruited 2 drivers based on contacts from prior studies, as well as 3 passengers based on convenience sampling from our home universities. For co-design workshops, participants were recruited from a combination

ID	Age	State	Gender	Income	Platforms	Drives to Commute	Employment
P1.1	18-29	MA	Non-binary	$12k - $50k	Uber (4.94), Lyft	<Once a year	5-10 years
P1.2	18-29	PA	Male	$12k - $50k	Uber (4.81)	Never	<3 years
P1.3	18-29	CA	M	$100k - $200k	Uber, Lyft (5)	Everyday	<3 years
P2.1	18-29	CT	M	$50k - $100k	Uber (5)	Everyday	3-5 years
P2.2	65+	NV	F	$50k - $100k	Uber (5)	Never	10+ years
P2.3	18-29	IL	Undisclosed	$12k - $50k	Uber: (4.68)	Never	3-5 years
P2.4	30-44	NY	M	$100k - $200k	Uber (4.9), Lyft	Never	10+ years
P3.1	18-29	NJ	F	$50k - $100k	Uber (4.98), Lyft (5)	Few times / year	<3 years
P3.2	18-29	MA	M	$0 - $12k	Lyft (5)	Everyday	3-5 years
P3.3	45-64	TX	F	$50k - $100k	Uber, Lyft (5)	<Once a year	10+ years
P3.4	30-44	PA	M	$12k - $50k	Uber (4.9), Lyft (4.9)	Never	10+ years
P4.1	18-29	MA	M	$50k - $100k	Uber (5)	Few times / year	<3 years
P4.2	18-29	NJ	F	$12k - $50k	Uber (4.99)	Never	3-5 years
P4.3	45-64	FL	M	$100k - $200k	Uber (4.90) Lyft (5.0)	>Once a week	10+ years

Table 21: Passenger Demographics

of past participants, subreddits, Craiglist posts and physical flyers in local professional communities. Participants were compensated at a rate of $60/hour and selected based on eligibility, location and experience levels, indicated by pre-study screening forms. Table 2 summarizes participant demographics.

7.2.4 *Thematic Analysis*

After our workshops, three researchers coded all 12 hours of workshop transcripts (transcribed by Otter.ai) to extract important themes and opinions on improvements for each prototype. Then, we combined all individual driver codes in an affinity diagram to map out common ideas, extracting 8 main categories in codes: existing practices/strategies, frustrations, reactions to prototypes, design objectives, alternative gamified interactions, alternative interventions, current customer perceptions, and additional knowledge passengers should know. The first two and last three categories helped us understand how well our prototypes capture the proper driver experience, while the remainder guided our next iterations of prototyping, where we presented the most recent iteration available to each workshop to run our iterative design process and workshops in parallel. Additionally, we also used these codes to eliminate less effective prototypes and introduce new approaches.

7.2.5 *Positionality*

We reflect on ways to center worker experiences and reduce replacing their voices and opinions with our own values and epistemologies, especially since we examine participant vulnerabilities at work. Our team members receive training in Computer Science, Media Arts & Sciences, Software Engineering and Human Computer Interaction, where two authors have experience researching and working with rideshare drivers. One author has part-time experience working for a food delivery platform, while two authors have extensive experience laboring across service occupations.

7.3 GAMIFIED INTERACTIONS TO SURFACE DRIVER VULNERABILITIES

Presently, we are aware of only one system occupying the space of in-ride interactive games: the Play Octopus network that provides drivers with in-car tablets containing advergames. Marketing itself as the world's "largest rideshare advertising network", games such as trivia on Octopus primarily serve as rider engagement tools that generate advertising revenue. Since our gamified interactions aim to convey hidden driving conditions to riders, we draw from the game design and heuristics literature to identify relevant strategies that can maximize the effectiveness of the intervention. Additionally, we identified three key criteria specific to the rideshare context based on pilot interviews and reflections of the study aim. Below we discuss each design criteria and Table **??** shows how they applied to prototypes.

7.3.1 *Game Design Criteria & Heuristics*

7.3.1.1 *Replayable*

One measure for evaluating whether a game is engaging is the player's desire to replay [93]. Replay can enhance learning around educational contents of the game [244], making it crucial for achieving our intended goal of helping passengers achieve further understanding around rideshare driving experiences. Increasing replays of a game also promotes social interaction among its players (e.g., discussion of its content) [129], which support our objective of promoting understanding and advocacy around ridesharing driving conditions.

7.3.1.2 *(Timed) Challenge*

Another standard heuristic for game playability centers the level of challenge or difficulty involved for players to reach a winning condition. Malone [255] defined that a challenging game must contain "*a goal whose outcome is uncertain*", while Desurvire and Wiberg [94] further refined the heuristic by also considering its balance with pace: "*well-paced challenge(s) that makes the game worth playing*". In both video and mobile games [93, 221], the presence of a challenging goal is central to creating an engaging and enjoyable experience for the player. For ridesharing, a time challenge not only creates well-paced and enjoyable play experience, it can also serve to simulate realistic time constraints that drivers face [23]. However, we refrained from incentive mechanisms such as leaderboards or challenges to contacts (e.g., friends or family), which carry risks of trivializing sensitive topics such as driver vulnerabilities [329, 403].

7.3.1.3 *Embedded Design*

Kaufman, Flanagan, and Seidman [207] recommends embedding persuasive messaging in more "*stealthy*" ways to make players more receptive to the intended message. Below, we overview how we can leverage the three strategies of embedded design — i.e., intermixing, obfuscating and distancing — to effectively convey knowledge on latent aspects of rideshare driving.

Intermixing By interspersing both on-message and off-message material in a game, intermixing helps ease a player into intended themes – offsetting potential discomfort and initial reservations from players when presented with an emotionally-taxing topic such as sexism [**chimeria**]. The combination of thematic and playful content reduces chances of a player interpreting interactions as interventions, allowing them to subconsciously internalize the game's messaging. In the context of rideshare, a passenger who resist knowing the effects of their actions and participation current rideshare platforms could be adverse to overt designs that center rideshare driving conditions. However, when driving content is interwoven, platform changes from a gamified intervention to a more player-friendly game with informative elements.

Obfuscating Obfuscation refers to the technique of concealing the persuasive intent of serious and purposive games, reorienting players' objectives towards more

apparent game mechanics and goals to bypass their psychological defense against the underlying message and objective. To conceal intents, obfuscation frames serious messages in a way that covertly introduces the persuasive material, while still provoking critical reflection within the user. Obfuscation has been leveraged to approach many serious and sensitive topics, such as bias against women in STEM [130], the complexity of social identities [**buffalo**] as well as health advocacy [207]. Similar to effects of intermixing, obfuscation can help players avoid feeling pressures of their identity as a passenger, which can often impose stressors upon drivers due to their relative lack of power in the rideshare context.

Psychological Distancing through Fictional Narrative In both interactive and immersive forms, fiction is shown to be an effective medium for communicating complex and sensitive social experiences, including gender-based violence [329], interpersonal racism [379], healthcare [187]. Aligned to goals of this work, fictional and immersive simulation of social experiences also facilitate audiences' reflection [**close**], empathetic growth [141, 257] and prosocial behaviors [251, 415]. By creating safe spaces where players can explore sensitive topics (driver vulnerabilities in our case) without directly experiencing harmful and disturbing work conditions, a fictional game carries capacity to augment passenger knowledge and empathy for the labor, logistics and vulnerabilities of rideshare driving.

7.3.1.4 *Rideshare-specific Criteria*

Atop relevant game design criteria from the literature, we also reflected upon formative interview findings with 2 drivers and 3 riders, as well as our own knowledge of design and app-based labor to elicit potential requirements for the rideshare context.

In-Ride Compatibility Passengers in our pilot studies expressed a common preference for "*lightweight*" and easy-to-pickup games that minimize chances of car sickness. Despite this preference, R2-3 also desired realistic simulations of rideshare driving. Driver D2 suggested leveraging the Octopus tablet currently in their backseat to more naturally integrate and implement rideshare-related content.

Before implementation, we verbally considered with pilot passengers ideas of integrating rideshare content with puzzle, trivia, simulation, visual novel, or social party games. Both drivers supported the idea of connecting with and engaging passengers

through gameplay, but D1 cautioned how embedded content should not come across as a way to "*vent your complaint*" to passengers.

Interactions with Drivers When discussing preferred genres, R2 indicated more interest in simulations that shed light on how drivers "*talk to the person in the backseat*", since they're not a fan of actual driving. Similarly, R3 suggested interactions where "*you have to talk to the driver, or engage with them*".

Ground Truth Answers To most effectively reconfigure the role of passengers in understanding and advocating for worker conditions, concepts should convey accurate and believable information regarding the rideshare context. The ground truths are apolitical and generalizable, making them easier to disperse as the player learns them, and extends the reach to a larger audience.

7.3.2 *Problem Space: Embedded Rideshare Driving Concepts*

In addition to eliciting design criteria during pilot interviews, we also sought to understand key ridesharing challenges drivers wanted to convey to riders through gamified interactions. We report drivers' support for and hesitations around the idea of fostering rider understanding and empathy, as well as passenger preferences and motivations for engagement.

When probed about their experiences talking to passengers about driving conditions, D1 shared how "*Very few [passengers] – maybe one or two – out of the couple thousands of rides I've done have asked me what my pay for that ride versus what they were paying. So I think [they] probably don't know [or] don't care*". D2 similarly shared how only folks with experience working on "*a gig app . . . or if there's somebody in their immediate circle of life (friends or family) that does it*" are likely to know anything about it, suggesting that passengers lack motivation, spaces or occasions for learning about ridesharing conditions.

The three passengers recognized and reflected on their limited knowledge around the current state of rideshare driving, including conditions, policies, and platform logistics. However, in contrast to pilot drivers' perceptions that passengers "*just didn't care*", riders we interviewed expressed curiosities to learn. In fact, all three passengers indicated that the inclusion of content related to rideshare conditions would motivate gameplay, with R1 relating that "*[he]'ll be more inclined to try it out*" while

	Replayability	Obfuscating	Intermixed	Fictional World	Timed	Ground truth answers	Playable in-ride	Interaction with driver
CrossRoads	X	X				X	X	X
Driven	X	X		X			X	
TriviaRide	X		X		X	X	X	X
Dilemmas @ Work	X		X					
Driving Questions	X		X				X	X
Ticking Roads	X	X		X	X		Mobile-Only	

R3 and R2 shared that *"[she] would definitely play a rideshare driver simulator . . . where your goal is to get from one place to another"*. Overall, riders expressed interest around how platforms function and the appeals of rideshare driving as an occupation.

7.4 PLAYABLE PROTOTYPES EMBEDDING RIDESHARE CONCEPTS

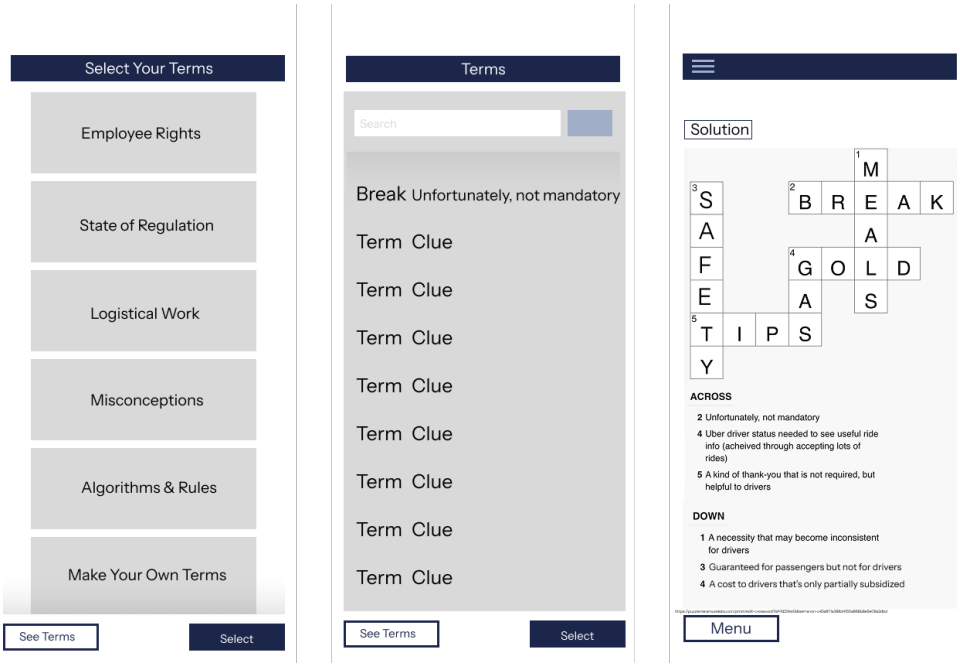

Figure 5: CrossRoads contains driver-selected rideshare concepts

7.4.1 *CrossRoads*

Resembling standard crossword puzzles, CrossRoads embeds rideshare-related terms and clues to expose such knowledge to passengers. In addition to incorporating ground-truth rideshare concepts, CrossRoads contain mechanisms allowing drivers to pick and define their own terms and clues, affording them agency to select rideshare topics most relevant to their own experiences while improve replayability of the game for passengers across rides. The puzzle nature of the crossword orients players to focus on character order as opposed to the rideshare-related terms, but the small screensize of mobile and tablet devices limits content and therefore potential to introduce intermixing. In this prototype, we embedded concrete definitions of concepts (fulfilling requirement for ground truth answers) related to driver rights, regulations, algorithmic management strategies, and logistical burdens.

While driver D2.1 saw potential in CrossRoads as a "good distraction" from work for riders, others found it "boring", cognitively demanding, and criticized its lack of a "social loop" to interact with the driver, as well as in failing to contribute to "energy I'd want in a fun way" (D2.2). Combining these concerns with the difficulties of typing on a tablet keyboard, we decided to eliminate this prototype after the second driver workshop.

Figure 6: Dilemmas @ Work contain black cards representing (rideshare) work dilemmas & white cards with actions to take in response

7.4.2 *Dilemmas @ Work*

Based off of the popular social party game *Cards Against Humanity* and inspired by related applications of the card game towards discussion of contexts such as AI ethics [408], as well as driver-led advocacy [303], we adapted card decks so that black cards represented work dilemmas that drivers and traditional workers might face in their everyday labor – leveraging intermixing (§7.3.1.3). Correspondingly, white cards depicted potential strategies for handling the various dilemmas presented in black. Designed for a physical social context, the random dealing of cards each round creates a replayable (§7.3.1.1) experience even among the same group of players. Meanwhile, the objective of humoring the dealing player of each round serves to obfuscate the concepts rideshare vulnerabilities.

Participants of the first driver workshop ranked Dilemmas @ Work as the lowest amongst presented prototypes, explaining how its design to operate outside of a ride

discourages engagement with the topic: "I don't know that I would see many people actually doing it, if the purpose of this is to educate riders on the driver experience", especially since they believed "the impetus for any of these games would be [with how they are played] during a ride" (DW1.1).

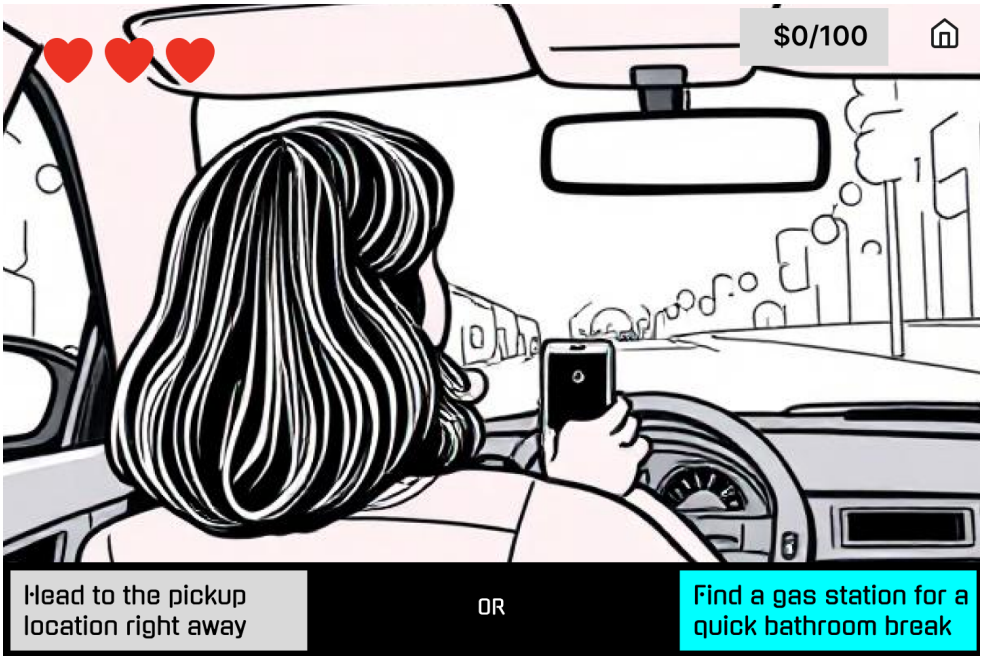

Figure 7: Driven is visual novel with point-and-click options that advance plotline of two rideshare NPCs

7.4.3 *Driven*

The visual novel used feedback we gathered from the first participants who said they wanted something low-impact and casual, but were still drawn to an engaging story. The visual novel started with one story that centered around a few decisions a driver would have to make in both earning money through the app and in their own life. The story follows David Luiz, a father who was recently laid off from his job who starts ridesharing to make ends meet. Players make select 1 of 2 options similarly to a choose-your-own-adventure novel. This game deeply centers around the work-life

balance that is often a struggle while ridesharing. Driven touches upon rideshare challenges such as deadheading, work-life balance, and algorithmic management.

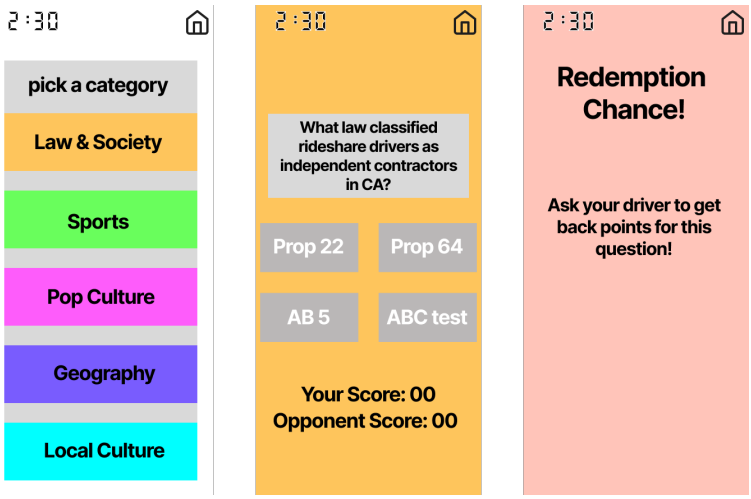

Figure 8: TriviaRide is a timed challenge with optional driver interactions and embedded rideshare concepts

7.4.4 *TriviaRide*

After pilot interviews, we focused on the games that were best received both for their gameplay styles and ability to have rideshare concepts embedded. The first prototypes we made were of a categorized trivia game and a narrative visual novel. The trivia game initially consisted of four categories: Social Studies, Science, Pop Culture, and the Arts. The original game is played against a hypothetical opponent with the goal being the first player to get 6 correct answers. It contained questions about the policies and information on the ridesharing platform, such as 'What law classified drivers as independent contractors in CA?' as well as unrelated questions that are more rooted in general trivia. The intermixing allows the game to feel playful and approachable for every user without the rideshare concepts becoming overwhelming.

The nature of TriviaRide requires the use of ground-truths as it relies on a correct/incorrect binary. The facts related to rideshare do not require a background

in the platforms when re-attempted, allowing the answers to questions like "Which location is the most lucrative for drivers?"

In later versions of the game, the first-to-six objective was replaced by a timer and point system. D2.2 stated "I think putting a timer would be very good, like, you know, the urgency to answer the question" reaffirming the timer fulfills the paced challenge necessary for enjoyable gameplay.

D2.2: adding a driver-passenger collab mode would be super cool. Not everything needs to be complete feel. A game where we solve a puzzle together

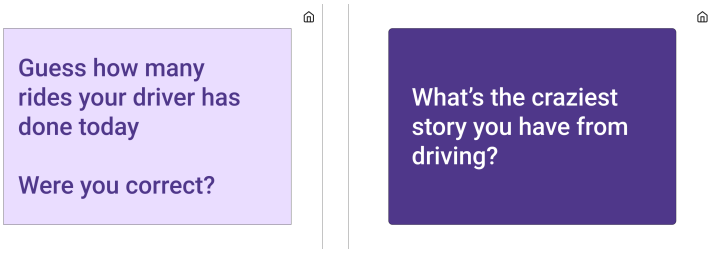

Figure 9: Driving Questions attempts to bridge the rider-driver social gap with conversation prompts for both sides

7.4.5 *Driving Questions*

Inspired by the game *We're Not Really Strangers* (WRNS), *Driving Questions* was conceived when D1.2 suggested more interactions and connections between the driver and passenger, on an emotional level. WNRS is a conversation prompting game where the player takes turns asking and answering questions. Driving questions serves as boundary object to mediate conversation between drivers and riders, keeping conversations related to the driving conditions while allowing the rider and driver to get to know each other as people. We repeatedly updated the content to arrive at less intrusive, as well as more locally grounded and clear questions. Since driver-passenger pairings in rideshare are almost always unique, there is strong replayability. Ticking Roads fulfills replayable criteria and intermixed embedded design. The game has a limited selection of questions, but its conversational nature makes responses vary with every new passenger-driver combination. Concepts embedded included mental health impact, platformic logistics, take rate.

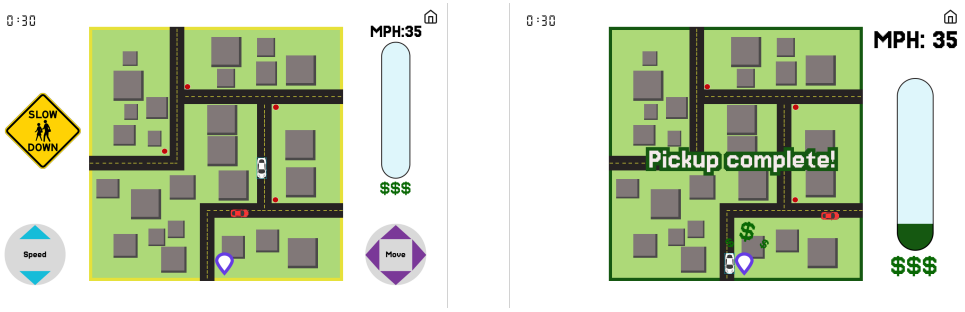

Figure 10: TickingRoads simulates rider pickup (logistics) and immediate feedback from controlling a car on the map

7.4.6 *Ticking Roads*

Ticking Roads is a time management game that surfaces stressors of the road to players through simulations of rideshare obstacles on a map. Players undertake the driver task of picking up passengers at designated locations on the map, and receive feedback when performing actions to deal with such tasks (e.g., move around, speeding up/down, waiting at pick up location). By framing stressors as obstacles and adding timed pressure, Ticking Roads diffuses the objective of exposing rideshare conditions with time pressure – leveraging the timed challenge to achieve obfuscation. Although not realistic, Ticking Roads also offers a fictional and abridged simulation of logistical stressors and burdens encountered by drivers on the road, thereby creating psychological distance between the player and underlying intention.

7.4.7 *Initial Driver Feedback Implementations*

Drivers of the first two workshop sessions made several concrete and adaptable suggestions for the prototypes. Responding to their feedback, we removed two prototypes (i.e., CrossRoads and Dilemmas @ Work) and added a time management game, a conversation prompting game as well as a game selection menu screen.

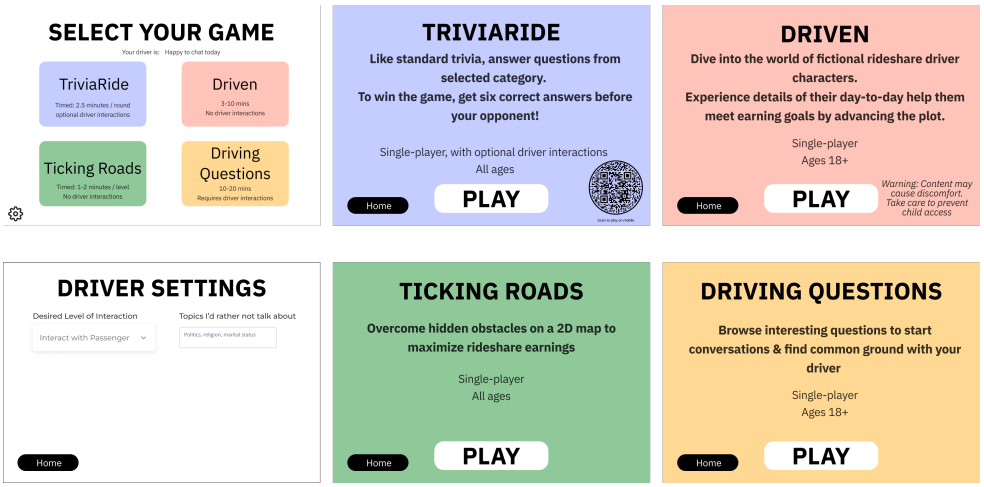

Figure 11: Menu selection enables passenger selection of games with driver-preference awareness

Menu Selection Driver workshops 1 & 2 revealed a high demand for a selection screen allowing riders to choose what game to play, since "the customer should always have a choice" (driver workshop 1 31). To accommodate this, we added a menu selection screen at the start that briefly previews each game's goals and mechanisms. The main selection menu addresses riders' concerns over drivers' comfort levels with passenger interaction during a ride, since "some drivers [. . .] want a situation where they never have to say anything." (driver workshop 1 36).

On the rider's side, players see all four playable games with estimated time spans and driver interaction levels listed, allowing them to quickly eliminate long during short rides, and select appropriate interaction levels based on mood and atmosphere. After selecting a specific game, a fuller description of the game is displayed, along with the number of possible players, allowing players to systematically eliminate games inappropriate games for their context and ensuring more captivating, engaging and educational experiences.

Drivers can indicate a preferred interaction levels with passengers, ranging from "not at all" to "anytime" and specify topics to avoid in discussion. The interaction input options from both stakeholders aims to minimize pressures to discuss (rideshare concepts). The bottom left image in Fig. 1 shows drivers' selection screen, while the rest of Fig. 1 shows how riders' selections react to driver preferences. This selec-

tion gives drivers agency to steer away from personally sensitive themes or difficult questions.

7.5 RESULTS

Driver generally expressed enthusiasm for fostering passenger understanding and empathy, with participants like D2.2 who sharing excitement for creating reflexive and memorable experiences around theirs rideshare knowledge: "*making them go* 'yeah, man, I never thought about it like that' *and that's what makes a game memorable*."

7.5.1 *Consumer Knowledge Gaps & Drivers' Prioritized Concepts*

Here we selectively report the most prominent themes from the series of three driver and passenger workshops: **pay rates**, **platform management**, ... This section also includes themes around **covert logistical, emotional and immaterial labor**, including vehicle-related responsibilities such as gas, oil changes and general car maintenance or in-ride labor to keep the temperature and mood comfortable, as well as the ride itself safe and stable. We discuss in 6.2 how gamified interactions can assist drivers with service-oriented responsibilities inside the vehicle during rides.

7.5.1.1 *Pay rates*

A wide variety of stressors plague the daily operations and well-beings of drivers, but none surpassed pay in terms of prioritized topics to communicate to riders. Drivers described rampant passenger misunderstandings around pay rates. For instance, driver relayed how many "*think that, if the fare is $100 that we make $85*" or how "*everybody has a 30% number in their head of what Uber takes, [...] which is just simply not the case*". This common oversight motivates drivers to explain hidden costs to their passengers: "riders think is that drivers are just sitting around and waiting for easy money [...] what they don't see at the dead miles between things, the gas, the maintenance, the insurance [...] A good night isn't always as profitable as as it looks" (D2.2), D3.2 similar shared how they would "*love [passengers] to know that I don't really get the full fare they are paying. [...] Uber first of all, take their cut, then I cover fuel, car maintenance, time – all these are swallowed by [what's broadly considered] service.*" A direct result of this passenger misunderstanding is their disincentivization to tip: "*they assume a lot of times that they don't have to tip [...] they feel like their charge all goes*

to the driver". D1.1 explains how pay overshadows other concerns since adequate compensation may alter their perception of all other stressors they experience:

> "*If we are investing our energy, our time, our efforts, frankly, we just don't [want] a feeling of being taken advantage of [. . .] of being manipulated [. . .] of being not cared about. I want to feel like somebody gives a [expletive] about me for the energy I'm putting in, [like] I'm making the money I'm making.*"

Corroborating driver observations, passengers (e.g., all members of PW1 & PW3) were also "*surprised about the 30% [take-home rate our drivers estimated.] I didn't realize that it could be that low. That's bad.*" In the case of a more sympathetic rider who has asked drivers about rising take rates, P2.2 observed how "*all the drivers are anxious to answer [. . . to ensure] riders know that even though [passengers] are paying more, [drivers] are not making more*".

7.5.1.2 *Pickup Logistics*

One overlooked factor impacting pay is the time that drivers spent waiting for passengers during pickup. Drivers such as D3.2 discussed the consequences that pickup delays carry for earnings: "*I don't get paid to wait at pickups, [. . .] when you keep me waiting like 5-10 minutes, I'm not really getting paid for that time [. . .] that's time and fuel I'm losing, with little or no extra pay.*" Besides financial losses, details how platform mechanisms fall short in ensuring timeliness of passenger arrival: "*I'm sure the customer doesn't really pay that much more in wait time [. . .] it's not enough to be prohibitive. [. . .] It's almost like they encourage like [platforms] want to encourage that*", while D3.3 "*second[s] that the waiting time is really expensive, especially when gas prices go up [. . .] depending on what car we're using to drive it could just eat into our profits* so bad, *and I feel like only us drivers really understand that.*" Other road conditions such as parking availability also impact drivers during pickup, D1.2 describes a time when

> "*I had to pick up someone, it was center of the city, and there's literally is no parking, it's red lanes on both sides – bus only lanes. You can't drive in those lanes. You can't stop, you can't park, you literally just can't be in those lanes. So I was sitting in that lane waiting [and] of course, the bus came through. I got a ticket.*"

Passengers also expressed curiosity around pickup mechanisms. P3.3, for instance, wonders and worries about how their suburban location impact driver earnings "*I*

live in a suburb . . . and I always wonder, if they're . . . having to drive so far to each location to drive people around, I don't think they're getting paid between the different ones. . . . I always wonder if they're making a lot less money and just driving basically for free between the places." Relatedly, P3.3 then considers how location affects driver arrival time and her own passenger ratings: "*they come really early sometimes. And I always wonder, do they mark off if you don't come right out? If we say, come at 5pm and they come in 4:45pm, and we don't come out, I wonder if they mark off [my passenger ratings]. Because well, it's not my fault.*"

7.5.1.3 *Rating Pressures & Passenger Expectations of Service*

Driver ratings constitute another notable variable that exerts psychological control in rideshare labor, since drivers with ratings under certain thresholds may experience platforms' elimination through deactivation [333]. However, passengers with high expectations and little awareness around the harsh effects of ratings will often "*give low ratings for things out of my control – e.g., traffic delays, being in a rush, or even misunderstandings over route choices – so ratings feel personal, but the reality is more complicated*" (D3.1). However, drivers point to a plethora of factors, stressors and costs that remain behind the scenes, the invisibility of which drives up passenger expectations of service and thus rating pressures:

> "*Ratings can drop for stuff I can't control: sometimes I'm reading the vibe and giving folks their space, not just ignoring them. We are not just driving, we are juggling through navigation, personalities and keeping things safe. The app itself is not perfect, it doesn't show everything we are dealing with, so [passengers] should be a little bit more understanding.*"

Drivers across workshops consistently describe the misconceptions that passengers hold, which lead to unrealistic expectations of how drivers should manage conditions inside and outside of the car. Inside the car ride, D3.4 relates

> *riders expectation are so high [. . .] the AC must be perfect all the time, the car must be super clean. They're expecting a premium vibe, but [the] trip is [just] a regular Uber [. . . and even though] comfort trip pays just a little more, but the rider expect luxury treatment.*

At the same time, drivers must also deal with external road conditions. But riders often expect perfectly managed traffic: "*riders assume I have full control over traffic [for]*

pickups or that I'm just screwing around if I'm a minute late. There's construction, detours, sixth street chaos and airport gridlock, stuff that slows me down"

7.5.1.4 *Platformic Management & Long-term Consequences*

Drivers also reflected on platform mechanisms of psychological control as well as longer-term financial and health consequences of taking short-term risks. Unlike abovementioned stressors that passengers expressed curiosity for, these hidden consequences are designed to remain unobservable to riders. Confirming related works around psychological and algorithmic control, D1.2 describes notifications as an intimidation tactic "*[platforms]'ll send out a notification that basically says, '*We noticed that you're putting on last rides. As a reminder. You should only use last ride when you're when on your last ride. Drivers who do this, blah, blah, blah, blah.*' They don't [actually] point to the terms of service. It's [expletive], but they do it all the time, and it's intimidation.*"

Besides app mechanisms, drivers also described how platforms incentivize them to take short term risks for small rewards (e.g., bonuses or pay boosts) without considering longer-term consequences. For instance, D3.3 describes sacrificing bathroom breaks to maximize time for bonuses:

> *Because even those few seconds, even though I pee fast, it can make the difference between capturing it and not capturing it. We shouldn't be facing those choices. Most people, it's within reason. They can go to the bathroom on their job without facing, bonus losses [. . .] The pay boost isn't always worth the effort. Sometimes it comes down to, do we even have the time to use the bathroom? What if for that I have to go to a doctor, having to pay more money than I would've even got with a little bonus?*."

In DW1, drivers discussed the tradeoffs of considering cash rides [1], with D1.1 starting off the topic when discussing how conversations with passengers that expose low take rates will often lead up to the action: *"[after] those conversations, you can very easily flip them to cash rides and [expletive] Uber completely, which is what more and more drivers are doing nowadays. Because frankly they're saving the passenger money, there's a lot more risk with regard to commercial insurance and the risk side of it, but a lot of drivers, they're so desperate [. . .] stuck between a rock and a hard place [. . .] They take these*

1 strategy where drivers and passengers mutually agree to pay in cash to avoid platform fees

risks simply because they're not being paid." In addition to D1.1 acknowledging serious insurance and deactivation risks involved with cash rides, D1.2 also supplemented how "*if [he] were to get caught doing that, it is a mandatory impounding of the vehicle [for] the charge of providing commercial transportation in a non-commercial vehicle*".

7.5.2 *Consent & Content in Gamified Rideshare Interactions*

7.5.2.1 *Overcoming Driver-Rider Social Boundaries*

Both riders and drivers expressed inherent hesitancy to initiate conversation. Up front, drivers feared putting customers on the spot since "*not every rider wants to interact. And if the game feels too personal or like a distraction from driving, it can backfire*", and expressed concern over approaching overly heavy or suggestive topics such as "*sexually suggestive or flirty questions? No, no, not, not the place [. . .] It's gross, it's unsafe, and it creates a very dangerous precedent, especially for for women drivers and riders*" (D2.2). In the backseat, passengers observed and respected drivers' rating pressures that compel them to keep riders comfortable in terms of conversation topic, noting how "*in a car there is that dynamic of: they don't want to make you feel uncomfortable, and if I just bring up a topic that makes them feel uncomfortable, I don't think that [helps]*" (P2.3) while P2.2 acknowledges

> "*a fine line between having a genuine interest and prying [. . .] as passengers, we have to be conscious of the fact that these drivers don't want to offend us, because after all, their rating is at stake, so questions should not be intrusive*"

Driving Questions presents an opportunity to bridge the social boundary between drivers and riders. For instance, P3.3 identified as "*an introvert [. . .] and I have trouble starting conversations [. . .] but it's something this game would help me be more talkative, because it gives me things to say*". However, the opportunity to bridge the social barrier also introduce risks of intruding privacy. For example, discussions about pay (a prioritized topic by drivers – §7.5.1) makes passengers such as P3.1 "*feel uncomfortable asking them how much they're getting paid, or their take home pay*", let alone more personal inquiries about what drivers miss (7.4.5), since "*it can be painful when you leave your home country*" (P2.2).

7.5.2.2 *Balancing Lighter Logistics & Heavier Labor Topics*

Passengers took care to minimize belittling or criticizing of drivers. For instance, self-conscious riders such as P1.2 "*don't really feel that it's like right for me to criticize the way they're doing their job, because I don't really know anything about what it's like being a rideshare driver*", while P2.2 recognized the power differential they held over drivers: "*it is important that we recognize what our position is in the rideshare thing, and we don't offend people or put them on spots*". Despite the hesitation to upset drivers, passengers felt comfortable discussing more rideshare-specific logistics, including the number of rides the driver has completed or reasons for cancellations (P3.3), time spent between rides (P2.2), or how ratings compare to those of other service platforms (P2.3).

For heavier topics, the visual novel was effective at presenting heavy and thought-provoking topics (e.g., harassment or family obligations) in creative and memorable ways (D2.2, D3.1), but also runs the risk of being too long or heavy for the ride. Thus, even though passengers found the visual novel thought-provoking (P1.4, P2.4, P3.2) and "*fun to play in the backseat [. . .] I was pretty invested*", others found it "*emotionally taxing*" and "*frighteningly realistic*" (P2.4) – making drivers "*worry about it being too much for some passengers, [since] not everybody [is] in the mood for deep [content] or or even hearing stories*" (D2.2).

Drivers also recognized the potential for games like *Driven* to engage passenger attention, alleviating their immaterial/emotional labor to keep passengers entertained. Drivers such as D3.1 described combinations of immaterial labor involved, many of which still resemble those found a decade back by Raval and Dourish [315]:

> "*There's always a bit of emotional effort in every ride [. . . when] I'm not just driving. I'm paying attention to your body language, your tone, your energy, from the moment you get [in] [. . .] If you're if you're chatty, I'll match that. If you're quiet or stressed. I'll try to keep things calm and give you space so it's little things – e.g., adjusting the music so it fits your mood, making sure the temperature is comfortable, choosing the smooth test route so you're not bouncing around in the back*"

D3.2 also shared how engaging games can alleviate the emotional labor that he performs by distracting their attention from factors like traffic or other time pressures: "*it passes time fast, also especially helpful on short trips or when we are stuck in traffic, riders stop checking how long it's taking*."

7.5.2.3 *Toward Driver-Centered and Integrated In-ride Gaming Interactions*

Among drivers with experience or exposure to Octopus tablets, many shared how existing (Trivia) experiences did not feel natural to the rideshare context, suggesting instead more personalized, local and mood-aware alternatives. For instance, D2.2 expressed how "*I want games that feel like they belong in the rideshare world, not like they were copied from somewhere else and shoved into into my car*", suggesting instead interactions with "*more personalization, more mood awareness, more empathy, fun*". Numerous participants (D2.2, D3.1, P2.1, P2.4, DW4 members) desired to include trivia, recommendations and regulations that are relevant to their location to *add a local city flavor, trivia about Seattle [. . .] we have landmarks nearby, or [. . .] which coffee shop this quote is from – it makes the ride feel connected to where we are, and breaks the ice faster than [on] a plane* (D2.2).

7.5.3 *Future & Alternative Content, Interactions & Incentives*

7.5.3.1 *Alternative (Modes to Present) Content*

Participants yearned to connect with drivers and local events, suggesting in-ride content that would expose them to such knowledge. Reminiscing about how a photo prompted conversation with a driver, P1.1 suggested more physical cards that present *"little things that maybe a rider could connect to and be like, 'Oh, cool, you also watch Love Island.' "* While drivers were enthused to share rideshare-specific (e.g., "Uber drivers make playlists just for open silences") and personal information (e.g., *"Did you know your driver once drove a pet pig to a party?"*) as well as music playlists (D5.2, D3.1), a few also suggested tailoring "to rider interest or local culture" (D2.2)

> "*Seattle has the most coffee shops in the US, [so it's] not only about drivers, but also about local city parts – weird, but true [facts]. Or we can have brainy or historical thing here, ridiculous laws*" (D3.1)

7.5.3.2 *Enhanced & Further (Gamified) Interactions*

While Ticking Roads simulates the difficulties of navigating to pick up passengers, drivers also suggested several other aspects of their labor that might be effectively gamified. D2.2 considered a game that guesses the rider's mood, to highlight the emotional labor that drivers perform: *"guess the rider's mood game based on small clues:*

the way they greeted you, or a storytelling round where the driver shares one situation and the rider has to react, interacting with my riders, so it helps highlight how much reading the room is part of what we do" (D2.2). Other suggested logistics pressures to gamify includes cases where *the player fight that through declining rides that aren't good, and taking the ones that are . . . like in Street Fighter* (D1.2).

7.5.3.3 *Incentives for Engagement*

Besides gamified interactions, passengers like P2.2 described how directing their winnings to drivers (or charitable causes) could incentivize them to engage more: "*I would think there should be an option in there where you could play and win something for your driver.*" In addition to incentives, P1.1 also considered punishment through ratings that dissuade poor and rude passenger behaviors

> *I'm imagining if you're consistently reported as a rude a rider by drivers maybe you have to pay a fine [. . . so riders think]: Oh, I should probably not be rude to this driver, because then my next ride is gonna cost me more*

7.6 DISCUSSION

More than a decade ago, Kittur et al. [218] posed the question of whether we can "foresee a future a crowd workplace in which we would want our children to participate?" Borrowing this lens of envisioning and creating healthier (gig) workplaces for posterity, this study approaches improved working conditions for rideshare driving through game design as a medium to (1) challenge and contest existing conditions by proposing alternative futures and (2) engage the younger ridership demographic, many of who may benefit from knowledge about the various responsibilities of rideshare driving — e.g., financial/algorithmic literacy, asset management, car maintenance.

Through a "soft action" like gamified interactions presented in our prototypes, we explore how "can we activate" and mobilize methods in design, to enact change related to a disruptive technology [316]. By engaging consumers in the labor advocacy process, we can begin opening up opportunities for end-user audits [226] or collective resistance through non-use tactics [397]. Additionally, we surfaced opportunities for new interactions and incentives that can promote more aligned and mutually beneficial interactions and understandings between drivers and riders.

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DECLARATION

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5000 Forbes Ave, Pittsburgh, PA 15213, Jan 2025

Jane Hsieh

COLOPHON

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