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SAFETY AND HARM IN SOCIAL COMPUTING SYSTEMS THAT SUPPORT MATCHING MARKETS

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Abstract

Safety and Harm in Social Computing Systems That Support Matching Markets

by

Veronica A. Rivera

Social computing systems that support matching markets, like online dating and gig work platforms, provide numerous benefits to users. However, these systems also present safety-related risks. Prior research has considered individual aspects of safety in these systems (e.g. scams, physical violence) across specific user groups. However, there is a gap in understanding how platform affordances (or lack thereof), impact how users experience harm and the protective safety behaviors they engage in to try to mitigate harm.

In this dissertation I investigate how platforms influence safety in gig work and online dating, focusing on three characteristics shared by one or both of these platforms: a financial motive for the interaction, uneven power dynamics between interacting parties, and a non-trivial offline component of the interaction. I begin by studying how these characteristics impact safety in four types of gig work. Then, I broaden my work to systematize the harms and protective behaviors across online daters and gig workers, bringing together two seemingly disparate groups that actually share many safety-related vulnerabilities and protective strategies. My work suggests that in addition to causing and facilitating harm, matching market platforms also limit the protective safety behaviors users can engage in.

To mom, dad, Patty, and Alex.

That'll do pig, that'll do. –Babe

Acknowledgments

Seven years ago late in the fall of my senior year of college, I decided to apply to Ph.D programs on a whim. I never planned for graduate school; undergrad was challenging for me and my grad school app didn't have many of the characteristics of a "strong" student. Therefore, I had never really given it much thought prior. I didn't think I would get in, much less get as far as writing this dissertation. Thankfully, because of the support of so many people, I did make it that far.

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And now, for some formalities. The text of this dissertation includes reprints of the following previously published material:

- Veronica A. Rivera and David T. Lee. 2021. I Want to, but First I Need to: Understanding Crowdworkers' Career Goals, Challenges, and Tensions. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW1, Article 150 (April 2021), 22 pages. `https://doi.org/10.1145/3449224`

- Ning F. Ma, Veronica A. Rivera, Zheng Yao, and Dongwook Yoon. 2022. "Brush it Off": How Women Workers Manage and Cope with Bias and Harassment in Gender-agnostic Gig Platforms. In *Proceedings of the 2022 CHI Conference on*

Human Factors in Computing Systems (CHI '22). Association for Computing Machinery, New York, NY, USA, Article 397, 1–13. https://doi.org/10.1145/3491102.3517524

And a reprint of material soon-to-be peer-reviewed:

- Veronica A. Rivera, Daricia Wilkinson, Aurelia Augusta, Sophie Li, Elissa M. Redmiles, and Angelika Strohmayer. (In preparation). Post-Digital Safety in Digitally-Mediated Offline Interactions. https://tinyurl.com/55zkypxk

David T. Lee, Dongwook Yoon, Elissa M. Redmiles, and Angelika Strohmayer directed and supervised the research which forms the basis for this thesis.

For the project titled, *I Want to, but First I Need to: Understanding Crowdworkers' Career Goals, Challenges, and Tensions*, I was the primary investigator. I developed the research questions with the help of David T. Lee, conducted a literature review, recruited and interviewed participants, analyzed the data, and wrote the paper. For the project titled, *"Brush it Off": How Women Workers Manage and Cope with Bias and Harassment in Gender-agnostic Gig Platforms*, I was the co-primary investigator. My co-author Ning F. Ma and I evenly split the duties of formulating research questions, conducting a literature review, recruiting and interviewing participants, analyzing data, and writing the paper. My co-author Zheng Yao on that same project helped us with the literature review of the paper and paper-framing discussions. And Dongwook Yoon gave feedback during the analysis. For the project titled, *Post-Digital Safety in Digitally-Mediated Offline Interactions*, I was the primary investigator. I

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Chapter 1

Introduction

Social computing systems are ubiquitous and have significant positive implications for how we interact with one another. A social computing system is a digital technology that supports social interaction via a site, app, and/or platform [408]. These systems include social media, messaging apps, online forums and platforms for online learning. Social computing systems allow us to stay in touch with friends and family near and far, meet new people with experiences different than our own, and share ideas that enhance our understanding of the world [491].

Social computing systems vary in their structure, and thus in the types of interactions they support. For example, Twitter supports broadcast communication; Reddit enables interest groups to form large online communities. Other social computing systems, like online dating and gig work platforms, support matching markets. I also refer to these as *"matching market platforms"* in this dissertation. Dating and finding jobs is something that people have done long before the introduction of their digital coun-

terparts. However, the introduction of digital matching markets in these domains has brought considerable benefits; most notably, they have increased the potential romantic partners [150] and jobs [248] people have access to.

However, social computing systems that enable matching markets also pose the potential for harm. In these systems, a digital platform and its underlying algorithm effectively serve as "matchmakers", suggesting to users people they should engage with in intimate settings, jobs they should take, and/or people they should hire. When making these determinations, platforms do not have the full context of a user's experiences and vulnerabilities to gauge their potential for experiencing harm in a match. This can cause people to enter situations that increase their risk for a plethora of harms including hate and harassment [459, 354], scams [497, 334], physical violence [468, 308], and emotional abuse [188, 406]. Harmful experiences like these can lead users to feel unsafe using these systems.

In this dissertation I focus on safety and harm in two matching market platforms: online dating and gig work platforms. In particular, I systematize the harms users experience when interacting with these systems into a comprehensive framework. I also evaluate how platforms contribute to these and inform the behaviors users engage in to protect themselves. It is interesting to study harm in online dating and gig work because of the power dynamics, financial motives, and offline interactions they collectively share. In both interactions, some users meet offline after being introduced on the platform. In gig work, interactions feature an uneven balance of power and occur for financial reasons. I explore these three characteristics in this dissertation.

Throughout this dissertation, I draw on definitions of safety that characterize it as a basic human need, where there is an absence or limited existence of threats to an individual's emotional, physical, or social well-being [277, 205]. I use the term *"threat"* to refer to an action or experience that could be detrimental to at least one area of an individual's well-being if they were to occur; I use the term *"harm"* to refer to the fallout resulting from those actions or experiences once they have occurred. While this dissertation adopts a broad view of safety and what may threaten it, I present a summary of prior research that grounds my work in Chapter 2.

This dissertation supports the following thesis statement: **Users interacting via matching market platforms are vulnerable to harm caused by the platform and other actors. They adopt protective behaviors to avoid harm but their attempts are limited by the design and structure of the platform itself.**

1.1 Dissertation Overview

In Chapter 2, I present the related work my dissertation draws from and contributes to. This includes an overview of online dating and gig work platforms, safety-related issues in these, and issues in gig work affecting workers' stability and well-being.

In Chapters 3 and 4, I study how the design of matching market platforms influences the harms users experience and the protective safety behaviors they engage in. I look at this across various forms of gig work: crowdwork in Chapter 3; ridesharing, food delivery, and home-based tasks in Chapter 4.

Chapter 3 focuses on how workers' financial need and the uneven power dynamics characteristic of gig platforms create financial and autonomy-related harms in crowdwork that are difficult for workers to mitigate. I surveyed (n = 20) and interviewed (n = 6) crowdworkers on Amazon Mechanical Turk (AMT) to understand their career goals and the challenges they face in pursuing them. I found that workers have ambitious career goals and see crowdwork as a stepping stone towards their goals. However, platform features such as the unpredictability of task availability, lack of mentorship, and low pay, limits workers' ability to engage in practices that support their professional development and secure their long-term financial security and overall well-being. Ultimately, they are forced to choose their immediate standing on the platform over their long-term safety.

Chapter 4 looks at how gig platforms' failure to consider how women workers' disposition for harm increases the biases and harassment they experience in work that is conducted offline. We interviewed 20 women working in ridesharing, food delivery, and domestic work. I found that gig platforms' decisions to ignore existing gender inequities ultimately causes increased marginalization and disproportionate risk for women workers. For example, the lack of platform regulation, rating-based work assignment mechanisms, and lack of post-harm support (e.g. blocking and reporting) makes women workers feel that they have little recourse when they experience harm. As a result, they brush off and downplay negative experiences despite the significant emotional harm they cause.

Chapter 5 systematizes and extends the harms discussed in Chapters 3 and

4 in the context of digitally-mediated offline introductions (DMOIs): interactions that are initiated online via a matching market and have a significant, intentional, offline component that occurs early in the interaction. I reviewed 113 papers across three groups that engage in DMOIs: gig workers, sex workers, and online daters. From this review I developed a taxonomy of five harms shared across these groups, the actors that cause them, and the ten protective safety behaviors they engage in to try to mitigate those harms. I identified a gap in the literature: an absence of any large-scale study that quantifies the prevalence of different user definitions of safety, harms, and protective safety behaviors. To fill this gap, I ran a large-scale survey of gig workers (n = 451) and online daters (n = 476). I found that physical and emotional harm are the most prevalent safety threats; the most prevalent protective behaviors are those that involve leveraging users' close contacts and social networks.

Finally, in Chapter 6 I synthesize two key takeaways from my dissertation and draw on the findings from Chapters 3, 4, and 5 to suggest directions for future work.

1.2 Dissertation Contributions

This dissertation contributes the following

- I present the first study of the career goals and challenges of crowdworkers on Amazon Mechanical Turk. I found that platform features, workers' financial need, and the uneven power dynamics between workers and requesters create financial and autonomy-related harms. In particular, they are unable to progress towards

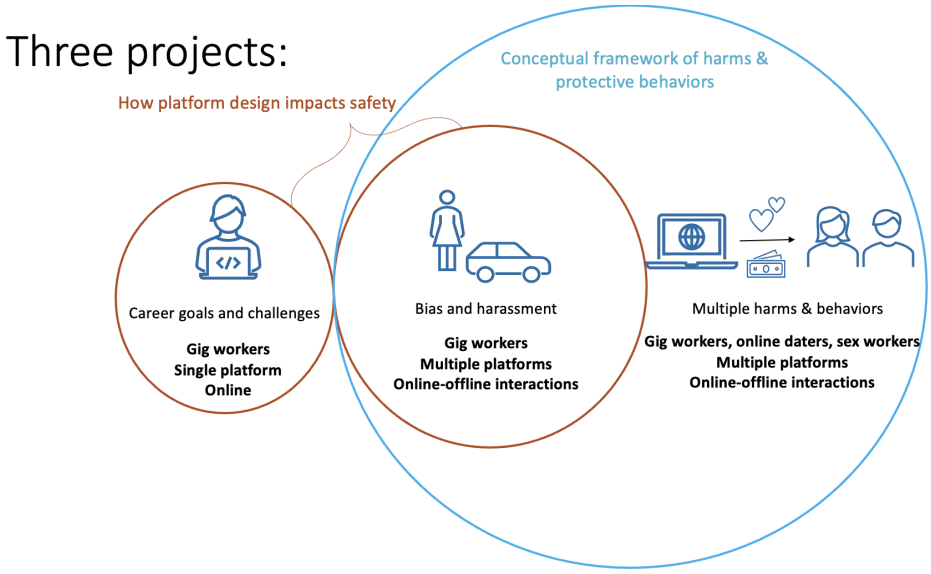

Figure 1.1: Overview of dissertation.

their career goals and the long-term financial security and overall well-being these would provide.

- I introduce the term *gender agnostic* to describe the ways in which the design of gig platforms that enable ridesharing, food delivery, and domestic tasks (e.g., cleaning, organizing, handiwork) further perpetuate socially-grounded harm against women workers. Through gender-agnostic design, gig platforms fail to acknowledge women's contributions, reinforce gender stereotypes, and fail to protect them against the harms they experience. This creates additional safety-related vulnerabilities for women workers and limits their ability to respond to, and mitigate, such harm.

- I introduce the concept of *digitally-mediated offline introductions* (DMOIs) to describe interactions that initiate via an online matching marketplace and have

a non-trivial offline component users engage in soon after. Using this framing I synthesized prior work on the harms and protective safety behaviors of groups that engage in DMOIs, including online daters, gig workers, and sex workers. Focusing on gig workers and online daters, I conducted a large-scale survey to measure the prevalence of the harms and protective behaviors in the taxonomy. This prevalence data fills a gap in prior work; namely large-scale data related to safety in online matching markets.

Figure 1.1 summarizes the three projects in my dissertation and how they relate to one another.

Chapter 2

Related Work

2.1 Social Computing Systems That Support Matching Markets

Prior work has studied social computing systems that support matching markets, but has not considered the notion of safety I focus on in this thesis. Lampinen and Brown argued that markets are social systems and therefore, that we can draw on work in economics on market design as a lens for designing more effective peer-to-peer exchange platforms and socio-technical systems in HCI [260]. They applied five concepts from market design to two case studies. One of these concepts was safety, where safety essentially defined as a kind of incentive compatibility (in the economic sense). Safety reduces to whether or not the system incentivizes truthful behavior. This is very different from the definition of safety I use. In my work I adopt safety definitions that characterize it as the absence or limited existence of threats individual's emotional,

physical, or social well-being [205, 277].

To my knowledge, Lampinen and Brown's work is the only existing HCI research studying matching markets in the abstract. However, there is much research on specific social computing platforms that support matching markets. In the rest of this section I survey prior work related to the two types of social computing platforms for matching markets at the core of this dissertation: gig work and online dating platforms.

2.1.1 Gig Work

It is difficult to precisely measure the prevalence of gig work in the population because different sources have different notions of what constitutes gig work [7, 141]. A survey by the Bureau of Labor Statistics found that 10.1% of American workers in 2017 [336]. In their definition of gig work they included independent contractors, on-call workers, and temporary help agency workers. A 2022 study on the economic well-being of US households by the Federal Reserve found that in one month, 16% of adults performed gig work, where gig work included selling items through online marketplaces, ridesharing, and jobs where people are paid for specific tasks [335]. Finally, a UC Berkeley study using California tax data found that 14.4% of tax filers had some income from independent contracting, and about half had their entire income stem solely from independent contracting [46].

Even though accurate measures of the prevalence of gig work are limited, gig workers still make up a nontrivial portion of the population. In this thesis, gig work refers to the class of jobs in which workers enter into formal agreements with companies

to provide services to clients [124] through online platforms or apps. Gig work offers some incentives to workers, such as greater flexibility to choose jobs and hours, the ability to work from home, and an opportunity to supplement income [124]. They are attractive because they facilitate finding work, making more types of jobs accessible to people who may have a hard time working in the more traditional workforce [381, 197]. In this dissertation, I focus on two categories of gig work: crowdwork and in-person gig work. These have a lower entry barrier than online freelancing jobs (e.g. such as those found on Upwork) that often require more specialized training [453, 118, 412].

Crowdwork platforms, like Amazon Mechanical Turk (AMT) and Prolific, allow workers to engage in microtasks like immage tagging, translation, transcription, and object classification, and survey completion [297, 382]. These kinds of tasks are often done as part of training AI systems and/or research studies. Clients, otherwise known as *"requesters"* in this context, post tasks on these sites. Crowdworkers see a list of available tasks, and if they meet any prerequisites for the task they can complete it. Tasks are fully completed online.

Ridesharing drivers and food delivery workers, (also known as couriers) find jobs on apps or platforms that use algorithmic management [40] to match workers with clients and jobs. Workers get hired online through platforms and apps, but complete tasks offline in the physical world. Gig workers who perform home-based work such as cleaning, caretaking and handiwork, also get hired online and complete their jobs offline. However, platforms that enable this kind of work, such as TaskRabbit and Care.com, operate like a Marketplace rather than a strict matching system; they provide clients

with a ranked list of workers to hire from.

Gig platforms have been of interest to the HCI community. Prior work has evaluated some of the systemic challenges workers face, such as power dynamic differences between workers and clients [381], worker surveillance and control via algorithmic management systems [398, 230], invisible labor [177, 472], and unfair/unstable pay [194, 230]. Some recent, but limited, work has also looked at safety in gig work, particularly physical safety and scams [21, 497, 516]. I cover this related work in grater depth in Chapter 2.

2.1.2 Online Dating

Online dating is prevalent; over a quarter of adults in the U.S have met a partner through an online dating app or website [26]. Online dating sites afford users several opportunities that make them attractive systems. First, they enable individuals to meet potential partners they might not have met otherwise in their immediate offline communities [150]. Second, they allow individuals to think carefully about how they want to present themselves to others prior to meeting [138]. And third, they can be freeing for those who have difficulty forming interpersonal relationships offline, giving them more agency in setting the pace of the relationship [263, 315]. Various aspects of online dating sites and the dynamics of the relationships that form through them have been of interest to the HCI community in recent years. For example, prior work has looked at how online daters select potential partners [151], norms of disclosure and deception [496, 495], and the role of online communities in supporting online daters [299].

Surprisingly, there is limited work on safety in online dating within HCI. Some prior work in the field has considered issues around privacy, sexual consent, and harms resulting from disclosure of sensitive information [100, 111, 496, 495, 494]. Much of this work builds on a significant body of research on dating violence in psychology and criminology which I survey in Section 2.3.

2.2 Harm in Gig Work

2.2.1 Safety-Related Harms

2.2.1.1 Physical Safety

The work in this dissertation builds on recent work that has looked at two components of safety in gig work: physical safety and scams. In particular, I incorporate this literature into a taxonomy of safety-related harms and protective behaviors experienced by both gig workers and online daters (Chapter 5) and evaluate the intersection between gender and harm in Chapter 4. I also extend the dimensions of safety that have been previously considered in Chapter 3 by considering career development and the long-term financial security and stability it provides as a type of safety.

Almoqbel et. al conducted a qualitative study with rideshare drivers in the U.S to understand their safety concerns and how they address the safety related issues they face in doing their job. They found that sources of safety concerns stem from physical harassment from passengers (e.g. sexual harassment and assault), intoxication of passengers, driver's own gender, and trust issues [21]. Research conducted by the

International Labour Organization found evidence that digitally-mediated work can cause psychological and physical violence. Issues include discrimination, harassment, cyberbullying, racism, and physical and verbal abuse [323]. This work suggests that physical safety issues are prevalent in gig work and resemble safety issues in society at large. Yet, the dynamics of how these safety issues manifest are uniquely tied to characteristics of digital labor platforms.

Some research suggests that physical safety issues in gig work can be caused by entitlement and privilege. For instance, in a study conducted by Milkman et. al [318], female food delivery workers expressed resentment towards male customers who hit on them, and talked down to them. The participants noted that perhaps the customers' behavior was due to the way they were raised and not learning to respect women. This can be worsened by the power dynamics in gig work that favor the client and platforms over workers' needs. For instance, Raval and Dourish found that the unequal effects of rating systems in ridesharing apps pressure workers to tolerate rude behavior, inappropriate comments, and offensive remarks from passengers for fear of low ratings [363]. Similar results were reported among beauty workers (e.g. workers who perform manicure, pedicure, hair services, and massages within clients' homes) in India [28]. In this particular study, policies beauty work platforms were found to be biased in favor of the customer, which made it difficult for beauty workers to set boundaries (e.g. refusing to service individuals for safety reasons). Other work has suggested that safety issues can be traced back to the social isolation inherent in this type of work. Researchers noted that the isolated nature of delivery work endangers workers, especially when they

are incentivized to make deliveries at night and in secluded locations [413]. Similarly, Moore found that working in intimate spaces and private homes, in addition to lack of labor laws and social protection, breeds safety issues for gig workers [323].

Prior work suggests that gig workers rely on platforms and apps to keep them safe, yet when that fails, they turn to each other for support or to personal safety strategies. Anwar et. al found that women beauty workers in India working on digital platforms relied on platform policies for protection against misbehaving clients. Yet, platforms did not have any strong protections in place for protecting women against negative experiences like harassment [28]. Ticona describes how some gig workers believe they are secure because the platform monitors their conversations with clients and stores information about the client [464]. Other researchers found that delivery workers end up turning to each other to maintain a sense of safety due to lack of platform protections and mistrust of police/government [413]. For instance, workers create networks for emergency support through WhatsApp, and have informal "buddy systems" for late-night deliveries. Gig workers who go to clients' homes, such as babysitters hired on Care.com, will send client's information (e.g. name, address) to friends, family, and/or other workers with instructions to check in on them [464]. Other research has reported gig workers using a myriad of personal non-tech strategies to ensure their safety such as video recording [21], carrying lethal and non-lethal weapons [21], and being selective of the job's time and location [21, 222, 458].

2.2.1.2 Scams

Scams are another safety issue faced by gig workers. These are prevalent among both workers who perform tasks exclusively online, like crowdwork, and those who perform tasks offline, like carework [465]. A majority of prior work has focused on scam-related safety risks among crowdworkers. Xia et. al conducted a survey study with 435 AMT crowdworkers to understand their privacy concerns, losses, and expectations. They found that crowdworkers' privacy concerns and experiences centered around targeted ads, phishing, malware, scams, profiling, secondary use of collected data, and stalking [516]. Sannon and Cosely investigated how AMT crowdworkers navigate these privacy risks and the challenges they face in doing so [397, 398]. They found that one of the main challenges crowdworkers face in navigating privacy concerns is not being able to evaluate the risks associated with a particular task upfront. Workers cannot determine whether a task is safe/secure until after they've invested time in it. At this point, returning tasks would mean loss of time and effort, which translates into lost earnings. Some participants also reported providing inaccurate personal information on tasks to protect their privacy. They classify privacy navigation in crowdwork as a form of invisible labor that is worsened by the uneven power dynamics on the site [397].

Recent research has also looked at scam attacks among ridesharing drivers and how they discuss those experiences in an online forum [497]. Watkins found that ridesharing drivers experience multiple types of scams: those perpetrated by riders attempting to get a lower-cost ride by manipulating the app, and those targeting the

driver's money by impersonating the company. Watkins also found that when stories of scam attacks are shared in an online forum, they are often met with derision from other workers, and rarely empathy or respect [497]. This is interesting given the dependence on collaboration among workers for mitigating physical safety risks. This result brings up the question of whether there may be differences in how gig workers are able to navigate different safety and security issues.

2.2.2 Platform Design & Algorithmic Management Issues

2.2.2.1 Worker Powerlessness, Information Asymmetry, and Invisibility

Some workers are initially drawn into gig work because it promises flexibility and autonomy [104, 222, 230, 269]. However, workers' experiences often do not live up to these ideals. Rather, workers find that more power is put into the hands of platforms and clients than their own [381]. Much of this power imbalance is manifested through algorithmic management systems [267]. Features of these systems such as rating-based reputation mechanisms are unforgiving and determine which jobs a worker has access to [267]. Platforms also give more power to clients than workers, siding with the former when disputes arise [297, 313]. For example, clients sometimes engage in unfair labor practices, like rejecting completed work without paying workers and leaving false reviews [313, 398]. Yet, platforms rarely involve themselves in resolving these issues, leaving little recourse for workers in these situations [313].

Despite the importance of mechanisms like ratings and reviews for workers' success, platforms provide little transparency and guidance on how to interpret ratings,

improve their work, and how exactly platforms use ratings to match workers to jobs and clients [285]. This information asymmetry means workers end up having to invest invisible, unpaid, and emotional labor trying to make sense of the algorithms that manage their work [177]. A lot of this work is done in worker-operated online communities where workers engage in algorithmic imaginaries and meaning-making to make sense of platforms and their algorithms [81, 243]. In some of these communities workers spend considerable time finding information about a client's reputation [224] and learning how to use worker-created browser extensions to search for tasks more effectively [297]. Other work has found that in ridesharing, workers feel pressure to go beyond what is required of them to please passengers; they'll offer refreshments and personal stories to connect with passengers on a more personal level in an effort to increase their ratings, especially when they are not sure how to improve their reviews otherwise [363].

Researchers have designed and built systems to support gig workers in mitigating the effects of powerlessness and invisible labor. Ma et. al used Stakeholder Theory to inform the design of more ethical ridesharing, and suggest ideas for improving how ratings are given to drivers, and how drivers get assigned rides by Uber [158]. Irani and Silberman created an activist system that enables crowdworkers to collectively organize and build solidarity around the issues that affect them [224]. In a later study, Salehi et al. built upon Turkopticon by studying crowdworkers' unique barriers to collective action beyond the limitations imposed by the AMT platform [389]. These insights were used to co-create a system with workers that supports them in forming publics around issues and mobilizing towards change. Finally, Whiting et al. introduce a system,

crowd guilds, that better organizes a decentralized workforce by creating crowdworker collectives in which crowdworkers can provide feedback to each other [504].

In Chapters 3 and 4 I build on this work to evaluate how worker powerlessness and invisibility influence gig workers' protective safety behaviors. Understanding this is crucial for informing the design and development of systems to support workers' safety.

2.2.2.2 Unfair and Unstable Pay

Gig platforms are notorious for underpaying workers. For example, a 2018 study recorded 2,676 workers performing 3.8 million tasks on Amazon Mechanical Turk and found that workers earned a median hourly wage of only $2/hr and only 4% earned more than $7.25/hr [194]. Another study found that app-based gig workers such as rideshare drivers and food couriers typically lose 20-30% of their earnings in commission fees to the apps [381]. Workers are also responsible for paying costs associated with their work, such as car maintenance, with no support from the app itself [381]. Finally work assignments are volatile; workers do not necessary know when the next job will be available or how much they will earn [61]. Platforms do not provide a way for workers to view hourly wages for tasks, or support on how to determine how much they should work in a given day to make a goal amount of earnings [80].

The precariousness surrounding pay in platform-based gig work is augmented for individuals from underrepresented and marginalized groups. For instance, one study found that on AMT there are certain tasks that pay less than others, such as image labeling [194]. Yet, these tasks are typically the ones that are most accessible to in-

dividuals with disabilities, who turn to crowdwork when they are excluded from the traditional labor market [528]. There is also a significant gender pay gap in gig work. A study by the Stanford Graduate School of Business found that on Uber men earn about 7% more per hour than women on average [104]. They concluded that this pay gap is due to differences in men and women's work practices. For instance, they found that male Uber drivers are more willing than women to drive in areas with higher crime and more drinking establishments, which are typically lucrative.

In Chapter 3 I build on this work to evaluate how the pay structures in crowdwork and workers' financial need influence their decisions around autonomy-related and long-term financial safety.

2.3 Harm in Online Dating

2.3.1 Privacy and Consent

Prior work in HCI has looked at issues of privacy and consent in online dating. One thread of work has considered how online daters' safety concerns, especially around privacy, inform their self-disclosure decisions. Cobb and Kohno found that online daters' primary privacy concerns include unanticipated disclosure, stalking, cyberstalking, inappropriate messages, physical violence, and scams [100]. Online daters are particularly prone to catfishing and other deceptive romance scams that prey on their desire for compatibility and emotional connection [421, 100]. Simmons and Lee found that being a catfishing victim not only affects people's future use of online dating platforms, but also

their behavior on other social computing platforms, like social networking sites [421].

A related thread of work has considered harms that could occur when sensitive personal information is disclosed, especially among marginalized groups. Warner et. al. investigated the effect of undisclosed sensitive information (e.g. HIV status) on how people perceive dating profiles among men who have sex with men [495]. They found that undisclosed information can negatively affect how profiles are evaluated, which can harm those from minority groups. For example, in the absence of HIV status information, people may use other profile features such as ethnicity and profile photos to make inferences about the undisclosed information. In a related study, Warner et. al. also studied how men who have sex with men manage tensions between health, stigma, and privacy when deciding what to disclose in online profiles [496]. Cui et. al. studied how sexual-minority women in China develop practices on dating apps that allow them to disclose their sexual orientation online while avoiding such a disclosure offline [111].

Other work has evaluated how the harm that occurs on dating apps, including XR-enabled dating apps, can shape people's understanding of appropriate sexual behavior such as consent [414, 532]. Building on this work, Zytko and Furlo looked at how to design computer-mediated sexual consent technologies in the context of online dating [531]; Zytko and Chan evaluated how to design for consent in the emerging VR dating apps [530].

HCI researchers have also considered how to design technologies that help mitigate online dating harms. For instance, Datey et. al. studied how AI risk assessment models could help women avoid online dating violence by augmenting their existing

prevention strategies, such as profile vetting [114]. Bull et. al. conducted a participatory design study to examine how the design of opportunistic matching systems, like those of online dating sites, can prioritize women's safety [69]. They found that participants want matching systems to monitor them during an offline meeting, akin to a "guardian angel", and are willing to provide significant amounts of personal data to enable this. Finally, Zytko et. al designed a messaging system that empowers women to better determine who they will enjoy and feel safe meeting offline [534].

2.3.2 Violence

Dating violence is a term stemming from psychology and criminology to refer to threatening communication, verbal abuse, or physical aggression in the context of courtship and romantic relationships [278]. Within these two disciplines, researchers have drawn on dating violence literature to study *online* dating violence, especially among teens [341, 324] and college students [58, 143]. A variety of safety-related harms have been considered in the online dating violence literature. These include, sexual violence and abuse [149, 93, 169], harassment [441], stalking [95], emotional harms (e.g. lies and deceit) [107, 470], and health-related harms such as sexually transmitted diseases) [107].

The online dating violence literature illuminates how digital platforms expand the risks and harms associated with dating [311]. Borrajo et. al. [58] found that more than half of surveyed college students in a romantic relationship had experienced harm through social messaging applications (e.g. WhatsApp). In their extended literature

review of online dating violence, Phan et. al. [349] noted that online dating is a significant source of technology-facilitated sexual violence because of the increased access to potential targets and people's increased predisposition to quickly trust and share personal information with the people they meet online.

Some work has investigated how online dating risks may be influenced by certain demographic factors, with an emphasis on gender differences [349, 149, 167]. Prior work suggests that women experience online dating violence at a higher prevalence than men [503]. A survey by Pew Research found that women under 35 years of age face the highest prevalence of harassment: 60% of women daters 18-34 years old surveyed said someone on an online dating site undesirably continued contacting them after an initial offline meeting and 57% were sent unwanted sexual or explicit images [26]. Gillet [170] evaluated women's experiences with intimate intrusions in online dating, defined as "behaviors women themselves perceive and/or experience as intimidating, threatening, coercive or violent". Reed et. al., [373] found that among teenagers the consequences of online dating violence are especially detrimental for women.

Chapter 3

The Impact of Power Dynamics and Financial Need on Safety in Crowdwork

In this chapter I studied the career goals and related challenges of crowdworkers.

While at first it may seem odd to include career development in a study of safety, career development has been viewed as a kind of safety for a long time. Maslow's hierarchy of needs defines safety as including job and economic security, social stability, control over one's future, and health/well-being [314, 301]. Prior work from career and organizational studies suggests that career development allows individuals to achieve many of these; this work finds that career development allows individuals to pursue work that aligns with their values and interests (thus promoting mental well-being) [409, 291], provides greater financial security [76], and enables them to exercise independence and agency [378, 499].

We surveyed 20 Amazon Mechanical Turk (AMT) crowdworkers and interviewed six of them (recruitment details in Section 3.3.2). We asked questions to understand what long-term career goals they have, what challenges they face in pursuing them, and the role the platform plays for them in working towards those goals. Overall, we sought to evaluate how features of crowdwork platforms such as uneven power dynamics, unpredictability of task availability, lack of mentorship, and low pay, coalesce with workers' financial need to impact their safety in the form of career development.

We found that crowdworkers have ambitious career goals and see crowdwork as a stepping stone towards their goals. In particular, many join AMT in an attempt to alleviate some of the challenges they face in pursuing those goals, such as financial constraints. However, the opportunities for success on AMT are limited; the pay is low and the lack of collaborative work and opportunities for situated learning make it difficult for workers to overcome both financial challenges and other career progression barriers including obtaining career mentors and engaging in adaptive career behaviors such as learning and planning. We see an unfortunate dynamic: finding themselves on a platform that does not ensure their immediate financial security, workers focus on providing this security themselves through hyper-focused attention to the platform and irregular work hours. In this process, they sacrifice their long-term goals and the safety (e.g. future financial security, well-being, and stability) that achieving those goals would provide.

The work in this chapter was done in collaboration with Dr. David T. Lee, published in the Proceedings of the ACM on Human-Computer Interaction in 2021, and

presented at CSCW 2021 [377].

3.1 Introduction

Career development is an important part of employees' happiness and well-being [232, 139], and a significant factor in employers' business success [309, 227], since happy employees are more productive. For these reasons, employers typically invest in providing structures and resources, such as career ladders and mentorship programs, that support employees' career goals within the organization. For employees, these benefits are not only important for moving up in their current organization, but also for moving across organizations and sectors [400] and for maintaining relevance in a rapidly changing economy shaped by technological progress [65]. Jobs are becoming increasingly polarized into lower-skilled and higher-skilled jobs [208, 115], and workers are realizing that learning and retraining need to happen continuously if they are to avoid getting pushed into lower paid and lower-skilled occupations [65, 208, 159].

Along with the changing dynamics of career development is a change in how work is conducted. Tech innovation is expected to restructure 38% of jobs within the next ten years [177]. This includes a shift to tasks that can be performed on-demand and on a piece-work basis, like most of the jobs in the gig economy [431]. In 2016 at least 20 million adults in the U.S earned money by working on online on-demand tasks like those found on Amazon Mechanical Turk (AMT), a number that is expected to rise with the growth of AI [177]. On-demand work platforms offer some benefits, such as

flexible work hours and the ability to work remotely, but are plagued with poor working conditions. Workers on platforms like AMT face issues such as low pay, lack of basic worker protections, and power imbalances [209, 225, 420, 297]. With more and more people expected to form part of this workforce, it becomes even more important to consider how to create a *"future crowd workplace in which we would want our children to participate"* [248].

The majority of research around crowdworker well-being has focused on diminishing some of the precariousness associated with this kind of work. This includes research on facilitating workers' reviews of requesters [224], strengthening worker-requester relationships [297], supporting organization for collective action [390], and developing guidelines for a worker-centric peer economy [20]. However, there has been little research on supporting career development in crowdwork.

Supporting career development in crowdwork is important for two reasons. First, enabling crowdworkers to pursue their career goals is another way to support their well-being and safety [208, 270, 33, 101, 301, 314]. Second, changes in the structure of work are making it imperative for all workers, including crowdworkers, to easily retrain and change jobs across industries [208, 65, 361]. Since crowdwork is a relatively new form of work, it is important to understand the types of careers crowdworkers may want to pursue, and what challenges they may face in retraining and working towards their career goals. In this paper we explore these ideas by addressing the following research questions:

- RQ1: What are crowdworkers' long-term career goals?
- RQ2: What challenges do crowdworkers face in working towards their career goals?
- RQ3: How do environmental factors within crowdwork platforms support or inhibit their learning and pursuit of their career goals?

To answer these questions we conducted a qualitative study consisting of an open-ended survey with 20 workers on AMT and semi-structured interviews with six of those 20 workers. We found that many crowdworkers have long-term career goals they would like to accomplish that require them to transition out of AMT. They join the platform as a precursor to pursuing those goals. However, they struggle to make progress towards their goals while working on AMT due to lack of career guidance and limited time and financial resources. Since tasks on AMT pay so little and good-paying work is hard to come by, time is of the essence for these workers, especially for those who consider it to be their main source of income. Furthermore, they need to constantly be "on", ready to work on the next decently-paying task in order to meet their goal earnings for the day or week. Many workers also have additional constraints such as office jobs and children to look after. When these responsibilities are coupled with the unpredictable nature of tasks on AMT, it becomes difficult to find spare time to develop the skills they want to, and need to, learn to transition out of crowdwork.

This study extends existing research on crowdworker well-being by offering a new perspective of career support as a form of well-being. Our contributions to CSCW are two-fold. First we, contribute insight into crowdworkers' career goals and the chal-

lenges they face in pursuing them. Second, we build on our findings to recommend design and research directions for better supporting crowdworkers in pursuing their career goals outside AMT. Our hope is that these contributions can spark new conversations on how the safety and well-being of crowdworkers still falls significantly behind what we expect for workers in traditional work environments.

3.2 Background: Factors that Support Career Development in Traditional Forms of Work

Knowing the importance of career development on workers' safety and well-being, how do we go about understanding and supporting career development in gig work? We draw on the research in career and organization studies to ground our study of career development in crowdwork. In this section I describe the factors that support career development in traditional work. We use these to inform the data collection and analysis in our own work.

3.2.1 Strong Interpersonal Relationships

Interpersonal relationships can have a significant, positive impact on an individuals' career development, especially career mobility. For example, family and friends can help by suggesting jobs that align with that individual's values, interests, and skills [310]. Past co-workers can serve as role models [41, 71] supporting their career decision-making processes [168, 331, 358], and can boost an individual's self-

efficacy [137, 358, 404]. Close connections can provide emotional support leading to greater confidence in overcoming career obstacles to pursue goals [206] rather than settling for less interesting career paths that are easily attainable [272]. And finally, professional connections can help open doors by providing information about job opportunities, facilitating meetings with influential people, or sharing the norms of a particular industry [515], ultimately increasing the options an individual is able to obtain when changing careers [206].

3.2.2 Appropriate Financial Resources

The availability of financial resources also strongly influences how an individual copes with a career change [270, 136]. The retraining necessary for changing careers is expensive. This is why studies show that financial pressure is the most important factor for individuals in deciding whether or not to pursue further education and training, choosing temporary work between jobs, and determining how they feel about their overall career change prospects [136]. *"No contextual factor appeared more striking in its impact on an individual's ability to cope with the transition than did finances"* [136].

3.2.3 Ability to Engage in Adaptive Career Behaviors

One of the reasons social support and financial resources are so crucial to career mobility is that they influence the ability of individuals to engage in adaptive career behaviors, i.e. self-regulatory behaviors such as planning [401, 455, 270], career exploration, and goal-setting that have been shown to increase the likelihood for obtaining

satisfying career outcomes [270]. For example, the ability to picture the details of a potential future career move and to proactively take steps towards those goals, e.g. by learning new skill sets, helps workers determine whether decisions they make will benefit them in the long run and to make informed decisions quickly when needed [136]. The ability to use temporary employment purposefully was also critical for keeping the need to generate income from becoming a barrier to career change [136]. We chose to focus on social support and financial resources because these factors best align with the tensions that crowdworkers are known to experience (see Section 2.2.2). Therefore, we hypothesized that these challenges may have a higher likelihood of connecting to the structure and design of gig platforms.

3.3 Methods

We conducted a study of the career goals of AMT workers and the challenges they experience in pursuing their goals. This consisted of open-ended surveys with 20 AMT workers and interviews with 6 of those workers. Our goal was to gain insight into their career goals and the challenges they have faced in pursuing those goals. In this section we begin by describing a small pilot study that motivated the research in this paper. We follow by describing our process and methodology for studying the career goals and career-related challenges of AMT workers.

3.3.1 Pilot Study

Prior to carrying out this research, we conducted a small pilot study to help understand whether crowdworkers have unmet career goals and if this space warrants further study. The pilot study consisted of two surveys (N=50 for the first, N=6 for the second) and three tasks (N=4) that required workers to learn basic data analysis and apply those skills to a large dataset. This pilot study was carried out as a class project for UCSC CMPM 243 Social Computing Research: Design, Algorithms, and Incentives.

The purpose of the surveys in the pilot study was to explore workers' career goals and how they see their work on AMT as contributing to those goals. The tasks scaffolded the process of conducting basic data analysis of a large dataset on Google Sheets, with each subsequent task building on prior ones. In each task workers learned a particular concept through provided written tutorials and videos, and immediately applied the concept to the provided dataset. The purpose of the skill-building tasks was to prompt workers to think more deeply about their ability and interest to perform more complex work than typically available on AMT. Both the surveys and skill-building tasks were posted as HITs on AMT and compensated workers at a $15/hour rate. The only recruitment criteria for the first survey was that workers had to be located in the US.

The first survey, which received responses from 50 workers, was used to explore workers' motivations for being on AMT and screen participants for later parts of the pilot study. We asked workers to provide their age range, primary occupation, how long

they work on average per day on AMT, and how long they have been working on the platform. We also asked open-ended questions such as what motivated them to become workers on AMT, what they like and dislike about working on the platform, and what are some things that they would change about the platform. This helped provide some context about their experiences on AMT to frame their career goals and perspectives around complex tasks. From those 50 participants, six were invited to complete a followup survey and the three skill-building tasks. We chose workers who provided thoughtful responses to the open-ended questions in the initial survey and included both workers who consider AMT their primary occupation and those who consider it a side job in order to have a variety of perspectives represented in our participant pool. We limited this part of the study to just six workers so that we would be able to answer questions workers might have as they worked through the more involved skill-building tasks.

All six workers completed the follow-up survey, which asked them what their long-term career goals are, whether they feel they can learn new things from the tasks they do on AMT, and how they see the relationship between their career goals and the work they do on AMT. Four workers completed all three skill-building tasks and post-task surveys where they described how valuable they found the tasks, whether they learned skills that they might use in other contexts, and how much they enjoyed these tasks relative to the ones they typically work on in AMT.

The results of the pilot study revealed that some workers on AMT have career aspirations, such as climbing the career ladder in an organization to get a better position,

Name	Gender	Age	Time on AMT	Hours/Week	Education	Career Goal
Alvin	M	25-34	1-3 yrs	63-84	Bachelor's	Make a good living
Renee	F	35-44	4-6 yrs	35-56	High School (GED)	Freelance programmer
Christina	F	25-34	1-6 months	25-40	Bachelor's	Obtain pharmacy degree
Anne	F	25-34	1-3 yrs	54-72	some college, no degree	Find what she's passionate about
Kristi	F	35-44	1-3 yrs	140	High School (GED)	Visual merchandising executive
Lola	F	25-34	4-6 yrs	15	some college, no degree	Registered dietitian; get degree
Ben**	M	35-44	1-6 months	21	Bachelor's	Data analyst; get degree
Jana	F	35-44	4-6 yrs	60	some college, no degree	Social worker; get degree
Brenda	F	35-44	4-6 yrs	21	Master's	Database administrator
Earnest	M	25-34	7-10 yrs	90	Bachelor's	Career in broadcasting
Eleanor**	F	25-34	1-3 yrs	10	Master's	Data Analyst
Perry	M	25-34	1-3 yrs	14	Associate's	Network systems administrator
Tasha**	F	25-34	1-6 months	30	some college, no degree	Government teacher; get degree
Derrick	M	25-34	1-3 yrs	20	Bachelor's	Ebay reseller; avoid desk job
Hope**	F	45-54	4-6 yrs	56	Associate's	Own art gallery
Lindsay	F	25-34	1-3 yrs	16	Master's	Professor and writer; get PhD
Viola**	F	25-34	1-3 yrs	112	Bachelor's	Find what she's passionate about
Lorena	F	25-34	4-6 yrs	30	Associate's	Computer programmer
Charlotte**	F	45-54	1-3 yrs	30	Bachelor's	Social worker; get Master's
Francisco	M	35-44	1-6 months	36	Bachelor's	Own an online business

Table 3.1: Characteristics of AMT worker participants who completed the open-ended survey. 11 participants out of 20 indicated that AMT is their primary occupation and source of income. All names are pseudonyms. ** denotes individuals who participated in an interview, in addition to completing the surveys

and learning new, complex, skills like computer programming. We also noticed that the workers involved in our pilot study were excited about the opportunity to work on tasks that were more involved than those typically found on AMT. They expressed excitement about the three skill-building tasks we presented them with, explaining that *"it is nice to do something that is really productive and not the same old stuff that Mturk has"*. Participants noted that the skill-building tasks were fun, and made them feel like they actually learned something useful, in stark contrast to the tasks they usually complete on AMT. Some participants even messaged me to express their gratitude for the opportunity to work on these tasks, and expressed their interest to continue working on similar tasks in the future. These results and interactions suggested to us that workers on AMT value learning and career development, and that our research questions were worth pursuing.

3.3.2 Open-Response Survey & Interview Study

We conducted open-ended surveys with 20 Amazon Mechanical Turk workers, and semi-structured interviews with six of those workers. All participants were U.S workers. Questions were based on factors that have been found to support career mobility in traditional work. For example, we included several questions around the strength and nature of interpersonal relationships.

3.3.2.1 Participants and Data Collection

We began with a screening survey to select workers for the main portion of the study and obtain background information to contextualize their responses. The screening survey contained 8 demographic multiple-choice questions and two open-ended questions concerning workers' long-term career goals, and whether their work on AMT supports these goals. We received 112 responses to the screening survey. These responses are not part of the analyzed data. 25 of these participants were invited to complete a follow-up survey with 11 open-ended questions about their experiences on AMT, why they joined, and their current efforts working towards their long-term goals. These participants were chosen based on the following criteria: 1) AMT being their primary occupation or spending at least 10 hours per week working on the platform, and 2) the quality of their responses to the two open-ended questions in the screening survey; specifically, whether they wrote at least as many sentences as the instructions requested, the readability of their responses, and the overall perceived effort of their responses.

Of the 25 workers we invited to participate in the follow-up survey, 20 com-

pleted the survey. These 20 responses are part of the analyzed data. From those 20 workers we then filtered out five who indicated they did not want to be contacted for an interview and five more whose responses did not meet the instructions' length criteria. We invited the remaining 10 workers to participate in an interview and received responses from six. For the two surveys and the interview, AMT workers were compensated at a $15/hour rate.

Our semi-structured interviews with the six AMT workers were 20-35 minutes long and conducted over the phone. I performed all interviews. Interview questions built on the open-ended survey responses, focusing on understanding workers career goals in greater depth, the challenges they have faced in working towards those goals, and the barriers they anticipated facing in the future. We also focused on understanding their lived experiences as crowdworkers on AMT and how their work on AMT affects their day-to-day life. We were particularly interested in evaluating whether AMT workers might benefit from some of the same resources that have been found to support career development of workers in traditional work environments.

3.3.2.2 Data Analysis

We generated interview transcripts using automatic transcription software and checked them for accuracy and I made corrections as necessary. The open-ended survey responses were analyzed primarily by myself, with support from two undergraduate research assistants. The interview transcripts were all analyzed by myself. All codes and emerging themes across data sources were documented in a spreadsheet and dis-

Code Category	Relevance to Research Question	High-Level Themes (Round 1)
(1) What led crowdworkers to join AMT in the first place and what has kept them there.	Understand the relationship between AMT and participants' career goals (e.g. are they using AMT as a stepping stone into their dream career, what is the role of AMT in the greater context of their career goals)	**Financial hardship** **Desire to be self-sufficient** **Job constraints**
(2) What do AMT workers look for when choosing tasks.	Evaluate whether workers are choosing tasks that might help them in pursuing their career goals (e.g.picking tasks that are somehow related to their interests or could help develop certain skills)	**Maximize hourly wage** **Interest in task content**
(3) What are AMT workers' experiences like on the platform.	Understand the lived experiences of our participants to contextualize their career-related challenges (e.g. how might their experiences on AMT affect how they think about and pursue their career goals).	**Need to always be "on"** **Self-directed learning** **Power imbalance**
(4) What are AMT workers' career goals, career plans, and career-related challenges.	Understand AMT workers' career goals, how they plan to work towards those goals, and the challenges they are facing or anticipate facing along the way. Directly helps us answer RQ1 and RQ2.	**Uncertainty & feeling stuck** **Financial constraints** **Time constraints** **Desire for career outside AMT**

Table 3.2: Categories used in first round of analysis, description of how each category relates to our research questions, and list of high-level themes identified for each category in first round of analysis.

cussed regularly with the David Lee. All data was analyzed using thematic analysis and deductive coding [60], focusing on the four categories below, which were derived from our interviews and surveys. Details about how the categories relate to our research questions can be found in Table 3.2.

1. What led crowdworkers to join AMT in the first place, and what has kept them there.

2. What do AMT workers look for when choosing tasks.

3. What are AMT workers' experiences like on the platform.

4. What are AMT workers' career goals, career plans, and career-related challenges.

We analyzed the data through multiple rounds of coding. In the first round we conducted open coding around each of the four categories and clustered the resulting codes together into twelve high-level themes (Table 3.2). We then performed a second round of coding to identify sub-themes for the twelve high-level themes. We focused this analysis on the underlying what, why and how behind each of the themes identified in the previous round. A total of thirty sub-themes emerged, many of which pertain to multiple high-level themes from the first round of analysis. The patterns from themes and sub-themes identified for the fourth category were directly used to answer RQ1 and RQ2. To answer RQ3 we conducted a third round of analysis, looking for patterns resulting from the intersection of sub-themes emerging out of the first three categories with those emerging out of the fourth category. In the findings section we include quotes from

interviews and open-ended survey responses that are both evocative and representative of the main findings across the dataset. In section 3.6 we discuss the limitations of our methodology.

3.4 Findings

We found that participants want to transition out of crowdwork to pursue a career that can deliver greater job security and fulfillment. For some, these goals stem from lifelong dreams they want to see realized. Others have less concrete goals, but know that crowdwork is not the end goal. They join AMT as a means to an end, yet face challenges in taking the first steps out of crowdwork and towards their career goals due to lack of career guidance, financial hardship, and time pressure. On AMT participants find themselves needing to prioritize their longevity as crowdworkers over working towards their career goals.

We begin by offering a description of the career goals and motivations of our participants, focusing both on those who are still figuring out their career identity and those who have a clear vision and laid out plan towards their goals. We then describe the three challenges we saw participants face in pursuing their career goals and conclude by describing the ways in which participants creatively try to learn and grow through their work on AMT, and how they ultimately end up having to prioritize their efficiency on the platform over anything else.

3.4.1 Seeking Greater Job Security and Fulfillment of a Lifelong Dream

Participants expressed wanting to pursue a career outside of crowdwork in order to obtain greater job satisfaction and security than that offered by crowdwork, and to fulfill lifelong goals. Many participants shared they want a job that will allow them to be financially independent.

> *"I would love to be a Network Systems Administrator to experience a lively adulthood. It's where I see myself able to garner enough funds for a home of my own with no one else in it and a flourishing career."* -Perry

Participants seek a fulfilling career and do not want to settle for crowdwork. Tasha explained, *"it [AMT] is not rewarding enough work that I could stomach it for a long-term career type thing."* Likewise, Earnest said, *"With time, I'll probably phase it [AMT] out to find something more fulfilling. It's a decent line of work but it's not the endgame for me."*

Some participants shared they have career goals they have wanted to pursue for a long time, often times stemming from life-long interests. For instance, Hope dreams of owning an art gallery and explained, *"photography has been a hobby of mine ever since I was a little girl...I love photography, it's my biggest passion and if I could do that full time, I would".* Similarly, Tasha shared that she wants to get a degree in education and aspires to teach high school government and politics classes because she has been interested in politics ever since she was young.

> *"I decided when I was four I was going to be the first female president of the United States. I think I'm going to miss that though. But I mean, it's been a lifelong interest of mine where I was following politics. I got my picture in our local paper from getting a letter from the white house when I was in*

> *first grade cause I kept writing. This has gone on forever. I was voted most likely to be president in high school. So politics has always kind of been my thing."* -Tasha

Although participants expressed wanting to pursue a career outside AMT, their level of clarity around the specifics of their goals vary. While some participants might know they want a fulfilling job that offers financial security, many do not have a specific career direction in mind and want to explore potential career options and interests first.

> *"I'm not sure [what I want to do], and this is the biggest conundrum to me. I have interests that branch out to all different types, but nothing strong enough to make me want to commit to it for the rest of my life."* -Anne

In the meantime as they figure out their career plan these participants joined AMT to make money to either overcome financial hardship, or to be productive in their spare time. Many of them plan to continue working on AMT until they can figure out what they want to do career-wise. When asked how much longer she expects to continue working on AMT, Jennifer replied, *"If things don't pan out, probably for a while until I figure out what I'm good at and can apply for other jobs that fit my skill set."*

Other participants know exactly what job they want, what skills they will need to develop, and have envisioned a path for getting to their goal. Many of them plan to attend school and obtain a degree as part of their retraining process. For instance Jason has laid out a clear plan for pursuing a career as a data analyst:

> *"For now, the first thing I want to do is pay off my student loan debt. After that, I want to make sure I have enough money to relocate to a new area and land a job. After I settle in with a job and a place to live, I'll probably attend college, trying to avoid student loans, and eventually get my bachelor's degree. At that point, I'll try to find an entry level data analysis job."* -Jason

However, obtaining a degree is costly, and many of these participants face financial obstacles, such as outstanding debt, that make it difficult for them to move forward with their career plan. They join AMT hoping that they will be able to make enough money to both pay off existing debt and save money to pay for school.

> *"I lost my online business and I had an mTurk account from years ago. I needed to make money quickly before figuring out my next career...I would ultimately like to become a computer programmer. I want to work as a freelancer or with a reputable company, ideally remotely. I hope to become successful with that. I also eventually want to go to school and mTurk will play a big role in paying for that."* -Lorena

Regardless of how clear their career goals are, all participants indicated that their goals lie *outside* AMT. They joined AMT as an initial step, hoping that eventually they may be able to move on and transition out of crowdwork. However, they find it challenging to make progress.

> *"I have [begun to work towards career goals], but I feel like I don't get anywhere, so I stay stagnant for a while and just settle for mTurk."* -Anne

We found that participants' challenges pursuing their career goals outside crowdwork stem from lack of appropriate career guidance, minimal financial resources, and limited time to dedicate to learning.

3.4.2 Challenge: Lack of Career Guidance

Trying to pave one's career path without appropriate guidance and mentorship is difficult and confusing. Many participants feel lost in thinking about their careers and expressed difficulty figuring out their next steps.

> *"I really don't know what exactly I would like to do. I don't really have a dream job because I haven't really found something I'm passionate in...I was thinking something related to computers because I use them frequently, and obviously programming is a huge job market, so I was leaning towards that, but I'm not really sure...If I had more confidence that I was actually good at programming and would want to do it full time I would probably be much more willing to jump into it."* -Alvin

Alvin thinks he might be interested in computer programming. But with no prior first-hand exposure to the field, and no guidance from someone who knows the area, he is hesitant to pursue this interest further. Alvin does not know what being a computer programmer entails, and whether it is a career that might suit him.

Other participants expressed related challenges entering a new industry. For instance, Viola shared that she is interested in a job that would enable her to help people, but she is unsure how to turn her interests into a career. From speaking to her we learned that before joining AMT she worked for several years as a QA chemist. Now she wants to transition into a completely different industry she had no prior exposure to throughout her scientific career. Her lack of experience and knowledge in her area of interest make it difficult to even know where to begin.

> *"I have also been really thinking about doing something that I enjoy and helping people with support groups or some sort of non-profit organization, but I don't know where to start...I'm slowly figuring that out as I go."* -Viola

Eleanor also expressed she has faced difficulties trying to break into data analysis due to her inexperience, specifically her lack of related work experience and industry connections.

> *"Because there's not that much of a need for that in the market unless you've got good experience, good connections, et cetera. I haven't been able to break into that [data analysis] yet, but I'm working on it."* -Eleanor

Several of our participants expressed that while they have emotional support from friends and family members who want to see them succeed, they lamented not having adequate mentors who could help them navigate their career direction. Having a mentor could help them overcome challenges defining their career goals and finding relevant work experience in their areas of interest.

> *"I wish I had a mentor. I wish I had someone that I could have at least had advice that knows how to like, navigate this whole mess. But no, I've never actually had anyone that actually could do that, I've never had anyone that was like, hey, this is a university you should actually consider these majors or what's so important about it or why it's important to have a job in the first place. I didn't really have that type of mentorship or person that's older or experienced to help me get through a lot of things in my life."* -Viola

Viola further shared that her biggest challenge in pursuing her career goals stems from her lack of the *"connections and experiences from working a real job"*, insinuating that she is unable to develop the career-oriented relationships and contextual skills she needs just through working on AMT. She feels she needs to work a "real job" in order to develop those kinds of relationships and skills.

Overall, participants expressed wanting to pursue a more stable and fulfilling career outside crowdwork, but struggle to work towards those goals because they lack a mentor who could guide them in the right direction. They joined AMT as they try to figure out their interests and how to pursue them, yet these challenges persist as AMT fails to cultivate the kind of mentoring relationships that might help workers and that career studies suggests are instrumental to career development and successful career change.

3.4.3 Challenge: Financial Strain

While some participants face challenges developing their careers due to uncertainty and lack of career guidance, others face significant financial barriers. Several participants joined AMT hoping that it might be able to help assuage financial roadblocks and allow them to build up their savings for future educational pursuits, but they find that the income they earn on AMT is insufficient to make steady progress towards their goals.

Many participants who have a specific job they want to pursue and a laid out a career plan envision getting a degree through formal schooling to acquire the skills they will need. For instance, Tasha wants to go back to school to get a degree in education so that she can be a high school government and politics teacher. Charlotte wants to obtain a master's degree in social work to be able to provide counseling to students and their families. Hope aspires to go back to school to earn a bachelor's degree in something related to art or photography, and obtain more business training to open up her art gallery. Christina wants to apply to pharmacy school. Ben wants to move to his closest major city and enroll in an applied math degree program. And Lorena aims to pursue a degree in computer science to become a computer programmer.

However, formal education is expensive, and many participants also face financial hardship from unemployment, medical debt, and prior school loans that they need to overcome before they can move forward with their plan to put money into a degree.

> *"Right now I am in crisis mode. I have too much debt to do anything else...I have to pay off my debt first. I have to be online all [day] to work and can't do other things right now."* -Hope

For many participants, pre-existing financial barriers are the biggest challenge they face in trying to pursue their career goals.

> *"That's [financial debt's] really the challenge. I mean, I can make everything else work, but on the inside, you know if it weren't for that, I really think that this is something I probably already would be teaching if it weren't for the hangup of the loan and, you know, always hitting some roadblock in the way of getting back on a repayment plan with the loan that I can actually follow. That's really what's getting in the way."* -Tasha

Several participants joined AMT to help pay off outstanding debt and save money for their career goals. AMT was an enticing option because it enabled them to work from home, and thus, manage the other constraints in their lives such as needing to take care of young children, health issues, and being in a location with limited employment opportunities. However, participants end up struggling to put their plan into action because pay on AMT is so low that they can barely make ends meet, much less be able to save money for retraining and learning. For instance, Charlotte explained that her first step towards pursuing her goal of being a social worker is to get a master's degree in social work. However, her family is *"so cash strapped"* that relying on AMT is not enough for her to complete her degree.

> **Interviewer:** *So do you think that mTurk will be able to help you be financially secure enough to get your master's?*
>
> **Charlotte:** *No. I don't think that I'm going to be, let me word it this way, one cannot base their income on mechanical Turk because that is, that's a disaster waiting to happen. So if a person is relying on mechanical Turk to pay their monthly bills, it's not going to happen. It's just not possible. Um, while there are some that do thrive, the majority of individuals will be very lucky if they pulled 20, maybe $30 a week. So no I can't solely rely on Amazon to meet my needs.*

In some cases, the financial challenges are so great that participants need to find ad-

ditional income sources. For example, Ben shared that he needed to obtain another job at a retail store in addition to working on AMT in order to make any significant progress paying off his existing student loan debt, so that he can more quickly relocate and pursue his bachelor's degree in applied math.

3.4.4 Challenge: Time Strain

Some participants shared that they struggle to find time they can devote to self-directed learning and planning towards their future career. The challenges they face around time are oftentimes compounded by needing to work long hours and irregular schedules on AMT in trying to meet their financial needs.

Many participants, especially those who heavily depend on AMT as a source of income, experience difficulty balancing work and caretaking responsibilities with making time for learning and retraining. For instance, Renee described how one of her biggest deterrents in pursuing her goal of being a freelance software developer is being able to self-study programming at home.

> *"My biggest challenge is time. When I'm free during the day, I'm usually working on mturk and can't focus solely on learning. During the weekends, my kids are home and it's hard to get a distraction-free area just to absorb the information."* -Renee

Lorena faces a similar problem. She said, *"A big challenge I face is having enough time to work, take care of my son, take care of the house, and learn programming"*. Both Lorena and Renee face financial challenges that make it so that they need to prioritize their financial stability by working as much as they can on AMT in order to maximize

their earnings. In addition, both of them face care taking responsibilities, which further cut into the time they might have available to focus on learning and retraining. Likewise, Viola explained that she is still trying to figure out exactly what she wants to do career-wise, but it is difficult for her to make progress because in addition to not having career guidance, she lacks the time to think about her goals because she is always taking care of others and putting their needs before her own.

> *"I never had the time to like pursue what I need to do and, and just self improve myself. I never had the time...I basically had to work all the time."* -Viola

Viola further explained that she does not have time to think about what she is interested in or what career she might want because she is the sole breadwinner of her household and needs to work long hours on AMT to be able to maintain both herself and her husband.

The nature of crowdwork makes it so that the participants who have the greatest financial need have to not only work long hours, but also maintain irregular and unpredictable schedules. Many participants described how their schedule is set by how much money they need to make that week, and how much they are able to progress towards their goal earnings each day.

> *"I basically work until 8-9PM...but sometimes if I see things happening I'll go until midnight. Last Friday night was really crazy and I didn't go to sleep until 2:30AM so I plan on stopping myself much earlier. The weekends are more laid back, I sleep in and don't start until 7 or 8AM and it ends alot earlier like 9PM."* -Viola

Similarly, Lindsay explained that she often finds herself needing to work on AMT during the weekend when she has not met her goal earnings for the week, on top of working a

full-time job offline. She said that the hardest thing for her in trying to pursue her goal of being a professional writer is not having the time to further her education.

> *"The challenge is always time. There does not seem to be enough time in the day. This is why it is particularly important to prioritize tasks on mturk. I need more time and money each day to work toward my goals. There are not enough days in the week."* -Lindsay

For many participants working on AMT is not a 9-5 job, so it is difficult for them to dedicate time to pursuing their career goals during "after work hours" because there is not a clear notion of after work hours. Work hours revolve around how much an individual needs to make that day and how long it takes them to reach their goal earnings. Additionally, beyond needing to work long hours and irregular schedules many workers need to continuously look for tasks and be ready to go when good work (fair-paying work) is available. For instance, Hope described how she needs to spend a lot of time each morning just looking for tasks on AMT in order to have them all lined up and ready to go.

> *"A lot of time I have spent hunting for work because unfortunately it's not like a regular job where you just log in and you know exactly what you have to do and then you go home and the job is done. You have to be very proactive and multitask in looking for the work. Like right now I have three studies that I'm going to do. As soon as I'm done with this phone call, I already have them queued up in my queue ready to go. So you have to constantly be looking for work, stop, focus on the work, and then immediately go back again."* -Hope

Similarly, Renee explained that whenever she is home she is within earshot of the computer and ready to work whenever a good task comes up. She described working on AMT as being *"on-call"*. This experience of always being on not only makes it difficult for workers to plan their schedules consistently, but is also draining. Alvin explained, *"I*

often feel pretty unmotivated to study programming after a full day of completing HITs, so I'm kind of at a stand still."

3.4.5 Learning Through the Cracks and The Tension Between Learning and Earning

Despite the barriers they face to learning and developing their careers, participants displayed a strong desire to learn and oftentimes try to find creative ways to do so as they work on AMT. For instance, Charlotte shared that she learns a lot from reading the study descriptions that are included in the surveys she completes. She likes to take her time completing surveys rather than just *"fly[ing] through those surveys checking whatever boxes"* to really think about the questions. They encourage her to do some *"soul-searching"*. Likewise, Tasha explained that she enjoys participating in surveys and studies related to politics and seeing what questions are asked. She said that she will oftentimes email the requesters of those surveys asking for a link to the findings of the project so that she can read about them. She explained that being exposed to surveys related to politics and current events helps her think about potential curriculum she may want to use someday as a teacher.

> *"...it [the survey] really made me think more about the things that I learned, the things that I studied, you know, and, also just how to present current events, and also poll taking and how it works. Um, relevant to the things we see on TV versus how being on this side and taking polls and surveys and doing studies for work might affect or skew the results. Um, and that's definitely something that I didn't think about too much and that I'm thinking about now. That could definitely be something that I could work with and incorporate."* -Tasha

Yet, Tasha further explained that these kinds of tasks are difficult to find because most tasks on AMT are *"vague and broad"*. She said that *"overall there's not a ton because a lot of it is mindless busy work essentially, but there are a few gems that you can dig out of the dirt."*

But even though participants expressed a desire to learn and improve themselves, they need to balance ingenious workarounds to learning with practicality. For instance, Charlotte shared that because she likes to take her time and think deeply about survey questions, she will often run out of time on tasks. She then needs to reach out to requesters to see if they will pay her for her work. This both puts her at risk of not getting paid for those tasks and reduces her time efficiency. When choosing tasks participants usually opt for the safe route. They end up prioritizing those that have the highest pay rate and are the most time-efficient over tasks with interesting subject-matter or those they might be able to learn something from, even if it is less enjoyable.

> *"Pay. It's always pay. If something has a good hourly, it's green in MTurk suite etc, that gets priority. This isn't really fun for me, it's about trying to scrape what I can by the end of the day. So I have to always prioritize the things that are worth the most and are most fair for the time. Or, alternatively, give an opportunity for higher pay - like this one, where there was an opportunity to do this follow-up, which is worth the time and effort."*
> -Tasha

At the end of the day, participants want to make sure they are coming as close as possible to meeting their goal earnings on AMT. For similar reasons, participants also look for work from requesters they trust either because they have worked with those requesters in the past or because those requesters have received good reviews from other

workers.

> *"Lastly, how is the specific requestor treating the workers? In recent years there have been a number of new requestors who put work out and either do not want to reimburse for time and effort or they simply reject and keep the data. If you are not a worker you do not understand that for every 1 rejection it takes 200 approved hits or assignments to offset."* -Charlotte

In some cases, participants might try to learn a skill for the purpose of being more efficient on AMT and maximizing their earnings. For example, Hope was encouraged to learn a bit of JavaScript so that she could be self-sufficient and not have to rely on requesters every time a task was broken because the requester had used the API incorrectly.

> *"I've also done my own research, um, my own education through like the Khan Academy or Udemy. And those definitely helped cause it's definitely, they helped me with macros and they help you a lot. For me, the thing that helped me the most is if something doesn't work in a survey or a batch, I know why. I can tell the requesters, Hey, your parameters aren't set correctly for this frame and you need to change it cause I really want to do those hits, let's go."* -Hope

Even though Hope does not see herself needing to know computer programming for her goal of running an art gallery, investing some time to learn JavaScript has helped boost her productivity on AMT so it is worth doing.

3.5 Discussion

Our findings show that many AMT workers do want to transition out of crowdwork and that they join the platform as an initial step to figure out their career identity or to work towards concrete goals. Unfortunately, their lack of mentorship, tight finan-

cial constraints, and tight time constraints force them to prioritize work on AMT and prevent them from making progress towards their educational and career pursuits.

In this section, we reflect on these findings in relation to what is known about career mobility in traditional work and the affordances of crowdwork platforms. We identify three ways in which crowdwork platforms fail to support career mobility: the lack of sustained collaboration means that crowdworkers can't form the professional relationships they need; the consuming nature of crowdwork means that crowdworkers are unable to balance the tension of learning and working to dedicate needed time to career goals; and the lack of complex project-based work limits the situated learning that workers can obtain and their ability to accumulate a portfolio of work. These challenges are similar to those observed in low-wage service sector work. However, because crowdwork is digitally-mediated, there may be more opportunities to design platforms and tools that support career development. These are the opportunities we describe in the following section. Since we found that participants' career goals involve transitioning out of AMT, we focus our discussion of design implications on supporting that kind of career change.

3.5.1 Towards Professional Networking on Crowdwork Platforms

We have already discussed the importance of interpersonal relationships to successful career development in traditional work (see **Section 3.2.1**).

And despite the limited affordances for interpersonal interaction within crowd platforms, research shows that crowdworkers do still find ways to support one another

to reduce transaction costs, get work done, and recreate the social side of work [177]. Workers tap into their social network for guidance navigating confusing tasks, to work around the platform's technological shortcomings, to be more efficient in completing tasks, and to commiserate with others who can understand what being a crowdworker is like [177].

However, there are two different types of interpersonal relationships that support career development in different ways. Psychosocial support is akin to emotional support, and enables individuals to feel capable of overcoming challenges, while instrumental career support provides coaching on career-related issues, exposure and visibility in new industries, and job leads [206]. *The problem is that while crowdworkers have been able to provide psychosocial support to one another, they are much more limited in their ability to provide instrumental career support.*

In some forms of traditional work, individuals often work together in teams over an extended period of time. They learn about each others' strengths and interests, and over time, look to each other for guidance, networking, and help identifying career advancement opportunities [252]. In contrast, crowdwork is socially decontextualized, which inhibits the development of professional relationships. AMT crowdworkers do communicate with each other, but the work itself is almost always done individually. In the rare tasks that involve collaboration, crowdworkers are anonymous to each other and only work together for a single task. There is no long-term interdependent work.

Prior work in HCI and CSCW has focused on supporting collective action to combat abuse within crowdwork platforms [390, 224, 223]. We see an opportunity to

consider how to support crowdworkers in going beyond survival *within* platforms to thriving *outside* of them. In Ghost Work, Gray and Suri call for new mechanisms to help crowdworkers support one another: *"We all stand to benefit from learning how to align the range of motivations animating on-demand workers with the equipment to help them help one another as they make their way through this demanding work"* [177]. Our findings show that crowdworkers on AMT have career goals beyond crowdwork (see **Section 3.4.1**), and would benefit from more instrumental career support (see **Section 3.4.2**).

One approach to achieving this is to design for sustained collaboration and professional networking among crowdworkers. We see potential in extending research on teams for complex crowdwork and online collaboration [483, 375, 391, 388, 523] as a way to support these facets of career development. How might we design tasks, teams, and platform interfaces to support the formation of mentoring and networking relationships among crowdworkers beyond simple guidance on how to be a crowdworker? And how might we introduce mechanisms that enable and encourage workers to sustain these relationships over a long period of time?

Another direction involves understanding the role of knowledge sharing and how professional networking may arise. In [296], Margaryan suggests enabling crowdworkers to create profiles and portfolios highlighting qualifications to support their learning and career development. We might imagine how this would allow crowdworkers to showcase their skills to other workers and learn about their peers' strengths as well. Taking this a step further, we could incorporate profile features for workers to share

their career goals. It would be interesting to study how these different profile elements may help crowdworkers connect with others who share similar goals, or with those who could help them learn desired skills. However, one of the limitations of this idea that it has the potential to create more unpaid work for workers.

3.5.2 Towards Enabling Greater Allocation of Time to Pursuits Outside Crowdwork

A second problem is that crowdworkers are unable to allocate the time they need to engage in the adaptive career behaviors needed to pursue longer-term goals. We already discussed the importance of adaptive career behaviors for career development (see **Section 3.2.3**), and it isn't hard to see that you need significant time and attention to plan, search, apply, and obtain any necessary reskilling.

Yet, dedicating the time and attention required for a career change is challenging as a crowdworker. AMT workers operate in a low information environment which requires intense focus. Workers are responsible for finding tasks themselves. But since tasks are limited in quantity; vary widely in pay rate, requester fairness, and task content; and have idiosyncratic posting times, workers need to always be ready if they want to nab high-quality tasks. Workers do not know at the start of their day or week how much money they will be able to make. Working on AMT is like participating in a real-time first-come first-serve auction on items whose value is unclear. These many unknowns force workers to devote their attention to monitoring the platform to avoid significant loss to their earning potential. Workers end up working long or atypical

hours just to find tasks [45], making it very difficult to spend any time at all thinking about their career goals. These realities were echoed in the experiences shared by our participants (see **Section 3.4.4**). They explained the need to constantly look for work and to switch between doing work and queuing up tasks. One participant described the experience like being *"on-call"*.

This is further exacerbated by the low wages and power imbalances that make it hard to accumulate money on AMT to pursue a new career (see **Section 2.2.2**), and the fact that many crowdworkers live in a precarious financial situation where their household income is not enough to cover basic needs [45]. This was reflected in the experiences of the workers we interviewed (see **Section 3.4.4**): they reported that they sometimes had to seek additional work to supplement their income and were unable pay for degrees or other programs relevant to their career goals. As you will recall, financial resources are also critical for successful career development (see **Section 3.2.2**).

These challenges coalesce in a vicious cycle where workers need to put more and more time into the platform to try to meet financial needs at the cost of having less time to learn or work towards their career goals. Participants struggle to balance learning and earning because the opportunity cost of not finding good work is too high (see **Section 3.4.5**). They prioritize tasks that pay well, can be done quickly, and are put out by fair requesters, over actively looking for tasks they can learn from. We see two opportunities for alleviating the tension between learning and earning: 1) making the value of tasks more clear and 2) reducing the burden of needing to look for work.

In prior work researchers have begun to address the issue of transparency on

AMT by developing tools and forums to help crowdworkers obtain more information about requesters and task payment [224, 399, 191]. Much of this work, such as [399], focuses on helping crowdworkers earn higher wages. We see an opportunity to extend this literature by exploring how greater transparency into the value of tasks relative to time can help crowdworkers gain more control over their time and help them better direct their attention.

A second direction is to develop methods that support crowdworkers in maintaining a more regular schedule and in reducing the burden of finding work. The wealth of research on scheduling, bidding, and mechanism design in the AI and algorithmic game theory communities [383, 333, 79] could be a starting point. Some workers already use automated scripts to assist them in selecting tasks[1]. However, while these do support task search, they do not mitigate the problem of schedule irregularities. How might we automate task scheduling for crowdworkers based on the number of hours they want to work each day, the time blocks they would like to work, and their goals for earnings? Can this help give them more control over their schedule without excessively limiting the kind of work they have access to?

3.5.3 Towards Situated Learning in Crowdwork Tasks

There are two principal benefits that individuals obtain from experience with large, multifaceted projects for career mobility. First, it facilitates the situated learning of professional and technical skills that can be transferred across work settings; these

[1]For more information on scripts for supporting AMT crowdworkers, see https://turkerview.com/mturk-scripts/

include communication skills, project management skills, and domain-specific expertise. Second, the projects themselves can serve as a credential that encourages employers to trust a prospective employee, especially if the prospective employee can articulate concrete contributions. Such credentials would be particularly valuable for AMT workers because their job itself may be a poor credential. For instance, recent evidence suggests that driving gigs maybe not be a substitute for traditional employment on resumes for low-skilled workers [279] and that many workers on AMT choose to not list their crowdwork experience on their resume; they worry that crowdwork would not be respected and feel that it is not relevant to their careers goals [241].

The problem is that crowdworkers do not have access to complex project-based work. Crowdwork platforms like AMT largely contain fine-grained and intellectually decontextualized tasks that prevent workers from gaining a bigger picture view of their work or from describing their contributions to larger projects. Recent work has indicated that crowdworkers do learn some skills in their work [125, 48, 454]. Our study confirmed this, finding that participants learn facts from the studies they participate in, and even reflect on how they relate to their lives and society at large. However, it also revealed that many tensions still remain between learning and earning (see **Section 3.4.5**). This simple form of learning is just not a substitute for the professional skills and career development provided by project-based work.

We call on the research community to consider how to design crowdwork experiences in which lower-skill crowdworkers can contribute to large projects. We envision that platforms will be the ones to implement these, either restructuring existing plat-

forms or when developing new gig work structures in the future. As such, one of the primary challenges of this work will be to value-align crowdwork tasks with platforms' goals. Some steps have already been taken to do this in the context of education, where researchers have considered how learners can develop new skills while getting paid and obtaining real-world work experiences [253, 90]. For example, in a recent HCI paper on scaling apprenticeship learning, researchers introduced a new form of coordination called micro-role hierarchies to help short-term novices contribute to complex projects as they develop new skills [266]. They demonstrated its ability to coordinate learners to build static web pages for refugee resettlement agencies. How might we extend HCI research focused on supporting online learners to begin designing new coordination schemes that make crowdwork more meaningful and educational?

Another promising path we see is to find ways to help low-skill crowdworkers transition to high-skill crowdwork on sites like Upwork, which can in turn be a pathway to promoting project-based work. This is especially promising given the new structures being developed for organizing high-skill crowdworkers to collaborate on large projects [483], and research showing that high-skill crowdwork enables career exploration through project-based work [50].

3.6 Limitations

We acknowledge the methodological limitations of our study. First, our mechanism for recruiting participants introduces potential biases. One of our criteria for

selecting participants to move on in the study was whether they provided thoughtful, detailed responses to the open-ended questions in our surveys. While this helped us select participants who might be open to sharing more, it is possible that we were also unknowingly selecting more educated individuals (those who could write more eloquently), or those who are more extroverted and vocal within the community. Our study is also limited by the amount of detail we are able to provide about participants, such as limited information related to their additional jobs outside AMT.

Additionally, our study did not include workers who have been able to transition out of crowdwork successfully. In the future we may want to consider how to recruit ex-crowdworkers who are no longer active on the platform to understand the challenges they faced in pursuing their careers and how they overcame them. Furthermore, while our findings indicate that crowdworkers want to transition out of AMT, there may be exist crowdworkers who do want to make a career on the platform. Future work could consider whether such a population exists and how to support them. Even though our findings only focus on the experiences of a small percentage of AMT crowdworkers, we believe that learning about their career goals and the challenges they face can inform new research agendas on crowdworker well-being and the future of work.

3.7 Conclusion

In this chapter I considered career development as a lens into safety. I studied the career goals and related challenges of crowdworkers on AMT. I found that crowd-

workers have career goals they want to pursue and see crowdwork as an initial step. However, once on the platform, they are forced to choose immediate financial gain on the platform over their long-term goals and the safety that achieving those goals could provide. In particular, workers' inability to pursue their career goals contributes to financial and autonomy-related harms. The tension we see echos the phenomenon presented in Maslow's hierarchy of needs: that individuals are not able to meet growth needs, such as safety, until basic deficiency needs for survival (e.g. food, sleep, shelter) are met [314, 301]. I presented design opportunities to lessen this tension including tools that support peer mentoring among workers, tasks that allow workers to contribute to large projects with situated learning, and gig work ecosystems that allow workers to transfer skills across platforms (e.g. crowdwork to online freelancing).

The study presented in this chapter focused on harm in interactions where there is a strong financial motive for the interaction and an uneven balance of power between workers and requesters (clients). These increase workers' vulnerability for harms caused by the platform. Workers may also be more susceptible to certain harms when interactions occur offline. In crowdwork interactions occur strictly online. Therefore, in my next study I focused on harm related to bias and harassment among rideshare drivers, food couriers, and workers who perform domestic work. These are all interactions that not only feature a strong financial motive and uneven power dynamics, but where there is also a non-trivial offline component following initial contact on a matching market platform. This study is detailed in Chapter 4.

Chapter 4

Women Gig Workers' Experiences with Safety

In this chapter I studied women gig workers' experiences with bias and harassment and how they attempt to mitigate and respond to these harms.

We conducted semi-structured interviews with 20 women gig workers across ridesharing, food delivery, and domestic work (e.g. carework, cleaning, organizing, handiwork). We sought to understand in what situations they experience bias and harassment, how they respond to these situations, and the protective safety behaviors they engage in to mitigate future occurrences of harm. We evaluated how platforms contribute to the bias and harassment women gig workers experience and affect their protective safety behaviors.

We found that gig platforms are gender agnostic: they do not acknowledge women's greater risk for harm or the value they provide to the platform, especially in

the form of carework. Additionally, they reward qualities socially perceived as masculine (e.g. physical strength) through increased financial and physical security on the platform. By being gender agnostic, platforms fail to implement and enforce policies that reduce women workers' vulnerability to harm. Furthermore, platforms limit how workers can respond to such negative experiences and protect themselves. In particular, women workers report "brushing off" harassment, fearing they may loose access to work if they were to speak up.

I co-led the work in this chapter with Dr. Ning Ma. All data collection, analysis, and writing, was split evenly between the two of us and we actively worked together throughout this process. Dr. Dongwook Yoon and Zheng Yao were also collaborators. This work was published and presented at CHI 2022 [284].

4.1 Introduction

Millions of people have joined gig platforms as their primary or secondary work in the last decade [2, 524]. Platforms facilitate a large scale of service exchanges through algorithmically mediated dispatching and recommendation mechanisms [267, 189], and manage workers using automated peer evaluation systems [380]. Gig platforms' low entry barrier and perceived flexibility in scheduling and work locations [381] may provide opportunities for some. Yet, there are drawbacks. Platforms do not recognize workers' varied social contexts in making management decisions [282, 229, 297], and workers face information and power asymmetries [381]. These factors contribute to workers' expe-

riences and challenges. Furthermore, workers' social contexts are invisible to platform mechanisms that manage work, resulting in marginalization of workers [177].

Across gig industries such as ride-hailing (e.g., Uber), food delivery (e.g., DoorDash), and home services (e.g., TaskRabbit), women make up approximately half of the gig workforce in North America [2, 524]. In human-computer interaction (HCI), women gig workers' experiences have often been studied under the guise of *workers*, without specifically attending to a particular gender. Women have historically been marginalized in social interactions, where they are targeted for harassment in public places [274, 165], face gender stereotypes [254, 134, 135], and are perceived to be physically vulnerable [140, 165]. In offline organizations, women face a gender pay gap [121], workplace harassment [366], and lack of career growth opportunities [47] among other challenges. At the same time, gig platforms seem to provide an alternative for women to gain access to work that has a low entry barrier, and flexible schedules that allow them to accommodate their other responsibilities, such as care taking [239, 222]. Yet, it is uncertain how women gig workers navigate these opportunities and potential risks in interactions.

Despite the high participation of women in gig work, few studies have exclusively focused on women's experiences in gig platforms that support ride-hailing, food delivery, and home services. Prior research centered around these gig platforms has highlighted how algorithmic management results in bias [189], harassment [190] and safety [21] issues for workers. These issues are all pertinent to women, although they have been studied in a *gender neutral* manner. Our work looks into women's unique

challenges experiencing these issues, and how they cope with them given their unique social contexts and gender implications.

Recently, research on gig platforms has studied women's working conditions, focusing on the pay gap in ride-hailing [104] and online freelancing [154]. However, due to the quantitative nature of this work in identifying the cause of the pay gap, there is limited knowledge on women's perspectives, or their side of the story, regarding these challenges. For instance, Cook et al. concluded that the gender pay gap in ride-hailing is largely caused by women's preferences in driving speed and location, which eventually results in less "experience on the platform (working-by-doing)" than men [104]. This seems to suggest that the pay gap is caused by women themselves. Our work aims to present reasons that lead to women's work practices and the factors that contribute to their experiences.

With these considerations, we set out to investigate *what are women's unique experiences and challenges in gig platforms?* We interviewed 20 self-identified women gig workers who work in ride-hailing, food delivery, and home service platforms in North America. We selected these three platforms because they collectively represent varied levels of interaction between workers and clients, and differences in terms of who owns the space in which the interaction occurs. For example, in ridesharing and home service work there is a high level of interaction between workers and clients, relative to in food delivery. In ridesharing, the worker owns the space (e.g. the vehicle) in which the interaction takes place; in home service work the interactions tend to occur in the clients' homes. We analyzed our interviews through the lens of critical [338, 40] and

gender theories [72], and feminist methodologies in HCI [39].

We found that gig platforms leave women workers vulnerable to bias and harassment by not attending to their gendered experiences. By not enforcing anti-harassment policies in design, gig platforms leave women workers vulnerable to bias and harassment. Due to the lack of support for immediate actions and in fear of losing access to work, women workers "brush off" harassment. In addition, the platforms' dispatching and recommendation mechanisms do not acknowledge women's contributions in perceived safety and social support for customers and peer workers. As a result, women feel unsupported in gaining access to work and at a financial disadvantage.

From this, we argue that gig platforms are *gender-agnostic*, meaning that platforms' designs treat men workers' experiences as the norm and are blind to women's realities. Even though gig platforms may not actively discriminate gender, by being gender-agnostic they are insensitive towards existing gender inequities in socio-technical infrastructure. This leads to designs that marginalize women by perpetuating bias and harassment.

When algorithms exercise management decisions (e.g., dispatching) in a platform that does not recognize women's realities, they create unfair outcomes for women. We discuss in detail why gender-agnostic platform design is problematic through women's perspective, and draw comparisons between women in gig platforms and those in traditional organizations. Our work adds to existing discussions of how platforms fail to attend to workers' interests [381, 230].

We do this by highlighting the disproportionate risk women face as a conse-

quence of gender-agnostic platforms, and how such platforms marginalize women.

4.2 Methods

4.2.1 Participants

We conducted semi-structured interviews with 20 women gig workers across ride-hailing (Uber, Lyft), food delivery (DoorDash, GrubHub, UberEats, Postmates), and home-service platforms (TaskRabbit)[1]. These gig platforms were selected because their worker pool significantly consists of men [104, 2, 524], such as in ride-hailing and food delivery, or because they are gender-segregated [96], such as in home service work, where we suspect that women's experiences may be marginalized. At the time of analysis, we dropped one participant due to credibility concerns. Specifically, this participant had participated in one of our previous studies and provided information that was inconsistent with the information provided previously. The 20 participants included in the analysis were 19 - 61+ years of age and had spent 9 months - 6 years working on the platform at the time of the interview. They reported working 8 - 80+ total hours per week across all platforms they are on. Twelve participants self-identified as white, four as Black/African-American, one as Asian/Pacific Islander, and two preferred not to disclose their race. Five participants worked as drivers, six as couriers, and seven as taskers. Two participants worked as both a driver and courier. All participants worked for gig platforms in either the United States or Canada. Participant information is

[1]Throughout this paper we refer to food delivery workers as couriers and home service workers as taskers.

Name	Gig Type	Age	Race	Hours/Week	Experience
Alison	Driver & Courier	31-45	Black/African-American	36	3 yrs
Amelia	Tasker	19-30	White	10	1 yr
Angela	Courier	31-45	N/A	20-60	3 yrs
Annette	Driver	31-45	White	20	3 yrs
Ashley	Driver	61+	White	quit	5 yrs
Cindy	Driver & Courier	46-60	White	80+	6 yrs
Constance	Tasker	19-30	Asian/Pacific Islander	16	9 mos
Eileen	Courier	19-30	White	30-40	1.5 yrs
Ella	Tasker	46-60	White	15	3.5 yrs
Emma	Tasker	31-45	Black/African-American	30	2 yrs
Hope	Courier	31-45	N/A	20-30	3-4 yrs
Jennifer	Driver	31-45	Black/African-American	20	4 yrs
Jody	Courier	19-30	White	35	1.5 yrs
Kayla	Tasker	46-60	White	8	5 yrs
Natasha	Courier	19-30	White	10-20	1.5 yrs
Penny	Driver	46-60	White	45	6 yrs
Sheryl	Courier	61+	White	40	2 yrs
Tiffany	Driver	46-60	White	25+	6 yrs
Vivian	Tasker	19-30	White	20	1.5 yrs
Yvonne	Tasker	31-45	Black/African-American	15	4 yrs

Table 4.1: Self-Reported participant demographics for the 20 participants included in our analysis. All names are pseudonyms.

provided in Table 4.1.

4.2.2 Data Collection and Analysis

4.2.2.1 Recruitment and Data Collection

We recruited ride-hailing and food delivery participants by advertising our study on various social media groups for these workers. Home service workers were hired through TaskRabbit. We invited taskers who work on a range of task types including delivery, cleaning, personal assistant, furniture assembly, and home repair. Participants were first asked to complete a short survey to obtain demographic information (presented in Table 4.1). From that data we invited participants to an interview. For the interviews we prioritized workers who have a longer working history and have completed more total

transactions on the platforms they are on. Since we were interested in understanding how workers respond to and cope with bias and harassment, we expected that workers with more experience on the platforms may have experienced more bias and harassment.

The two investigators conducted interviews via Zoom between April 2021 and July 2021. Interviews focused on understanding workers' unique experiences as women, how their gender identity shapes their experiences working in gig platforms, and how they respond to and cope with bias and harassment. We included questions that asked about workers' experiences with safety, bias and harassment, customer interactions, and how these experiences shape their work practices. Each interview lasted between 35 - 95 minutes. To thank participants for their time, we paid them $25 - $50 USD or the equivalent amount in CAD for those based in Canada. All interviews were recorded by Zoom and manually transcribed by the two investigators.

In this process, we deductively excluded some extraneous content that did not speak to our research questions such as time stamps, rapport building, and logistics (introductions of ourselves and collecting payment information, etc.). The total number of sentences that were excluded from our transcripts is less than 10% of our data.

4.2.2.2 Analysis

We analyzed the interviews using inductive and deductive thematic analysis [60]. Our analysis is also informed by feminist theories on sociotechnical systems [38] and critical gender theories [72, 338]. We developed the initial round of codes using open

coding [88]. These codes were migrated to an online collaborative whiteboard[2] and were coded into different categories using axial coding [88]. Based on these categories, we developed second level codes by grouping initial codes into higher level categories. For instance, some of the initial codes were " night shifts", "dress code", "flexibility is important". These codes were later merged into higher level categories such as "platform masculinity" and "impression management". While merging codes to the next level inductively, we also deductively excluded some codes that did not relate to other themes (e.g., college student). The data collection and analysis was done in batches of 9, 8 and 4 participants. We ended up with 396 independent codes and 16 categories (which we developed into 8 themes) as they grew stable in the first 16 participants' interviews. In the last 4 interviews, only 11 new codes emerged. We fit these codes in the existing categories, but new themes did not arise. Throughout this process, the leading authors met several times each week between May 2021 and July 2021 to discuss the codes and developing themes. All authors also met weekly to discuss the appropriateness of the developed themes. Based on these discussions, we iteratively wrote several memos [88] which eventually developed into the key insights in our findings. Our study protocol was approved by our institution's ethics review board.

4.2.3 Positionality Statement

When presenting the findings and interpreting the data, we acknowledge our own gender, social privilege, and cultural background as potential areas of bias. This

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includes when interpreting participants' experience that are intersectional, we focused on the implications rooted from being a woman, and may not have adequately acknowledged their racial background. Even though all authors are non-white, this may have introduced biases where gender was seen as the primary cause of contention over race. Similarly, we omitted findings where women reported being marginalized by other women, such as experiencing more false reports and prejudice from women customers. From our own experience, we think this could stem from women workers' own gender bias against women. For instance, customers of all genders may view women as easy targets. As such, we did not report sufficiently on gender biases exercised among women, partly due to the majority of authors being women and our own level of sensitivity to bias among women. Lastly, we believe there are physical differences between men and women. This may have contributed to our perspectives on masculine qualities and how they benefit some workers.

4.3 Findings

Our interviews show that gig platforms are gender-agnostic to women's experiences. As a result, women are left vulnerable to bias and harassment. Facing these challenges, women "brush off" and de-escalate the situation, instead of using the panic buttons built into in the platform. We also found that women workers provide unique value to gig platforms, such as perceived safety and emotional support for customers and other workers. Yet, these contributions go unrecognized by platforms and are not

taken into account in existing dispatching and recommendation mechanisms. These contribute to women feeling unsupported and being at a financial disadvantage. Interestingly, we also found that masculine qualities, such as physical strength, are rewarded with increased financial and physical security.

4.3.1 Lack of Gendered Design Leaves Women Vulnerable to Harassment

We found that the lack of gender specific designs in platform policy and work infrastructure leaves women workers vulnerable to bias and harassment when interacting with customers. Women workers' experiences with bias and harassment, and their ability to react to such situations, are also mediated existing platform power asymmetries between customers and workers [381].

4.3.1.1 "Nothing. Absolutely nothing!": Lack of gendered policy and infrastructure leaves women vulnerable

Previous work has reported rampant bias [189, 190], harassment [288], and safety [21] incidents experienced by gig workers. Yet, platforms have done little to address these issues. One example is lack of workplace standards. Even though this affects all workers, women find lack of workplace standards particularly precarious. In service interactions, gender stereotypes such as women being physically non-threatening and having risk adverse tendencies make customers believe they are less professional, and easy to challenge and target (Annette, Penny). As a result, women workers face

disorderly customer behaviors such as false cheating accusations. Tiffany shared how she was treated as an easy target and her professionalism questioned by customers due to being a woman.

> *"With older guys basically when you [as a passenger] get in the car and you're a female you don't jerk around with them the same way, because you know they're kind of serious and they know what's what. But if you're a female driver, they[passengers] just figured that they can get away with more either bad behavior or saying that somehow you cheated, and they can get their credit that they could get money that's a big thing that they all try to do." (Tiffany, driver)*

Women delivery workers suspect that safety and harassment related incidents happen to them more often than men. For instance, Eileen gave an example of how she thinks that harassment incidents have happened to her because of her nonthreatening nature as a woman.

> *"People have been following me to my house to yell at me for my poor driving now that I am a female. And I believe that is because I am regarded as no threat. ... Would someone ever do this if I was a guy? I don't think so." (Eileen, courier)*

The current management mechanisms of gig platforms are agnostic to women's needs to work in a safe environment and be treated fairly by customers. This is caused by assuming that workers do not require designs that acknowledge their gendered realities. Several women (Tiffany, Penny), said that platforms do not take effective measures to ensure their safety. When customers show signs of being a physical threat or exhibit other disorderly behaviors, women have to deal with them on their own.

> *"They don't teach you how to use the APP they don't teach you customer service they don't teach you about laws on the road. They don't teach you about safe practices or best practices, nothing, absolutely nothing, so you wing it." (Penny, driver)*

To clarify, this quote should not be misinterpreted as if Penny needs more training for doing her job well; she has been a ride-hailing driver since 2015 and works about 45 hours per week. Rather, she needs a "written law" to refer to when defending herself in customer interactions. Without such a guideline she is defenseless when customers question her decisions as a woman. This is particularly the case with her notion of "customer service." It is unclear when it is okay to cancel a ride, or ask someone to step out of the car. When women form practices of their own to defend themselves in customer interactions, without platform endorsement, their decisions are often challenged by customers. From our data, we learned that women are in dire need of guidelines to protect themselves from a range of situations that arise when interacting with customers. Comparing ride-hailing to the taxi industry, the taxi industry usually has relatively better guidelines for workers to refer to, and procedures to follow when a customer is perceived as a threat. Workers can lean on such guidelines when making judgements and taking actions. In many cases, this may prevent situations from escalating.

4.3.1.2 Women "brush off" harassment as platforms fail to support immediate actions

Due to the lack of gendered policy and infrastructure in gig platforms, women workers find it difficult to stand up for themselves when facing bias and harassment in interactions with customers. Previous work in HCI has studied women's safety in public spaces and the efficacy of panic buttons for women in public space [237]. As an attempt to aid workers' and customers' safety, several platforms also introduced their

own versions of panic buttons [1, 98]. However, similar to the reception of panic buttons for women in public space [237], women gig workers do not feel panic buttons attend to their needs effectively when they experience harassment.

When interacting with potential risks in gig workplaces, women need to be alert and quick to recognize upcoming harassment. Their goal is to de-escalate the situation quickly, instead of reacting after the fact.

> *"...[hitting the panic button] that's not where my mind goes. My mind goes, get out now. Maybe after the fact once I've found myself in a safe situation I would think of it [panic button], but not in the heat of the moment, no." (Jody, courier)*

By the time hitting the panic button takes effect and a police officer arrives, the damage has most likely already happened. In these cases, the panic button is akin to an error report option, not a harassment prevention mechanism. This explains why Jody's first thought when facing harassment would not be to use the panic button.

In reality, when women gig workers experience harassment, they often have to de-escalate the situation by brushing off unwanted attention, playing along, or deciding to"joke it off"(Cindy). Annette, an Uber driver, referred to these de-escalation mechanisms as *"delay and deflect"*.

> *"I had a guy refuse to exit my vehicle unless I kissed him...I delayed and deflect[ed]. I was dropping him off at another bar so I told him that after I was done with my shift I'd meet up with him and he agreed to that. Of course I never went freaking back. But he agreed to that so he exited the vehicle and I was able to leave." (Annette, driver)*

In this situation Annette played along with the customer to get him to leave her vehicle. Although the situation may merit a stronger reaction, Annette did not force him to leave

her vehicle or actively fight his unwanted advances. Instead she made the decision to "delay and deflect" to avoid further endangerment of her safety, knowing that there are no other possible actions supported by the platform. Similarly, Jennifer described how she feels forced to put up with bias and harassment in her interactions with passengers because she would not feel safe speaking up as a woman.

> *"is it worth it? Is it worth your life to speak up right now? And most of the time it's not, so you just don't." (Jennifer, driver)*

For women like Annette and Jennifer, oftentimes de-escalating ongoing harassment is the only viable strategy to stay safe.

4.3.1.3 Women's protective safety behaviors are compromised by rating-based assignment mechanisms

The women we spoke with emphasized that brushing off bias and harassment is not how they would ideally handle these situations in the "real world" outside gig platforms. This suggests that their identity as workers on gig platforms plays a big part in how they react. While working in gig platforms, women need to prioritize their goal to generate income by maintaining a good standing in the platform's evaluation mechanism. This requires them to keep the customers happy.

> *"At the end of the day you are dealing with something that you might not necessarily do in the real world ... as long as you still give a five-star, there's compensation that comes with it. ... certain situations it's just not worth standing up for yourself because if you do, and they give you a bad rating, it's not like Uber reaches out to you to get clarification on the issue." (Jennifer, driver)*

The rating-based work assignment mechanisms [267, 190] compromise women's ability to stand up to bias and harassment. Additionally, several women mentioned that the lack of recourse following deactivation forces them to shoulder the consequence of an abusive interaction. For instance, Annette described how her livelihood with Uber was affected after she decided to say something to a male passenger who kept touching her.

> *"I told him if you do it again you are going to get out here. ...unfortunately that person ended up giving me a low rating which affects any promotions I can get and even my standing with Uber. They can take me off the platform because of that. And there is little to no rebuttal that I have." (Annette, driver)*

From these testimonies, we see women's fear of losing access to work leading their inaction/passive resentment of harassment and safety risks. At the same time, when they do speak up for themselves, they risk losing access to work as the platform's algorithm would punish them with lower ratings.

Lost access to work does not only come from platform deactivation, but also from time spent recovering after a traumatic experience, such as harassment. Any human being would be emotionally affected in the hours or days following such an incident. When a worker decides to take time off to gather themselves before facing a customer again, they are financially responsible for the lost work time. There is no platform support for this aspect of workers' well-being. Women who depend on gig platforms for a living may have to keep working in distress with no time to recover.

> *"It bothers me, yes. I have a choice of losing it and getting angry and taking time to gather myself to the point where I can work again or I can take it in a different route and just realize okay, you got this person here for five*

minutes and then they're getting out of your car and you will never see them again ..." (Penny, driver)

Admittedly, not all women would continue working after a harassment incident. We see that such decisions are made based on women's financial dependency [282, 407] on the platform. Platforms' reward mechanism forces women to trade their safety and emotional wellbeing for an opportunity to make money. While women who are less financially dependent on the platform might be able to afford to stand up for themselves (Ashley) and willingly stop working after certain hours to avoid safety risks (Natasha, Sheryl), more financially-dependent women (Cindy, Jennifer, Annette, and Tiffany) have had to make decisions similar to Penny's at various points of their gig career.

In this subsection, we discussed the ways in which women gig workers are marginalized by gender-agnostic platform designs. This is reflected in the lack of gendered policy and infrastructure that leave women vulnerable to harassment and unfair treatment from customers. Without effective guidelines and platform mechanisms to support women in defending themselves, women have to brush off harassment and de-escalate the situation to protect themselves from further endangerment and maintain access to work.

4.3.2 Dispatching & Recommendation Algorithms Do Not Acknowledge Women's Value & Contributions

We found that women gig workers bring unique value to service interactions with customers and the gig worker community, but platforms do not acknowledge the

value of their contributions. Women engage in activities that platforms do not consider work. Therefore, platforms' algorithms do not reward women for this labor with greater access to work, or work with higher earning potential.

4.3.2.1 Women provide perceived safety for customers and social support for other workers

Women workers shared stories of how they are able to cater to certain customers by providing a sense of comfort and safety. They explained that for various reasons, some customers prefer to interact with women workers. In these situations they may have an advantage over men workers. For example, some ride-hailing drivers (Tiffany) explained that women passengers often feel uncomfortable riding with men drivers, and express relief when their driver is another woman. We heard similar stories from taskers, especially those who perform male-dominant tasks such as handy work. For instance, Ella described that 90-95% of the people who hire her are women. Speculating on why her service is preferred over men's, she explained that she gets hired by

> *"...women who live alone, women who don't like creepy men coming to their apartments, women who can't get their husbands to do anything, and women who want to support other women." (Ella, tasker)*

These experiences suggest there is a preference for women gig workers among a certain group of customers, oftentimes other women.

Women also provide social support in online worker communities such as forums, subreddits and Facebook worker groups. Due to the lack of training and support

from the platforms, online worker communities are an essential part of how workers learn and form their own practices, and seek social support [285, 267]. However, online worker communities do not always provide a supportive environment, as negativity and aggressive behavior are common in these spaces [518]. As a result, women workers feel discouraged to speak in online worker communities. They see these spaces as negative, apathetic, toxic, and led by men workers. They believe a 'women only' platform would be much more positive and supportive.

> *"women are more tuned to be talking about the human aspect than men...and it would be great if there were enough women who are delivery drivers to actually have a forum like that. There wouldn't be so much complaining over things that you have no control over...gig work as a whole has a very patriarchal, masculinity feel." (Jody, courier)*

Several women expressed that they do not speak in online forums to avoid the negativity. Instead they are just long term 'lurkers' (Natasha) of the space.

However, they do feel obligated to speak when they see a fellow woman gig worker is in need of either informational or emotional support.

> *"I once saw someone who identified as a woman actually posting that can they use a fake name, and tons of people were commenting if you're too scared to use your real name you shouldn't use this platform and just all of this kind of really dismissive responses. That's like an example that I really felt like obligated to share with them that, yeah you can use a fake name i've done it no problem and it's fine just do it." (Natasha, courier)*

Even when women do not actively participate in online discussions, they will step up when they feel it is necessary. Natasha also shared that one of the few instances when she spoke up was to make another woman worker feel validated when the others in the community were not being supportive.

4.3.2.2 Gender-agnostic management mechanisms harm women workers

Gig platforms' gender-agnostic management mechanisms do not acknowledge and value the impact of women's contributions. In addition, they cause physical and financial harm to women workers.

As discussed in 4.3.1 platforms provide little to no support for women workers' safety, despite women workers' significant contributions to customers' safety. In the aforementioned section, we noted two concrete ways in which gig platforms fail to acknowledge safety concerns among women drivers and couriers: lack of gendered guidelines, and lack of efficacy of emergency alert features such as panic buttons.

We found that the threat of harassment extends to online spaces as well, where women workers face risk of online harassment when they speak up to support other workers. They often face backlash from workers who disagree with their beliefs or do not want them to speak for the community. For instance, Penny is an active member of a worker union and feels strongly about advocating for workers' rights. In speaking up about workers' issues on social media, she was verbally attacked by a male worker for being a white woman.

> *"The first one that comes to mind is because I was not a brown man. Okay, it was a brown man who attacked me in a threatening message through Facebook messenger and it was paragraphs long disparaging me for speaking up because I don't represent the majority of uber drivers." (Penny, driver)*

Examples such as this one suggest why some women may be reluctant to be involved in online worker communities. Yet women's involvement benefits online worker communities, and gig work as a whole. Prior work has shown evidence that online worker

communities play an important role in formulating workers' collective knowledge and work standards [389, 224]. Women take on the responsibility of supporting other workers and creating a safe workplace environment. Yet their contributions are unacknowledged by platforms, potentially not even being considered work. In traditional workplaces, human resource professionals perform this type of work, backed by allocated budgets.

Finally, platforms do not support women workers in financially capitalizing on their position in the gig marketplace. For instance, even though Ella often gets hired by other women who feel more comfortable with a woman worker in their homes, she feels that overall she does not get as many job requests as her male worker friends. Ella said that despite her years of experience doing TaskRabbit jobs and being a worker with *"elite"* status, she never appears on the first page of workers displayed to customers. She feels it would be beneficial to her and other women workers if customers could search for workers by gender, a feature that is currently unavailable on TaskRabbit's platform.

> *"I wrote to TaskRabbit a couple times and said, what's going on? How come I'm not getting anything?...There are a lot of problems with the apps, you never know if you are showing up...I asked them [TaskRabbit] if they could have an option that would allow people to search for women because everybody's like, oh a woman! I'm so glad to meet you! This is so exciting that you are a woman. What, like if they had that option they would be sexist against men or something? I don't think anybody has a hard time finding a guy." (Ella, Tasker)*

Women workers feel that their work is unacknowledged and wish that the platform would recognize their contributions with increased financial support. On TaskRabbit, we saw gender-agnostic management mechanisms taken one step further, verging

on being discriminatory. Despite women workers' care work contributing to the comfort and safety of customers and other workers, TaskRabbit devalues women's work in how it decides to allocate bonuses. One worker who does personal assistant jobs and organization tasks explained that TaskRabbit will sometimes offer bonuses to workers for completing a pre-specified number of tasks that month. She expressed frustration that it is always people doing the male-dominant roles such as fixing furniture and moving heavy items that get the reward. The reward is not offered for the types of tasks she does.

> *"One thing that is against women is they have these things where in a week if you do a certain amount of tasks you get an extra $80-$160. I've only seen it be specifically for men-done tasks like moving, heavy lifting. Women can do these tasks, but it's predominantly men. It's never offered for delivery or organizational tasks. I feel like I'm missing out on the opportunity to make the extra money. They should be including women on that. The societal standards and norms are being brought in." (Vivian, Tasker)*

Overall, failing to acknowledge and support women workers' contributions negatively affects their safety and financial well-being. This may further contribute to gender inequalities in gig workplaces. Past research has shown that women earn less than men in various types of gig work including ridesharing [104] and online freelancing [154]. By taking women workers' contributions for granted, platforms are reinforcing these gender dynamics around care work and the value of women's labor in the gig economy. Additionally, platforms do not seem to understand what features, tools, and resources women need to feel supported and valued for their contributions to the entire ecosystem.

4.3.3 Masculine Qualities are Rewarded Through Increased Financial and Physical Security in Gig Work

In a quote in 4.3.2.2 Vivian observed that societal norms and standards are brought into the gig ecosystem. We saw this pattern in the advantages of physical strength and masculine traits. Women who have had experience in male dominant environments and are confident in their physical abilities may have an advantage over other women on gig platforms. This finding was especially prevalent among Taskers, where we could note this distinction between tasks that are more dominated by women (e.g. cleaning, personal assistant, organization), and those more dominated by men (e.g. furniture assembly, heavy lifting, handy work). Experience in male dominant environments outside gig work gave women a sense of confidence to take on "men" tasks, which are also often the ones that pay the most.

> *"I was in the military so I was kind of forced to have to talk to people, so I'm comfortable kind of anywhere ... I was a tomboy growing up, played all the sports, growing up with by brothers, my cousins, my uncles, I was always around guys ... once I got into the military that was a continuation of my childhood...this [the military] was not anything weird to me, whereas a lot of girls struggled...they thought they could get ahead or get noticed by playing the woman card against all these men...even getting into TaskRabbit and not intentionally being like I'll pick furniture assembly because I know a lot of girls don't do it, it's just what I know ." (Yvonne, tasker)*

In this case, the sense of "I know how to handle myself around guys" goes a long way for taskers when deciding which job to take. Workers who are confident in their physical abilities may be more likely to choose the tasks that pay the highest wages. On the contrary those who are less confident in their physical strength may refrain from completing those types of jobs even if they wish they could do them. For instance,

Emma completes primarily house cleaning and personal assistant tasks on TaskRabbit. She wants to sign up for handy work, but lacks confidence in her physical abilities to get the job done.

> *"There are some tasks on there that I would like to sign up for. Ikea assembly, furniture assembly, mounting things, and house chore... But I just worry as a female like sometimes that stuff is heavy so I don't want to get there and then I can't move this, can't move that. And you have to think about putting a strain on your body. So I never really signed up for those. But those are like the number one skills, and people make so much money doing furniture assembly, moving, and maintenance stuff around the house. Men get paid a lot." (Emma, tasker)*

Confidence in male dominant environments also gives some workers greater ability to stand up for themselves when they are harassed or disrespected by customers. Many of the women we spoke with have faced uncomfortable encounters with customers that are borderline harassment or situations where they felt pressured by their conduct. Yet, Constance, an ex-rugby player, is reassured by her physical strength and prior experience in handling these situations.

> *"I was working in this apartment that was pretty small and he just happened to be standing very close to me, which made me very very uncomfortable. I didn't necessarily feel unsafe because I know I could handle myself,...In college I played rugby for four years and I've tackled some pretty large and tall people so I definitely could manage myself so I have no doubt that I could get myself out of that situation or at least try which makes me feel safer ...but if I didn't have the background that I have, if I were a smaller woman, it would have been very uncomfortable to have a man six inches away from me the entire time while I was working." (Constance, tasker)*

When faced with a potentially threatening situation, Constance knew the risk and planned for the worst. She knew that if needed, she could get into a physical altercation with the customer to defend herself. But not every woman has the same confidence as

Yvonne and Constance, as most are not ex-military or ex-rugby players. These examples suggest that for a woman worker to succeed or reach their income goals, they have to identify with strong confidence in their physical abilities in both doing the work and ensuring their safety.

In this section, we have shown that gig platforms are gender-agnostic through their lack of gendered policy [reference] misunderstanding of the safety needs of women [reference], and devaluing of women workers' contributions [reference]. In particular, the safety and care work that women provide to customers and gig worker communities go unacknowledged, but masculine qualities such as physical strength are rewarded through increased financial and physical security. In the discussion section that follows, we will outline directions to guide various stakeholders in making gig work better for women workers.

Our findings reveal stories of women workers who perceive platforms as complicit in marginalizing their experiences, due to the lack of designs to enforce gendered policies to protect them from bias and harassment. When faced with harassment and safety risks, women bush off harassment to avoid further endangerment and maintain access to work, as platforms fail to take immediate actions. At the same time, gig platforms do not acknowledge women's unique value in providing perceived safety to customers and social support to peer workers. Gig platforms reward masculine qualities, such as physical strength. This may encourage women to adopt such identities to be rewarded financially by platform management mechanisms. As such, we argue that these platform mechanisms are gender-agnostic; they do not attend to women's

value and vulnerabilities when making management decisions. We incorporate feminist methodologies [39, 264] to discuss how women's stories inspire the design of gig platforms that attend to gendered experiences.

4.3.4 How are Women's Experiences in Gig Platforms Different from those of Traditional Organizations?

Women are expected to perform a sheer amount of invisible labor that benefits gig platforms, such as helping customers feel safe, and creating a welcoming online worker community. Research has discussed the detriment of invisible labor to gig workers in ride-hailing [363] and micro-tasking [177, 519] platforms, largely as a result of algorithmic management [267]. This research problematizes the nature of invisible work and how platforms' value mechanisms are blind to these activities, which are essential to service transactions [363, 177, 519]. Our work presents the unique ways in which women perform invisible work to cope with bias and harassment, provide emotional support to customers and peer workers, and attend to their gender in order to succeed. These realities extend the current understanding of invisible labor, and articulate nuances that could help further explain other challenges such as the gender pay gap in gig platforms [104]. Our findings suggest that the less women incorporate feminine notions of gender identity in their work, the more likely it is for platform algorithms to reward them with more work (Yvonne), better paying work (Emma), and better interactions with customers (Constance). This is similar to women's experiences in traditional organizations [276]. So, how do gig platforms disenfranchise women differently than more standard

workplaces?

Through algorithmic management, platforms enable a systematic way of not acknowledging the challenges and disadvantages that are disproportionately experienced by women. This is different than being managed by a human. A human manager may discriminate a woman worker, but such discrimination is often case by case, and could be disputed more robustly. When platforms normalize the lack of protection or designs for women, they signal to customers that women workers are easy targets for exploitation. This emboldens some customers to exploit women workers by harassing them and issuing false reports. Additionally, platforms do not consider these added risks for women when evaluating their ratings or resolving disputes. This disadvantages women by limiting their access to quality work. Women who depend on the platform for a living are more likely to conform to this exploitation by compromising in service exchanges and brushing off harassment. Platforms then perpetuate these biases and harms, pushing disproportionate risk onto women that eventually compromises their ability to obtain equal treatment and pay. Safety is a prime example where platforms benefit from women's labor. Women provide perceived customer safety. Yet platforms do not adequately provide workers the same sense of safety or acknowledge their value. These realities, although not exclusive to women, are experienced by women disproportionately due to stereotypes of women's roles in social interactions (e.g., being more communal and having less agency) [135, 134]. The platform enforces unwritten requirements for social interactions, without designing mechanisms that acknowledge them.

4.3.4.1 A pluralistic way of acknowledging women's unique value and challenges

We provide several recommendations for platform designs to acknowledge women's unique value and the challenges they face in gig platforms. Platforms' design should acknowledge value beyond transaction and productivity focused mechanisms by including social values derived from worker-customer interactions [39]. Platforms already have mechanisms to document social values. For instance, drivers and couriers receive badges or keyword feedback from customers to augment star ratings. However, this documentation of workers' performance does not effectively translate to acknowledgements from the platform; there is no current feature where platforms use this documentation to improve workers' ability to access work or make money. Platforms could use these badges and positive feedback to support women's physical safety. For instance, ride-hailing and food delivery platforms could use them to give women some priority for the day, time, hours, and locations they want to work when they have accumulated more badges and positive feedback from customers. This could enable women to have priority in selecting the work environment that would make them feel safest.

To acknowledge the risks women face, and to better care for women workers during a safety incident, platforms should implement mechanisms to document workers' physical and emotional wellness [520], and prompt women to take breaks as necessary. For instance, platforms should normalize paid sick leaves ranging from short breaks to days off work, when women report an incident that has affected their physical or mental

state. This social sensing mechanism could act as a tool to legitimize women's request for paid leaves (e.g., showing higher than usual heart rates, during menstruation).

Given that women's voices are often marginalized in worker communities [518], platforms, worker organizations, and online community leaders should make sure that women's experiences are acknowledged when making design decisions. For instance, when conducting user studies, platform researchers should pay attention to the number of women participants they recruit, and in certain studies, prioritize women workers to capture more marginalized experiences. Worker organizations and unions should invest in helping women's voices be heard in both women and men worker communities. For instance, they may consider electing women leaders, and educating men gig workers how to support women colleagues as allies. HCI researchers could design tools with community moderators to audit conversations in worker communities that are insensitive towards women's experience.

Last but not least, platforms cannot change their value mechanism without departing from the profit driven, shareholder-centric business model [285, 430]. Our data showed that some women gig workers channeled confidence from their past experiences in the military (Yvonne) and playing rugby (Constance) for their work. Future platforms, non-profit organizations, and researchers should expand the definition of "work" in gig platforms to acknowledge what women bring to the table, instead of suggesting they conform to masculine standards. This requires algorithms to work with human managers to carry out transactions, while considering individual experiences and their impact on work. Future work should consider the effect of humans working collaboratively with

algorithms to facilitate work assignments and recommendations, allowing social contexts to make adjustments to algorithms.

4.3.5 The Problem With Gender-Agnostic Platform Designs

Our work highlights the challenges women face due to gender-agnostic platform designs and algorithmic management mechanisms. This results in further marginalization of women. Prior work described how gig platforms employ algorithmic management [267] to match workers and customers. As a result of algorithmic management, workers face large amounts of bias, harassment, and safety issues [190, 458, 21], as well as invisible labor [363]. Our work adds women's first-hand experiences and perspectives of the harassment and safety issues they've faced to these discussions. Additionally, our work presents new findings related to how women are undervalued despite their contributions to gig work. When platforms do not support women in managing gendered experiences such as harassment, women end up having reduced work hours, lower customer ratings, and are forced to avoid working in certain locations. Because of sociodemographic power dynamics, these consequences may be more dire for women workers than for men workers. These practices become the determinants for platforms' algorithms to provide women with less and lower quality work, and deactivate them unfairly. The coalescing of platform designs, women's experiences, and algorithmic management acts as a downward cycle to marginalize women within the platform. Therefore, platforms are not "gender-agnostic" by explicitly discriminating gender in their algorithms, but by ignoring the social interactions that contribute to gendered experiences. These gendered

experiences are then fed to platforms' underlying algorithms, resulting in marginalization.

However, we are not suggesting platforms should simply identify workers' gender and instate gender mechanisms to elevate women based on their identity. Feminist HCI suggests that platform designs should abandon the single, totalizing, and universal way [38] of measuring work. This includes both sides of the spectrum: disregarding gender in platform design and gender-based algorithmic decision making. Alternatively, platforms should focus on the service interactions women experience, and adopt more diverse perspectives that acknowledge women's efforts in maintaining the workplace. In particular, platforms should draw on women's lived experiences to design mechanisms to support them in preventing and reacting to abusive situations. These designs would acknowledge women workers' unique value and contribution in the evaluation mechanism. In other words, platforms should not design for a specific gender, but for gendered realities. To understand these issues from a full gender perspective, future work should run additional studies to evaluate the correlation between gender and harmful experiences, making sure to include a range of gender identities.

In the following paragraphs, we discuss the ways in which gender-agnostic platforms marginalize women workers, and how we propose to tackle these design flaws.

4.3.5.1 Platform mechanisms to enforce safety guidelines

We identify several areas for platform designs to enforce policies that address women's experiences around harassment and marginalization, and acknowledge their

contributions to the gig economy. Firstly, platforms lack clear standards in defining the boundaries of service relationships and how workers should be treated by customers. Such lack of standards and worker training results in customers treating women workers differently than men workers. Further, platforms do not provide guidelines for workers who experience harassment in service interactions. Although such guidelines do not have to be specifically for women, our findings show more structure could support women workers in significant ways. Currently, platforms only provide "tips" related to safety, bias and harassment [4, 3, 5]. Yet, women may likely still have a hard time enforcing them when they are not taken seriously by customers (Tiffany, Annette, Penny).

Platforms should take a more proactive stance and design mechanisms to *enforce* these guidelines. For instance, granting women the right to stop providing service and equipping them with tools to document and report incidents. Currently in ride-hailing, documenting and reporting is done manually and requires workers to submit camera footage and initiate a case review [5]. This process unjustly holds women workers responsible for their experiences. Platforms should take the responsibility of auditing interactions. When providing tools and clear guidelines, platforms can delegate women workers to chaperon this responsibility with clear ways to compensate and reward them. For instance, platforms can hold sexual offenders accountable by including customer "behavior rating" prompts such as "makes workers feel comfortable and safe", or in contrast, "makes workers feel uncomfortable", and "jeopardizes workers' safety". These badges should appear in customers' profile and be shown to workers when they decide to accept/decline the job, giving women more opportunity to assess the risk. Customers

that have been given multiple warning badges or negative reviews by different workers should be auto-banned from the platform. Such a punitive design will not only alleviate repeated offense to an extent, but also balance the current power asymmetries [381] between customers and workers. For example, these could help moderate negative reviews from customers. At minimum, when a harassment incident is reported, platforms should be able to lawfully fine the perpetrator and use this to provide some kind of restitution payment to the victim. This will allow women workers to recover from emotional and physical injury without worrying about financial loss. Consequently, this may prevent distressed workers on the job, who could compromise service quality or become a public safety hazard for others.

4.3.5.2 Women need support for safety in public spaces

Women's safety in public spaces affects their mobility and results in marginalized financial outcomes [237]. As gig workers, safety in public spaces can further affect women's decision in selecting work locations [21]. Finding safe areas to work and rest during breaks is important for women to be able to provide consistent service and generate income. We saw that one challenge women face is being able to find a safe area to rest (Cindy). To address this, cities and towns should work with HCI researchers and urban planners to support women in finding safe gathering places in between work, where they can rest, use the restroom, and take meal breaks. For instance, it would be optimal to have designated areas for women gig workers in parks, local department stores, and parking lots. Especially in suburbs, where there is limited public infrastructure, women

should be able to identify women worker friendly gas stations and re-charging areas. States' policies could also negotiate with local businesses, incentivizing them to provide service to gig workers in exchange for tax deduction.

On the other hand, many women choose to avoid working in certain areas or during certain times of the day to stay safe. Prior work has critically highlighted the redlining phenomenon in ride-hailing [458], which results in workers discriminating certain neighborhoods. We also saw this as a common practice among women gig workers (Sheryl, Natasha) with safety concerns. However, some women were hesitant to discriminate neighborhoods, even when they knew the risks posed (Cindy). We urge researchers and policy makers to provide solutions for this difficult situation. Women gig workers should not be responsible for choosing between staying safe and contributing to redlining.

4.4 Limitations

Our findings are based on a limited set of participants located in North America. Their experiences and perspectives are based on the social experiences of women in a male dominant, multi-cultural background. The women we interviewed are from African-American, Asian, and European backgrounds. Their perspectives overlap, but cannot capture the experiences of women outside of North America. For instance, we believe that the harassment and safety related experiences our participants have faced may resonate with women in India [237, 28], but our work does not capture the social

factors that affect women gig workers' experiences in India. Another limitation of our study is our lack of access to women who are no longer active in gig platforms. Therefore, our findings could be compromised by survivorship bias, which may limit us in capturing women's hardship to its full extent.

Our work identified the mechanisms by which platforms fail to acknowledge women's experiences, suggesting one way in which women gig workers are marginalized. We came across stories where women shared experiences that may have been mediated by other demographic factors such as race and socioeconomic status. We encourage future work to investigate the impact of intersectional identities on gig workers' experiences. Future studies should also look into the social mechanisms that leads to marginalization of women gig workers in more diverse social and political contexts, such as in Muslim countries and among immigrant workers.

4.5 Conclusion

In this Chapter (4) I considered two types of harm, bias and harassment, among women gig workers who perform their work offline. I conducted interviews with 20 women gig workers across ride-hailing, food delivery, and domestic work platforms to investigate the question: *what are women's unique experiences and challenges in gig platforms?* Informed by feminist theories on sociotechnical systems and critical gender theories I found gig platforms are gender-agnostic by not acknowledging women's increased vulnerability for socially-grounded harm and their contributions to the plat-

form. As such, they contribute to women workers' experiences of bias and harassment. Lacking immediate platform support and fearing loss of access to work, women workers "brush off" harassment. Drawing on our participants' stories, I provided design implications to guide platforms and policy makers in designing gig platforms and regulation that attend to gendered experiences of harm.

Both Chapter 3 and 4 focused on how harm is caused by the structure and design of the platform enabling a match. By considering interactions that include a non-trivial offline component (Chapter 4) I noticed that while the platform may *facilitate* and *further perpetuate harm*, it is the individuals a person matches with that physically carry it out. This led me to wonder: who are all the actors that cause harm in matching market platforms, how do they relate to each other, what harm(s) do they cause, and how do users protect themselves from these harms? In Chapter 5 I investigate these questions in the broader context of interactions that initiate online via a matching market platform and have a non-trivial offline component. In this work I extend beyond interactions that occur for work; I specifically focus on online dating and home-based gig work (e.g. cleaning, caretaking, handiwork).

Chapter 5

A Taxonomy of Harms and Protective Behaviors Among Online Daters and Gig Workers

In this chapter I studied the harms and protective behaviors of two groups who engage in interactions that initiate online via a matching market platform and have a non-trivial offline component. Within this chapter, I refer to this class of behaviors as *digitally-mediated offline introductions* (DMOIs).

In addition to contributing to the HCI literature, this chapter also intends to speak to the security and privacy (S&P) community. (S&P) has a long-standing tradition of studying and mitigating online threats that might harm users. These include issues such as phishing [156, 210], spam [204, 370], online hate and harassment [459], and fake news [327]. Prior work in this space has also looked at users' security and

privacy behaviors, such as their adoption of two-factor authentication [372], password creation [482], and factors that influence the adoption of particular behaviors [113, 359]. We think there are ample opportunities to leverage techniques and ideas from (S&P) in the context of DMOIs and hope the work in this chapter can foster discussion and collaboration.

We systematized 113 papers on the harms and and related protective safety behaviors of three groups that engage in DMOIs: online daters, gig workers, and sex workers. We found that there are five harms and ten protective behaviors shared across the three groups, which we systematize into a taxonomy. From the literature we also also developed a threat model to depict how the five harms are caused by four actors.

We identified a gap in prior work: the lack of any statistics to suggest which harms people are most concerned about and which protective behaviors are most prevalent. To fill this gap we conducted a large-scale survey of gig workers (n = 451) and online daters (n = 476). Our questions drew from our taxonomy and threat model. We found that physical and emotional harm are the most prevalent safety concerns and that the most prevalent protective behaviors are those that involve leveraging users' close contacts and social networks.

The work in this chapter was done in collaboration with Dr. Daricia Wilkinson, Aurelia Augusta, Sophie Li, Dr. Elissa Redmiles, and Dr. Angelika Strohmayer. The version presented in this dissertation underwent peer review at USENIX Security 2023 and is currently being revised for resubmission at a security and privacy venue[1].

[1]A preprint of the previously submitted article can be found here: `https://www.dropbox.com/s/eoc1va2q2kz53vb/PostDigitalSafety_Riveraetal_DRAFT.pdf?dl=`

5.1 Introduction

Seemingly every aspect of life is digitally mediated. People find romantic partners through online dating apps, household service providers (e.g., to repair household items or care for children) through online gig-work platforms, and housing through online marketplaces [484]. Coles-Kemp and colleagues argue that with this *post-digital* enmeshing of our digital and non-digital worlds requires a transfiguration of our security practices [103]. In a post-digital world, threats to security and privacy are no longer bound by space or contained in separated "online" and "offline" locales [443]. Instead, such threats – and defenses against them – cross between the digital and physical realms to affect people's overall sense of safety [443, 369]. Trauma we experience digitally also impacts our physical bodies, likewise, violence we experience physically – e.g. jobs that are digitally-mediated – will impact our relation to the digital platform that mediated this harm.

This concept of *post-digital safety* builds on decades of research across security as well as criminology, social sciences, and legal studies that attempts to both complicate and clarify what we mean by 'safety': from Maslow's hierarchy of needs, to human rights frameworks, to security frameworks for online content, at-risk groups, and in-game interactions [459, 406, 301, 244, 308, 493]. Broadly, safety is understood as a basic human need, which requires us to live in environments that are free of violence, threats, harms, and other intolerable risks which may be self-directed, interpersonal, or collective [277]. Building on this literature, post-digital safety encompasses the existence

of safety threats that manifest in interactions intended to be exclusively online (e.g., stalking, doxxing) as well as those that reside in the contexts away-from-keyboard [385] during digitally-mediated offline introductions (DMOIs) for e.g., dating, relationships, or labor.

Because threats to people's safety that cross the online-offline boundary cannot be easily classified as strictly-digital or strictly-physical violence, they are underaddressed in existing considerations of safety because neither security nor criminology considers such threats to be strictly within their domain. Yet, as in-person interactions are increasingly mediated and/or preceded by digital interactions, the security and privacy (S&P) community has a growing role to play in protecting end-users in physical as well as digital spaces.

Recent S&P work has considered a growing set of topics that fit under the umbrella of post-digital safety in the context of intentionally-online interactions [460, 186, 312, 459, 406]. While the goal in intentionally-online-only interactions is to *avoid* post-digital spill-over of threats such as stalking and doxxing, the goal in DMOIs is to interact in person. Thus, the relevant threat models and protective behaviors appropriate for this context significantly differ from those appropriate for intentionally-online interactions. Investigations of post-digital safety for specific populations engaged in DMOIs have been conducted (e.g., focusing on sex workers [308, 84, 350, 394], activists [14], and those facing intimate partner violence [477, 526, 476, 89]). However, a general systematization of post-digital safety threats and protective behaviors in the context of DMOIs is missing. This work aims to fill this gap by defining a post-digital safety

taxonomy and threat model for DMOIs to guide security researchers in re-imagining defensive tools to protect safety in such interactions.

To develop a robust, empirically-validated taxonomy of post-digital safety for DMOIs that systematizes both the harms that threaten safety (Section 5.3) and the strategies used to protect against them (Section 5.4), we systematize existing literature and engage in empirical data collection and analysis. Our taxonomy details five safety threats – financial, emotional, physical, data privacy, autonomy – and aligns these threats with ten protective behaviors used to defend against them. Further, we measure the prevalence of each component of our taxonomy – threats and behavior adoption – among two representative user populations: online daters ($n = 476$) and gig workers who perform strictly in-person jobs where they interact with clients ($n = 451$). We conclude with directions for future research and design in Section 5.5.

5.2 Methods

To build a taxonomy we systematically collect and analyze literature in this domain, as summarized in Section 5.2.1. To validate, expand, and take first steps toward quantifying key concepts in this taxonomy (e.g., use of particular behaviors) we deploy a quantitative survey informed by literature. We use similar approaches to those of [493, 459] to collect and systematize the literature, and use the results of our survey to supplement gaps in prior work. Our methodology is summarized in Section 5.2.2. We conclude with a summary of our work's limitations in Section 5.2.3.

As our contribution centers on providing a taxonomy of post-digital safety in DMOIs, we take a somewhat non-traditional approach to structuring our paper. Rather than presenting a 'Related Work' or 'Results' section, we present a structured taxonomy of the harms experienced and protective behaviors used in DMOIs then leverage our analysis of both related work and our survey results to justify and quantify the components of this taxonomy.

5.2.1 Literature Review

We conducted an electronic search of academic literature to identify post-digital harms and protective behaviors. Due to the interdisciplinary nature of this work, our search was conducted in databases spanning computer and social sciences such as Google Scholar, ACM Digital Library, ScienceDirect, Springer Link, and IEEE Xplore Digital Library. We considered articles available in English but adopted no restrictions on publication dates or venues. Relevant keywords included strings that were appended by the relevant interaction across the digital-physical boundary and "safety," "harm," or "scams" (e.g. "online dating safety" or "gig work scams"). We found additional literature by reviewing the related work section of each paper in our dataset. We specifically sought papers that discussed the safety concerns, safety definitions, and/or protective behaviors of people engaged DMOIs such as online daters, gig workers, and sex workers.

Data Abstraction. For all papers, we reviewed the titles, abstracts, and concluding arguments for relevance. Ultimately, we reviewed 113 papers and abstracted

data related to (1) harms and (2) protective behaviors. In identifying harms, we examined *mechanisms of harm* (e.g., How are the harms caused? Who or what creates these harms?). We likewise sought to understand what protective behaviors are used to protect against these harms. This consideration included identifying (a) the phase in which the behavior is used (e.g., What behaviors are used before, during, or after an offline interaction?), (b) the harm mitigated by the behavior; and (c) the protective mechanism (e.g., How is this behavior executed? What online or offline tools and resources are required?)

We performed affinity diagramming [211] to understand the relationship between harms, protective behaviors, and the phases in which they occur. Through this iterative process, we also uncovered key differences in different groups' experiences with safety and gaps in the body of work we reviewed.

5.2.2 Survey

The prior work in this area is highly partitioned: the majority focuses on the experiences of a single population (e.g., online daters) and/or a single aspect of safety (e.g., data privacy). Further, the vast majority of prior work uses qualitative methods to examine safety in DMOIs; quantification of the threats and behaviors encountered in DMOIs is limited. To offer a larger-scale validation of the threats and protective behaviors detailed in prior work and fill in gaps of knowledge on these threats and behaviors across multiple populations we surveyed two representative populations who engage in DMOIs: online daters ($n = 476$) and gig workers ($n = 451$). These two

groups were selected because they cover two different classes of interactions (romantic and labor) common to DMOIs.

Survey Questionnaire. To validate our systematization of the forms of harm relevant to DMOIs, we asked respondents to explain what safety means to them in the context of the interactions they engage in. Additionally, we asked questions to assess the role of safety in deciding to engage in DMOIs and the prevalence of unsafe experiences. To understand the prevalence of protective safety behaviors, we asked respondents several questions regarding whether they engage in the protective behaviors identified from the literature. The answer choices for these questions reference the mechanisms, strategies, or resources a person may use to carry out a behavior. We wanted to obtain a comprehensive understanding of how different behaviors are used in different contexts. Therefore, both our participant populations answered the same questions, except for minor wording changes. We ensured the questions and responses were applicable to the different contexts and interactions. We also included one attention check question in each survey, following best practice in survey methodology [368]. We discarded responses from those who did not answer the attention check question correctly. The exact wording of our survey questions are in Appendix C.2.

Data Collection. We recruited our sample of online daters using Prolific, a crowdworking platform ($n = 372$), and Lucid, a marketplace for survey panels ($n = 104$). We recruited our sample of gig workers ($n = 451$) only from Prolific. Our surveys ran for 4 months, from August to December 2021. We recruited respondents who met the following criteria: (1) were located in the US, (2) had used a dating or gig app within

the past two years, respectively, and (3) had met in-person with someone they met on a dating or gig app. We aimed to recruit samples with demographics roughly representing the U.S. For complete demographic information, see Appendix C.3.

For participants on Prolific, we first ran a short screening survey to identify participants who met these criteria; respondents were paid $0.15 for a 1 minute survey ($9/hour). Qualified respondents were sent our main survey and compensated $2.85 ($10.05/hour). For respondents recruited by Lucid, we are not privy to Lucid's compensation structure; we paid Lucid $5.50 per survey completed.

When analyzing our results, we noticed there were two questions we did not ask gig workers but should have, and a few questions whose answer choices could have been misinterpreted due to wording. To strengthen our analysis, we decided to re-field these questions in September 2022 to the Prolific respondents from our prior survey. We re-fielded a total of three questions to daters, and five questions to gig workers (included in the survey questionnaire in Appendix C.2). To incentivize respondents to complete the survey, we paid at a slightly higher rate than for the original survey: $1 for a 3 minute survey ($20/hr). We received responses from 140 daters (38% of original sample) and 217 gig workers (48% of original sample) over a two week period.

Analysis. We used a mixed methods approach to analyze our data. First, we used deductive thematic analysis [60] to analyze respondents' responses to the open-ended question, *"What does safety mean to you in the context of [online dating/in-person gig work?]"* The research team agreed upon an initial set of codes based on the literature that described potential safety concerns. Using the codebook, one researcher

independently coded all responses from the dating survey, and a different researcher independently coded all responses from the gig work survey. The two researchers then reviewed a random sample of 100 responses in the survey data they did not code and evaluated inter-rater reliability, achieving an average Cohen's Kappa of 0.656 (substantial) across codes.

We then conducted descriptive analyses with statistical comparisons to analyze respondents' responses to about the impact of safety, negative experiences, and use of protective safety behaviors. We calculated the proportion of people in each sample who selected each answer choice with exceptions for totals corresponding to "prefer not to answer". We make comparisons between the two samples' proportions using χ^2 tests, where $p \leq 0.05$ indicates a significant difference. We applied Bonferroni-Holm correction to the resulting p-values to reduce the Type I error rate. In Appendix C.1, we provide all proportions and comparisons, while in the main text we primarily report proportions for readability.

5.2.3 Limitations

We carefully implemented safeguards in our research, but acknowledge its limitations. Our literature review may have missed work related to DMOIs that did not surface from our search terms. Therefore, there may be experiences and definitions of safety that are not represented in our results, affecting the validity of our taxonomy. We encourage future work examining additional relevant post-digital safety experiences and conceptions in DMOIs.

Our work also faces limitations inherent to many survey studies, such as social desirability bias, under-reporting, and recall bias. To reduce the former we carefully worded questions to avoid suggesting there are right or wrong answers, instead asking respondents to answer the questions based on their personal experiences. To mitigate potential under-reporting and recall bias, we limited our survey to those who had engaged in digitally-mediated offline interactions within the last two years, and frequently asked respondents to recall specific situations they may have encountered in the past. We also presented the questions strategically, making sure to ask all questions about a particular behavior together.

Finally, while we tested the survey with other members of our research group prior to collecting data and received expert reviews of the survey, there were some questions we forgot to include answer choices that could have been better worded. We did not notice these limitations until we began analyzing data. We re-fielded only to the existing survey respondents and took care to remind them of the context of the survey. However, collecting additional data 9-12 months later may have increased the chance for recall bias, and respondents' safety-related behaviors, experiences, and attitudes may have changed. To evaluate the potential of such biases, we compared questions that were asked in both the original and re-fielded surveys finding no statistically significant differences. However, for transparency, we indicate with (†) when we report re-fielded data.

5.3 Harms Threatening Safety in DMOI

In this section, we detail the five types of harm our analysis identifies as the primary sources of threat in DMOIs: *financial harm*, which threatens an individual's financial assets or livelihood; *physical harm*, which threatens an individual's body; *data privacy harm*, such as unfair data collection and use; harm to *autonomy*, or an impediment to an individual's ability to make decisions about their interactions with others and how they use digital platforms to mediate those interactions; and *emotional harm*, threatening an individual's mental health and well-being. For nearly all of those we surveyed (96.6% D (daters); 97.6% G (gig workers)), safety affects their decision to meet someone offline. Furthermore, 59.4% of daters and 51.9% of gig workers report having had an experience that made them feel unsafe while meeting someone offline. Thus, it is critical to consider the harms that make them feel unsafe.

As we describe in this section, these harms may be perpetrated by several different actors: *platforms* that enable DMOIs; *Meets*, those who an individual intends to meet offline; and *scammers* and *aggressors* who pose as Meets to intentionally cause harm. Some of these attackers exist strictly in digital space, yet digital attackers may cause non-digital, or offline, harm, and harms that appear strictly digital (e.g., data privacy harm) may propagate other harms (e.g., financial, emotional) that cross the digital-physical boundary.

Building on the tradition of threat modeling to understand security risks in software and technical systems [418, 438] and socio-technical systems [443, 425, 157,

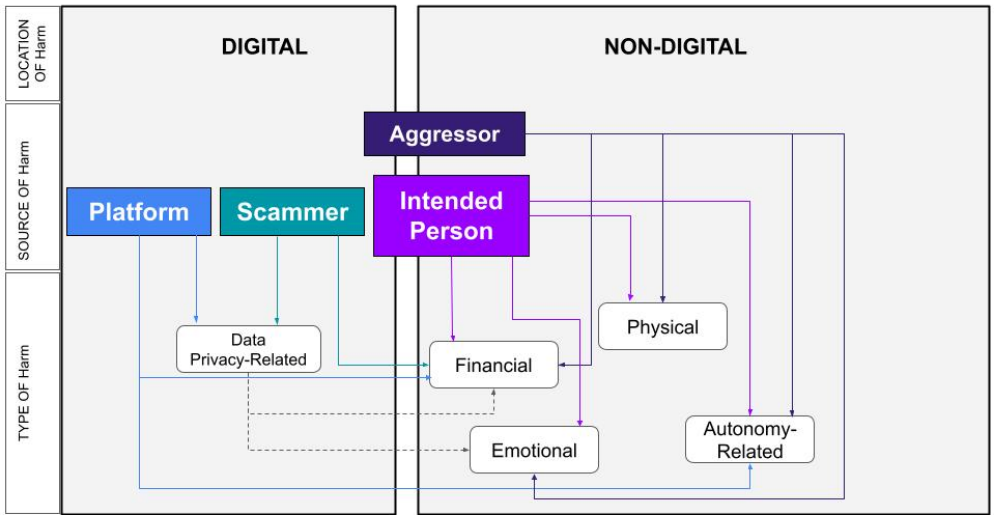

Figure 5.1: DMOI threat model that shows how harms cross the online-offline boundary and who perpetrates them.

322, 148], we present in Figure 5.1 a DMOI threat model that illustrates how attackers may perpetrate each of the harms detailed in this section.

5.3.1 Financial harm

Internet users face a variety of financially- and emotionally-costly scams [62]. Those engaged in DMOIs additionally face financial harm from (1) scams that take place on the platform and (2) physical robbery. Scams on platforms include those tailored to the user's specific use case, such as scammers posing as a potential date or client [468, 497, 334, 440, 100]. As one respondent notes, *"A lot of online dating apps have a lot of scams and bots that will initiate a conversation with you and eventually try and get money. Or blackmail. Safety from these people [is] a must." –D225.* Platform scams may also exploit the vulnerabilities that lead the user to be engaging in DMOIs

such as financial precarity or curiosity and loneliness [365, 465, 497]. For example, prior work studying the risks of online dating notes: "a Tinder user wrote in their bio: 'Send me $5, see what happens' [and] manag[ed] to raise a significant amount of money" [440].

People may also be the targets of digitally-mediated physical robbery from aggressors they meet through the platform and others they interact with in the physical environment [34, 522, 413, 222]. Attackers may leverage knowledge of how platforms work, or of how people use the platforms, to create harm. For example, attackers may congregate in areas where they know gig platforms route their drivers [133]; similarly sex workers may be targeted for robbery as a result of needing to carry cash because they are deplatformed from digital payment sites [308]. One respondent in our study said, *"[Safety means] that I do not get harmed or robbed while being out and doing gig work" –W376.*

Platforms may consider financial harms outside their scope, despite the fact that they were the intermediary that led their user to connecting with a thief [465, 34]. As a result, platforms expect users to take on the safety work [360, 199] needed to avoid scams and robbery, to remove themselves from a financially harmful situation, and to report these back to the platform [465]. Victims of financial harm, and their families and friends, are consequently left responsible for managing the losses, emotional trauma, medical bills, and in extreme cases funeral costs that often result from scams and physical robbery [66].

5.3.2 Physical harm

Physical harm includes assault and/or abuse (sexual and otherwise) [93, 169, 170, 384, 288, 529, 308], injury and/or death [34, 66, 429, 14], health concerns [94, 106], and other forms of violence.

Physical harm may be (1) premeditated, (2) opportunistic, or (3) situational [444]. Premeditated physical harm arises when the Meet purposefully seeks to assault and uses digital platforms to find targets. Opportunistic physical harm occurs when the Meet becomes belligerent or violent, without initially intending to cause harm. This may occur if they become angry or upset, and compounded by other factors such as excessive alcohol consumption. An online dater well-described their concerns with these two forms of physical harm: *"For me, [safety] means not getting in a toxic (psychologically) relationship or a relationship where the woman can become physically dangerous in unconventional ways (ex. stalking, stealth attacking with a knife/gun). For others, it would be preventing physical/sexual violence, alcoholic coercion into sex, or abusive relationships" –D184.*

In the case of gig work, the nature of the work may also pose situational physical harm risks: for example, exposure to harsh cleaning chemicals [468, 473] or transporting packages on bikes [468]. Gig workers commonly described health and injury concerns arising from the spread of COVID-19. *"Safety means adhering to basic social distancing, sanitation, and mask protocols in order to minimize the spread of covid-19 for me and my client" –W199.*

5.3.3 Data-privacy harm

Platforms that support DMOIs require the collection and distribution of personal details about users to effectively generate matches for romantic relationships, labor, and more. Platforms may require users to share social media profiles, government identification, device permissions for location tracking, and other personal information as part of their profiles or the sign-up process [467, 308, 398]. While people using these platforms sometimes use this collected information for safety purposes (further discussed in Section 5.4), prior work and our empirical data also show that people are concerned about the misuse and abuse of this information to cause the other harms discussed in this section [221, 100, 522]. Expressing this tension well, an online dater in our study defined safety as *"having enough information to learn about a person, but not enough to be able to locate and potentially interfere with someone's life unless they choose to specifically share that. Any personally identifying information that someone provides to a dating service should be very secure from intrusion"–D188.*

5.3.4 Autonomy-related harm

Autonomy-related harm may stem from either the platform or Meet. Such harm can occur in either digital spaces (platforms and algorithms that control what users can and cannot do) or physical spaces (an individual may exert control over another by limiting access to their digital devices and accounts), or across an enmeshing of both.

Platforms may limit individuals' autonomy through algorithmic management [28, 94] or deplatforming [43, 51, 52, 64, 13]. Algorithms may prioritize profiles based on

features such as photo quality or the amount of personal information shared [467]. This pressures users to share more information than they would prefer, eliciting concerns around data privacy [287], and the increased amount of information a potential Meet will have access to [167]. On labor platforms, such management may also depend on clients' numeric ratings of workers; as a result workers feel pressured to maintain good reviews at the expense of safety [267, 522]. Workers often hesitate to stand up to or report a belligerent client for fear of receiving a low rating and reduced access to work opportunities [28, 284].

Individuals may limit another person's autonomy by controlling access to their devices, a common threat in intimate partner violence [459, 89]. In these situations an abuser may limit a target's access to resources (e.g., banking information), or try to prevent them from being able to document their experiences to report later [459, 302]. While this form of control usually occurs in digital space, the consequences can be experienced in the physical world [459].

Finally, autonomy may be harmed by lack of knowledge about the physical space of interaction. One commonly reported concern among our survey respondents was wanting to be familiar with locations where they meet an individual so they can be self-sufficient in reacting to unsafe situations. For instance, several gig workers said that they want to know where the nearest emergency room is located so they can get help if they are injured on the job: *"Safety means I know where my working location is and where I can access emergency services close by" –W244.* Some online daters in our sample described wanting to feel that they can safely exit a space: *"It's important to*

always have an escape plan and ensure you don't get stuck"–D112.

5.3.5 Emotional harm

People who engage in DMOIs may suffer emotional harm as a result of hate and harassment, manipulation and deceit, and fears over the prospect of experiencing harm. In most cases these harms are caused by Meets. However, platforms may also cause emotional harm by pushing people towards behaviors and interactions that are harmful to their mental health or relational goals [473, 522, 94, 67], or by creating feelings of isolation, exploitation, or competition [473, 522, 413, 173, 186, 284, 363].

Emotional harm can occur even before a person engages with a Meet offline, via disparaging and disrespectful messages [299]. This form of online hate and harassment has offline effects; it may cause hesitation, distrust, and fear in future offline interactions even with a different person [459]. Similar harm occurs offline via insulting comments on physical appearance, or expressions of entitlement related to social class and gender [318, 18, 522]. One gig worker expressed their desire to engage with Meets who will be kind and supportive: *"[Safety means] Making sure that I, my client, anyone else around and the work space is clear, supportive, kind, loving, professional, and can work together to find a common goal" –W186.*

Meets may distort the truth via strategic manipulation and deceit, which can devastate the person believing the false reality [87]. Interacting with a Meet who has distorted the truth can lead a person to have unfavorable feelings towards future Meets [344]. For example, it may lead to self-other asymmetry – a bias where one be-

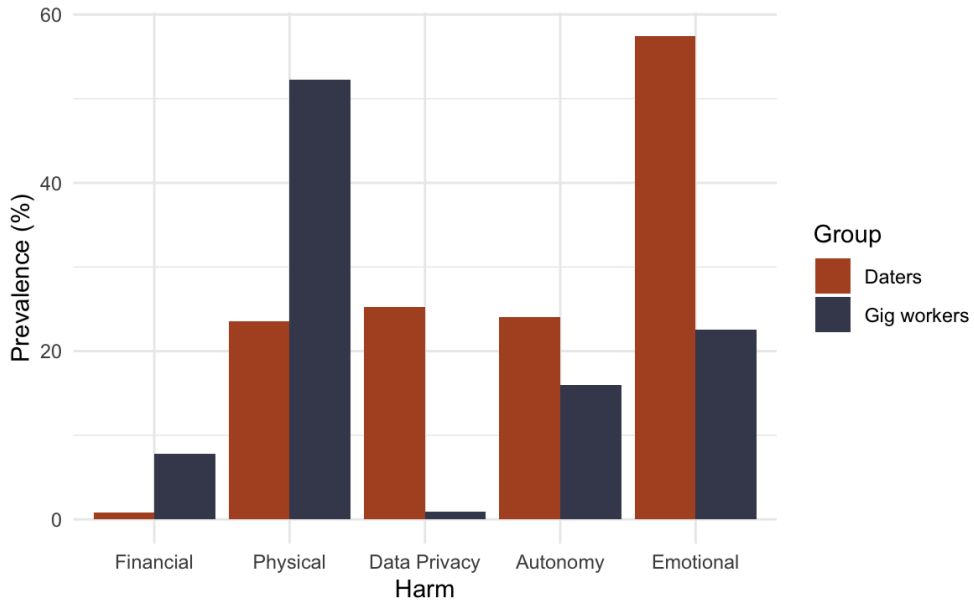

Figure 5.2: Prevalence of the concerns our survey respondents reported in their definitions of safety

lieves that others are more likely to engage in deceptive behaviors than they would [415]. Among respondents, both gig workers and daters underlined the importance of avoiding deceitful Meets: *"Safety means making sure the person you are meeting is who they say they are, and can be trusted... If anything feels off, it's a sign to move on" –D343.* Similarly, just the prospect of experiencing harm can cause emotional harm [506, 342]. One gig worker explained, *"I'm scared of being set up and it being someone who just wants to hurt or assault me and not a job" –W196.*

5.3.6 Prevalence of Safety Concerns

We summarize the prevalence of each harm mentioned by respondents in their definitions of safety in Figure 5.2. We noticed differences between the concerns our respondents most commonly expressed in their definitions of safety, and what prior

work has focused on. Despite significant attention to financial scams in prior work for both groups, they were not the primary focus of our respondents' definitions: fewer than 1% of daters (0.84%) and 10% gig workers (7.76%) mentioned avoiding financial harm in their definition of safety. Instead, respondents most commonly defined safety in terms of physical and emotional harm. Among gig workers, physical harm was the most prevalent concern reported in their safety definitions (52.3%). Among daters, the most prevalent concern reported in their safety definitions was emotional harm (57.4%).

Interestingly, we also saw that very few gig workers defined safety as related to data privacy harm (0.89%) compared to daters (26.2%). The low percentage of gig workers reporting data privacy concerns reflects the literature and the type of gig work our respondents engage in; prior work has found data privacy concerns among crowdworkers, gig workers who perform strictly online work [396, 397, 398]. Yet there are no reports that we know of describing data privacy concerns among gig workers who perform in-person labor.

Similarly, there is little to no prior work looking at daters' experiences with autonomy-related harm. Much of the literature that we describe in section 5.3.4 comes from research on various forms of gig work. Yet close to a quarter (23.90%) of daters in our sample described autonomy-related harm when defining safety, compared to 16.0% of gig workers.

	Behavior	Citations	Mitigated Harms				
			Financial	Physical	Emotional	Data Privacy	Autonomy
Pre	Screening	[222, 318, 355, 334, 16, 532, 356, 468, 490, 182, 28, 221, 171, 308, 106, 329]	●	●	●	●	●
	Self-Disclosure	[467, 334, 167, 494, 496, 495, 147, 325, 86, 131]	●	●	●	●	●
	Obfuscation	[334, 362, 486, 249, 100, 186, 255, 221, 470, 469, 325, 496, 494, 495, 21, 398, 395, 533]		●		●	●
	Vetting	[521, 334, 355, 221, 16, 167, 517, 275, 100, 317, 330, 346, 193, 479, 21, 398, 466, 43, 445, 444, 468, 497]	●	●	●		
During	Enviro. Precautions	[334, 462, 21, 37, 326, 308, 258, 15, 222, 458, 413, 221, 332, 16, 18, 281]		●			●
	Covering	[221, 413, 308, 307, 106, 150, 468, 448, 436, 83]	●				
	Emergency Alerts	[468, 233, 172, 512, 326, 293, 237, 85]		●			●
	Surveil. & Docu.	[445, 37, 468, 21, 398, 284, 355]		●			●
Post	Blocking	[442, 416, 171]	○	○	○	○	○
	Reporting	[284, 21, 413, 318, 308, 37, 444, 445, 193, 346, 479, 185, 405, 91, 463, 466]	○	○	○	○	○

Table 5.1: Taxonomy of harms in DMOIs by phase and the protective behaviors people engage in to mitigate harms before (filled circle) or after (open circle) they occur.

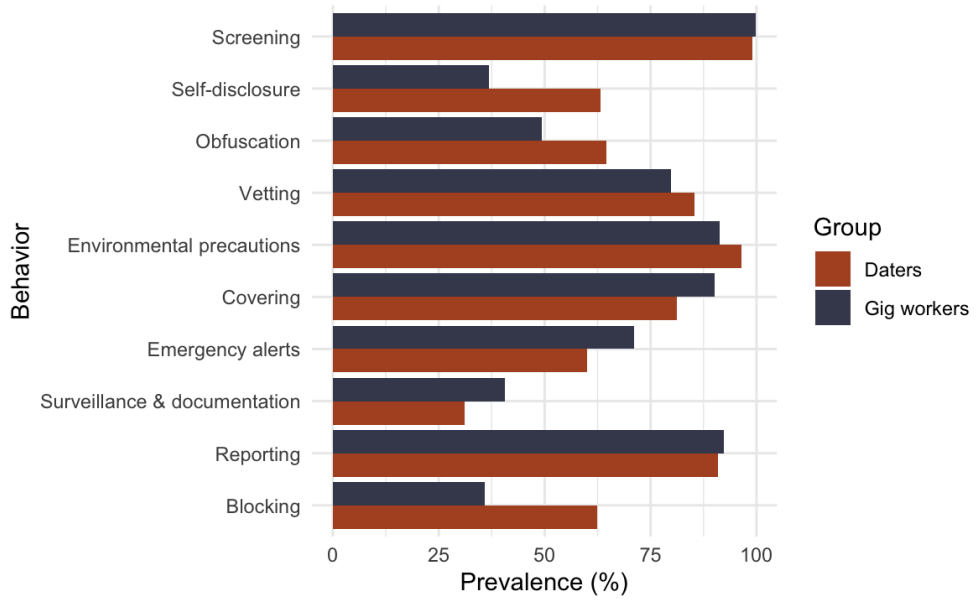

Figure 5.3: Prevalence of safety behaviors our respondents engage in to mitigate the harms described in Section 5.3

5.4 DMOI Safety Strategies

Here we detail how our respondents and those in prior work protect themselves from these harms. Figure 5.3 summarizes the prevalence of our respondents' protective behaviors, and Table 5.1 summarizes the connection between these behaviors and the harms in Section 5.3.

We systematize these protective behaviors according to the phase during which they are implemented: (1) pre meet, (2) during meet, and (3) post meet. *Pre-meeting* safety methods encompass all strategies that occur before meeting offline; including deciding whether to interact with potential Meet offline and while communicating with them online. Methods for ensuring safety in the *during-meet* – while meeting offline– phase can be set up beforehand, such as texting a friend about the meeting location or

intended duration. They can also be triggered during the meeting, such as by using an emergency button on an alarm app or wearable device. *Post-meeting* safety strategies occur after an offline meeting has concluded.

In this section, an asterisk (*) indicates a significant difference between the two populations (alpha = 0.05), while a dagger (†) indicates re-fielded data.

5.4.1 Pre-Meeting Safety Strategies

Prior to meeting in-person, people use a variety of digital behaviors in an effort to ensure they are safe when ultimately engaging in offline interactions. These behaviors include screening (using a variety of decision heuristics to evaluate the information presented by a digital platform about the person they are considering meeting); self-disclosure (intentionally revealing information about themselves in hopes that the other person will use it to screen them); vetting (seeking out additional information about a potential meet); and obfuscation (hiding information about themselves from the platform or person they may meet).

5.4.1.1 Screening

While deciding whether they want to meet with the person presented in a platform profile, people use certain heuristics, which we term decision heuristics, to evaluate the potential Meet's profile [222, 318, 355, 334, 16, 532, 356, 468]. Screening is used to avoid entering into situations that can cause any of the harms described in Section 5.3. For example, a person might want to avoid someone who seems likely to cause emotional

harm through racial or religious discrimination. Others may look for "red flags" that indicate potential for harassing, discriminatory or other unwanted behavior that could cause emotional or physical harm [16, 355, 171]. Nearly all respondents in both groups report screening Meets (99.8% D; 99.1% G) [2]. Factors used to screen Meets in DMOIs include the availability of a profile photo [106] (80.0% D; 57.1% G)*† and the presence of enough information on their profile to search for them online [355] (34.3% D; 53.9% G)*†. Screening heuristics may be context-dependent. For example, gig workers often decide whether to engage with a Meet offline if the job they will perform pays above a certain threshold, or is similar to other jobs they have done in the past [329] (74.2%)† (see Table C.1).

Further, prior work suggests that in digital environments, emotional safety in particular is maintained by an iterative process of boundary regulation where lines "are drawn in relation to a shared set of affective and relational knowledge" [356]. Interactions are more likely to be perceived as emotionally beneficial when a connection is made by a party who respects and maintains established boundaries. Thus, people may look for details that indicate ethical alignment between themselves and a potential meet such as the presence of reassuring information or actions (e.g., use of the gender-inclusive term "cis-man" in a profile), the absence of concerning information or actions (e.g., no weapons or concerning objects in profile photos), or a lack of or the indeterminacy of information (e.g., inability to determine a client's gender as either positive or negative signals to inform their decision heuristics [356, 490, 182, 28, 355] (79.3% D; 27.6% G)*†.

[2] Among our re-fielded sample 98.0% of daters and 97.7% of gig workers screen Meets

Screening is done using information that people can gather or observe easily and therefore requires that platforms obtain and make such information available in user profiles. However, some platforms do not provide enough information about a potential Meet for people to screen them; this is particularly common among gig platforms, which provide clients with more information about workers than vice versa [176]. When people are not able to screen a potential Meet with the information provided to them, they turn to trusted networks, social media groups and the internet to obtain more information about the other party [221]. In some cases they may seek information about a potential Meet's reputation within those communities [308] (4.3% D; 53.5% G)*†. We detail this process, called vetting, in Section 5.4.1.4.

5.4.1.2 Self-Disclosure

Some people purposefully choose to disclose aspects of their identity while using online platforms to meet others. In some cases self-disclosure may be for purposes other than safety, such as when trying to appear more attractive to a potential Meet [467, 334]. 63.2% of daters and 36.9%† of gig workers said they self-disclose information prior to meeting someone offline for safety reasons (statistically significant difference). In these cases, people self-disclose when they believe the information they are revealing would put them at risk of harm if it was discovered offline (e.g., LGBTQIA+ identity or race/ethnicity) [167, 86, 131]. People hope that by sharing this information, Meets will screen them and only agree to engage if they are accepting of their identity [494].

People self-disclose information on their profile (35.1% D; 22.6% G†)*, or

within private online and offline communication [167] (40.4% D; 15.2% G†)*. While self-disclosure commonly occurs prior to an offline meeting, some respondents in our study reported self-disclosing during a meeting as well (23.9% D; 12.9% G†)* (see Table C.2).

Individuals must balance self-disclosure with privacy and control over their personal information. For example, some people share their HIV status on social networking and dating apps [494, 496, 495]. However, they express privacy concerns around platforms having access to this sensitive information [494]. Additionally, self-disclosing can be emotionally taxing: individuals who share sensitive information may face stigma in their community [494, 147, 325]. We found no literature that describes self-disclosure behavior among gig workers, however our survey data† suggests a notable proportion of gig workers who engage in DMOIs do so.

5.4.1.3 Obfuscation

In contrast to self-disclosure, some people may wish to obfuscate personal information by omitting [334] or misrepresenting [362, 470] parts of their identity. Related literature on privacy-preserving strategies among social media users suggests that obfuscating is used to protect against physical, autonomy, and data privacy harms [486, 249]. Overall, a small majority (64.6% D; 49.4% G)* of our sample reported obfuscating personal information by either hiding or misrepresenting parts of their identity.

When obfuscating people omit or hide information that they believe may cause an unsafe encounter with a potential Meet, such as religion, job, and sexual prefer-

ences [100] (60.0% D; 50.3% G)*. According to our survey responses, the most common place where daters omit or hide information is in their profile within the app (42.7%). Statistically fewer gig workers report doing this (16.6%), perhaps because most gig platforms offer workers little control over their profiles, and opaque matching algorithms play a much larger role in determining which clients workers are visible to [229, 489]. Instead, gig workers are more likely to omit information in an online or text conversation with a potential Meet (31.0%) (see Table C.3). Specific strategies used to omit or hide information include removing online profiles [186, 255] (14.9% D; 12.4% G) and censoring images and personal information (8.7% D; 4.4% G) [221, 470, 469] (see Table C.4). Some people may also use emojis and specific in-group language in text communication or profiles [325, 496, 494, 495, 21].

Some people obfuscate by presenting inaccurate information about themselves to Meets (34.0% D; 28.4% G). Some may simply provide a different name, or lie about how they look and their qualifications for a job, sometimes referred to as privacy lies [398, 395]. Others use more involved impression management strategies such as maintaining differing online personas across multiple platform profiles with different social media information, photos, and phone numbers or devices [533]. Similar to the findings for omitting/hiding information, statistically fewer gig workers present inaccurate information in their profile (6.7%) compared to daters (17.4%). Among both groups, the most common place where individuals present inaccurate information is in an online text or conversation (20.2% D; 14.9% G) (see Table C.5). To have these conversations 19.1% of daters and 31.9% of gig workers report using separate contact

information and/or communication devices (statistically significant difference).

Obfuscating comes at a cost: potential deplatforming if obfuscation violates platform rules. Deplatforming leads to loss of income in the case of digitally-mediated labor [43, 51, 52, 64, 13]. Therefore, individuals must weigh the financial costs they may incur from obfuscating information against the safety protections it could provide.

5.4.1.4 Vetting

Many people seek to vet (or find additional information about) Meets before interacting offline. Vetting is used to prevent financial, physical, and emotional harm by attempting to determine whether someone is who they say they are, or if they have a criminal record [100, 193]. Vetting is similar to screening in that people use both to determine whether it is safe to engage with a potential Meet offline however vetting requires actively and externally seeking more information about the potential Meet beyond what is available on the platform profile. More than three quarters of our survey respondents in both groups engaged in vetting (85.3% D; 79.8% G) [3]. People vet a potential Meet by: 1) using search tools, 2) consulting whisper networks, and 3) asking the person directly, and evaluate the validity of the information by using multiple methods and sources and looking for consistency [521, 334, 355, 221, 16].

When vetting, people may search the internet [167, 100] (72.1% D; 88% G)* and social networking sites [100, 517] (70.6% D; 41.8%G)*, or consult background check services and court records [275, 100, 317, 330] (13.8% D; 12.8% G) for personal informa-

[3] Among our re-fielded sample 84.3% of daters and 79.3% of gig workers vet Meets

tion about a potential Meet (See Table C.6). Among respondents in our survey, daters looked primarily for additional online profiles, photos, and videos of their potential date (78.0% D; 47.7% G)*†. Gig workers looked primarily for the potential client's reputation (e.g., criminal history and reputation among other workers in online forums) (20.3% D; 59.9% G)*†. When vetting Meets, people look for personal information (e.g., their full name or phone number) (36.4% D; 29.1% G)† and information about the Meet's location (e.g., home and work location) (33.1% D; 34.9% G)†. People may also try to infer personality traits from information like political affiliation (33.1% D; 22.7% G)† (see Table C.7).

However, the information needed to search online resources and court records is not always readily available; platforms may not require an individual to provide their full legal name on their profile, verify the individual's authenticity, or prevent individuals from displaying fake information [182, 21, 284]. Additionally, some of the information sought is not typically displayed on platform profiles, such as the Meet's reputation within similar communities (e.g., among other workers or daters). To overcome this, some people will consult *whisper networks* for information about a person. Whisper networks are informal feedback networks that people use to communicate bad experiences [346]. They reached social prominence in the wake of #MeToo when many informal networks were created to communicate bad experiences with men, both after dates and more generally [193, 346, 479]. These networks may exist in the form of "bad date" or "bad client" lists. They may also exist in the form of less organizationally work-intensive spaces like online forums, where people share feedback and report neg-

ative experiences about those they have interacted with [21, 398, 466, 43, 445, 444]. People search for details about a potential Meet in these lists and forums, and directly ask others in the community whether they have had any negative experiences with the person [468, 398, 497]. Among our survey respondents, more gig workers than daters rely on these online whisper networks when vetting (6.2% D; 12.3% G)*. Whisper networks may also include offline networks, such as friends and family who can provide advice [466]. Slightly more daters than gig workers rely on offline whisper networks (28.6% D; 24.2% G).

A third strategy for finding information about a potential Meet is directly asking the person for the desired information, and explaining what the information will be used for [334]. Daters use this strategy statistically more often than gig workers (20.7% D; 13.4% G)*. Yet, we find that the majority of respondents *rarely* or *never* tell those they vet that they have done so (65.0% D; 82.5% G)*. Ultimately, even when they are unable to vet a potential Meet, only 25.6% of daters and 22% of gig workers would *rarely* or *never* engage with the individual offline.

5.4.2 During Meet Safety Strategies

When people interact with Meets offline, they engage in various digital and non-digital behaviors to protect their safety. These behaviors include environmental precautions (using techniques to try to protect their autonomy), covering (sharing details of a meeting with trusted friend or family member), emergency alerts (using technology to send a distress signal or call for help), and surveillance/documentation (using

technology to record interactions).

5.4.2.1 Environmental Precautions

When interacting with a Meet offline for the first time, people take a variety of precautions to make the interaction and environment safer [334, 462] (96.5% D; 91.4% G)*. These precautions are typically not digitally-mediated. Instead, they include behaviors that people believe will help them stay in control of the meeting, thus avoiding physical, financial, and autonomy-related harm. Environmental precautions include bringing protective items to the meeting [21, 37, 326, 308], engaging in advanced planning (e.g., having a planned escape route, getting their own ride to the meeting location) [258], selectively choosing the meeting time and location [334, 15, 222, 458, 21], not going to the meeting alone [413, 221], and avoiding certain personal behaviors that may increase an individual's risk of harm (e.g., drinking alcohol) [332] (see Table C.8).

When taking precautions to protect their autonomy, some people will carry items they feel give them greater control, such as lethal (e.g., guns and firearms) and non-lethal (e.g., pepper spray and pocket knives) weapons [21, 37], even in situations where such items are prohibited or illegal [326] (16.5% D; 16.6% G). The items people believe will protect them are dependent on the type of interaction they will engage in with a Meet. For example, sex workers and online daters may carry contraceptives, such as condoms, to protect themselves from health-related physical harm like STDs [308]. Others might try to protect their autonomy by engaging in advanced planning, such as driving themselves to the meeting location, and having a pre-determined escape route

to quickly leave in an emergency (18.0% D; 27.5% G)*.

When meeting someone for the first time, people try to meet them in locations that feel safe, such as in crowded, well-lit areas; they often meet in a public space, such as a coffee shop or busy park [334, 15], and avoid late meetings [222] or those in locations they deem unsafe, such as those in socioeconomically-disadvantaged areas [458] (62.4% D; 51.4% G)*. Sometimes people will bring a trusted individual to the meeting [413, 221] (17.1% D; 20.2% G). Some may also avoid having in-home meetings [18]. Some of these strategies may be more appropriate in some contexts than others. For example, some online daters note that meeting in public places is "useless" for those who are seeking hook-ups or casual sex from dating apps [16]. Gig workers and sex workers often do not have a choice to meet in a public location, since their jobs require private interactions, often in people's homes or private spaces [308].

People sometimes avoid certain personal behaviors such as wearing makeup, drinking alcohol, and wearing headphones [281] (29.0% D; 19.1% G)*. These are behaviors that individuals may typically engage in outside the context of DMOIs. But in this context, they believe engaging in the behavior may put them at greater risk of harm. For example, daters may choose to not drink alcohol to ensure they stay in control of the meeting. Yet, gig workers are typically not in a context where drinking is part of their interaction with a Meet. Instead, they may carefully calibrate their gendered presentation, including avoiding wearing makeup and/or dress in a particular way as they may perceive these behaviors as protective. These behaviors may be influenced by victim-blaming culture [513, 142].

5.4.2.2 Covering

While interacting with Meets offline, people use a protective strategy termed "covering" to protect against physical harm [308, 83] (81.2% D; 90.2% G)*. People cover by (1) having another person present (or close by) during a meeting [221, 413, 308, 307] (17.1% D; 20.2% G), or (2) sharing details about the Meet and meeting location with others [106, 150, 308] (77.6% D; 86.9% G)*. In most cases people share this information with a trusted, close contact such as a friend (91.4% D; 64.2% G)*, family member (18.5% D; 26.0% G)*, or roommate (30.2% D; 17.3% G)* (see Table C.10).

The details people share with trusted contacts include where they are going (74.5% D; 84.5% G)*, personal details about the Meet (37.1% D; 48.6% G)*, and what time they expect to be back (48.7% D; 63.9% G)*. They may also give trusted contacts instructions to check in during the meeting [468, 448, 308] (35.0% D; 30.4% G) (see Table C.9). About half (52.4% D; 52.6% G) of survey respondents in both groups said they also make emergency plans with their trusted contacts in case something goes wrong during the meeting. The most prevalent emergency plan made by both groups is for someone to call them (83.4% D; 75.9% G) (see Table C.11). An interesting difference between the two groups is in whether the trusted individual should contact the police. In gig work literature, particularly work that relates to criminalized and stigmatized communities, it is often noted that people may be hesitant to contact police in emergency situations, especially when they believe police may blame or them or criminalize their work [308, 73, 413, 436]. Our findings seem to support this, but add

nuance: statistically more gig workers report that they instruct a trusted individual to contact the police (62.5%) compared to daters (44.9%).

5.4.2.3 Emergency Alerts

When people feel their physical safety is threatened during an offline interaction they may send emergency alerts to trusted contacts or law enforcement (60.1% D; 71.2% G)*. There are two common types of emergency alerts used in unsafe situations, both in DMOIs and more broadly: (1) sending info to a trusted party [468] (28.9% D; 25.1% G), and (2) playing an audible alarm [233, 172, 512, 326] (28.9% D; 15.7% G)*. Sending an emergency alert enables someone to intervene in the situation. For example, sending info can support a future investigation and playing an alarm can distract the perpetrator or attract help. Among our survey respondents, the most prevalent pieces of information sent to trusted contacts are personal details about the Meet (14.6% D; 10.0% G) and GPS coordinates/other location details (14.2% D; 17.7% G) (see Table C.12). The most prevalent type of audible alarm is receiving a fake phone call which can provide an excuse to leave the situation (27.0% D; 12.9% G)* (see Table C.13).

Several apps and wearable technologies exist to enable people to send emergency alerts during unsafe situations. For example, some apps give the user a fake call [293], contain "panic buttons" that call local law enforcement when triggered [237], and allow users to quickly share their GPS location with a list of pre-determined contacts [85]. We asked respondents about their familiarity with eight such technologies (Table C.14), selected through an exhaustive search and our collective knowledge of the

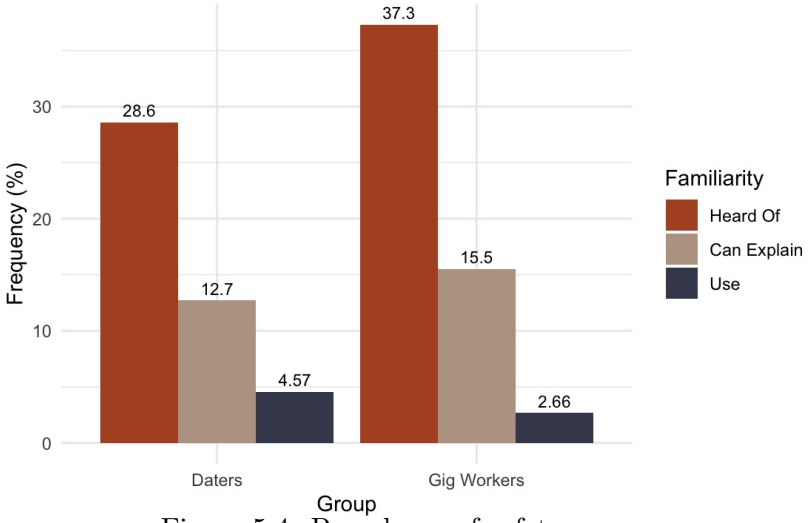

Figure 5.4: Prevalence of safety app use

area. We find that only a minority of survey respondents in our sample know about and use such apps. 28.6% of daters and 37.3% of gig workers have heard of at least one of the apps (statistically significant difference). Of those, only 12.7% of daters and 15.5% of gig workers know enough about at least one app to explain what it does, and only 4.57% of daters and 2.66% of gig workers personally use at least one app (see Figure 5.4.

5.4.2.4 Surveillance and Documentation

People may also record or live-share elements of their offline interactions with a Meet to protect against physical harm and gain more autonomy and control over the interaction [445] (31.2% D; 40.6% G)*. For example, people may record conversations and the Meet's behaviors [21], or their real-time location [21, 398, 355], visibly, or without the Meet's knowledge [37, 468]. People who visibly record hope the presence

of a recording device might deter a Meet's harmful behavior [468, 21]. For example, some gig workers working for rideshare apps commonly use dashboard cameras to video record passengers during the drive [21]. People may choose to record an interaction without the Meet's knowledge to obtain evidence for later reporting [468, 21, 398], especially since many platforms fail to provide adequate documentation and reporting mechanisms [284].

Interestingly, despite recording interactions being commonly reported strategies in prior work [490, 21, 398, 284], we found that only 2.3% of daters and 6.9% of gig workers reported using a recording device (statistically significant difference). Perhaps one of the reasons people may hesitate to record interactions is the high level of legal risk involved, especially if recording without the Meet's consent. In many locations, recording interactions without consent is illegal. This may lead to deplatforming and legal charges [398]. A greater number of respondents reported live-sharing their location with a trusted contact using an app or other technology (30.0% D; 37.9% G)* (see Table C.15).

5.4.3 Post-Meeting Safety Strategies

After an unsafe offline interaction with a Meet, people may discuss this experience with others or warn others about their experiences with the individual, report their experiences to platforms, hotlines, and law enforcement, and/or take steps to prevent the Meet from contacting them again [185, 405, 444, 346, 308]. It is important to note that these methods cannot rectify the harms an individual has experienced; rather they

may prevent similar experiences from happening to the same or a different person in the future.

5.4.3.1 Reporting and Blocking

People report harmful or unpleasant experiences primarily to platforms [284, 21] (29.2% D; 49.3% G)*; a small percentage report to safety organizations [445] (6.3% D; 8.5% G) and law enforcement (9.7% D; 10.3% G). However, they are most likely to describe these experiences to offline (88.4% D; 80.9% G)* or online whisper networks [21, 413, 318, 308, 37, 444, 445] (20.7% D; 46.1%)*†.

People have different goals for reporting to each group: they report to platforms to try to seek repercussions for the offending Meet [284, 21]; they report to whisper networks to help others avoid similar harm and to share safety information not provided by the platform [193, 346, 479, 185, 405, 37]. Overall, among the respondents in our survey, 90.9% of daters and 92.4% of gig workers have reported a Meet†[4] (see Tables C.16, C.17, and C.18).

We did not find prior work suggesting people report negative experiences to law enforcement and we find that a minority of respondents in our sample report doing so: 9.7% daters, 10.3% gig workers. The difference between this percentage and the percentage of those who instruct trusted individuals to contact police on their behalf if something goes wrong (44.9% D; 62.5% G)* (see Section 5.4.2.2) is stark. It may be that

[4]This proportion includes those who report to platforms, police, organizations, and offline whisper networks as well as those who report to online whisper networks, a question asked in our re-fielded data; as not all original respondents answered the question about online whisper networks, this proportion may be an under-count.

people mistrust police and other law enforcement agents, but feel reassured when someone else can contact those authorities on their behalf. Reporting to law enforcement, and similarly platforms, requires that individuals have trust in those groups. Prior work does discuss why some people who engage in DMOIs, such as those from marginalized groups, may not trust these institutions to support them [413, 308, 398]. For example, they may have experienced previous violence from these institutions and individuals, expect discriminatory and stigmatizing treatment, or believe these institutions will not support them at all [306, 488, 444, 284, 435].

Sometimes people share their negative experiences to take care of themselves following tech-related harm, as they find that sharing them provides a cathartic emotional release [463, 466, 91]. People share these experiences with some of the same groups they seek help from when covering, including both online and offline whisper networks. Within offline networks survey respondents share with their friends most often (83.8% D; 65.9% G)*. Some also tell their family (34.1% D; 54.3% G)* (see Table C.17).

In addition to reporting, people may also block the offending party from contacting them again [442, 416, 171] (62.4% D; 35.9% G)*. Daters most commonly block Meets on social media (44.5% D; 19.1% G)*, while gig workers most commonly block Meets from being able to call/text/message them (42.6% D; 25.5% G)* (see Table C.19). Blocking a Meet on the platform may not be an option for gig workers, as it requires platforms to provide mechanisms that enable users to do so. Features like these are often not built into gig platforms.

5.5 Discussion

Creating safer digitally-mediated offline interactions will require interdisciplinary work, drawing on expertise in security, human-centered computing, policy, and social science. Our work captures how people think about safety in this context, and the behaviors in which they engage to protect themselves from harms that are neither entirely digital nor non-digital. In this section we draw on our taxonomy to discuss why we need to change how we think about digital security (Section 5.5.1), potential ways that technical design can support post-digital safety in DMOIs (Section 5.5.2), and critical questions to engage with when implementing those designs (Section 5.5.3).

5.5.1 Expanding the focus of digital security

Since harms experienced by people who engage in DMOIs are neither entirely digital nor non-digital, we must expand our understanding of security to move towards post-digital notions of safety.

Respondents most commonly defined safety in DMOIs as centering on physical, emotional, and autonomy-related harms. Yet, prior research has focused primarily on financial and data-privacy notions of harm, which only a small subset of our respondents mentioned as core to their definition of what it means to be safe in DMOIs (see Section 5.3).

The relationship between particularly physical and emotional harms and safety is not new: social science researchers have explored the significance of "safe spaces" in

physical settings [277, 105], and defined safety as including aspects of human well-being such as economic development, social justice, and environmental protection [29, 433]. An emerging body of work on digital safety has shown that emotional and physical safety is part of digital safety on social media [369, 459, 406, 184, 54], in online communities [405, 180, 132], and when doing marginalized work [308, 460, 480]. The autonomy-related harm our respondents described relates to control over their physical bodies in offline spaces (e.g., the ability to physically leave an unsafe situation). Yet prior work on autonomy-related harm has focused on digital autonomy harms, such as the ways in which platforms use opaque algorithms to exert control over users [24]. Our work adds nuance to the meaning of autonomy-related harm by revealing how people's priorities within DMOIs differ from the digital-first focus of existing work. Our findings illustrate that not only are physical, emotional, and autonomy safety part of digital safety – they may be among the most important elements, particularly in the context of DMOIs.

In DMOIs abusers may intentionally misappropriate technical systems as instruments of harm; but more often abusers cause harm simply by using the systems as intended, to meet and interact with people in the physical world. Our work suggests the need to expand our focus to explore this additional mechanism of harm: offline harms that are encountered as a result of using a technical system as intended vs. as a result of abusers (mis)using technical systems. With this, we add a post-digital element to existing security literature.

Offline harms emerging from DMOIs are a security problem; platforms and apps play a significant role in matching strangers and encouraging their interactions

with one another, with limited safeguards to protect them. Addressing them will require understanding the nuances between harms in DMOIs and the ways in which we currently conceive of digital safety and harm. Previously, security researchers have focused on studying and addressing harms abusers cause using technology, including both traditional security considerations such as financial harms from scams and fraud [478, 75, 461], as well as emotional or physical harm via online hate and harassment [459, 460, 123] and technology-facilitated intimate partner violence [477, 526, 476, 89]. Security defenses against these harms may in some cases center on avoiding post-digital spillover of threats (e.g., an online abuser causing physical/sexual violence to a target) by reducing the likelihood for offline interaction. However, in DMOIs such offline interaction is the goal of using systems, and thus preventing such interaction is not an appropriate mitigation strategy.

As new technologies and technology-mediated spaces emerge, we will need to continuously refine what digital security means. In doing so it is imperative to involve users in co-constructing the meaning of safety in those environments. Our empirical work is a first step in that direction. We urge future work to actively involve users in co-creating safer post-digital spaces, taking a broad definition of the scope of safety. Such work may draw on participatory design methods [69] to create safety-mitigating technologies, strategies, and policy. It may also involve carefully examining the abusability of a system following the guidelines presented in [447].

5.5.2 Designing for post-digital safety in DMOIs

Just like people's definitions of safety in DMOIs often center around harms that occur in the physical, offline world, their protective behaviors are also mostly non-digital. However, since these interactions are digitally mediated and thus exist within a post-digital framing, there are multiple potential directions through which computer security research and development may support safety through the broader focus argued in the prior section.

Reconsider the design of existing safety tech. There have been significant efforts made to build safety apps to protect people from offline harms, such as physical assault [304]. These include tracking apps to know if someone is in danger [507, 300, 55] and panic buttons/alarms that alert emergency authorities of an unsafe situation when triggered by a user [237]. Our research, however, shows that few people are aware of these apps, and even fewer actually use them.

Research suggests there are limitations to what these technologies can do and how useful users find them to be in a moment of crisis [304, 237]. For example, many safety apps are reactive rather than proactive – they can only be used once an unsafe event has occurred rather than preventing one from happening. Users have expressed that this support occurs too late to be useful [284, 237]. Likewise, users often find tracking devices too inaccurate to use effectively [55]. Finally, safety apps that do rely on tracking may be seen by users as harmful surveillance technologies, rather than helpful safety apps [435, 280]. Surveillance is not the same as safety, and may cause harm,

especially to individuals from marginalized groups who face stigma due to their race, gender, and sexuality [435]. Our work corroborates these findings and offers additional insight into why people may hesitate to use existing safety apps to protect their safety. We use those insights to make design recommendations.

Respondents frequently rely on collective strategies, such as consulting whisper networks and relying on trusted contacts to intervene when an offline meeting becomes unsafe. Yet, design of existing safety technologies is highly individualistic and relies on centralization (e.g., emergency alerts that contact law enforcement). Respondents' collective strategies do not require the use of specialized technology beyond a device for communication and accessing online whisper networks. Further, while some people instruct trusted individuals to contact police on their behalf if a meeting becomes unsafe, very few choose to report unsafe experiences to police themselves. Thus, future research and development on safety technologies should carefully consider how to enable collective action and decentralized protection.

Evaluate how to use defensive security techniques to mitigate harm in DMOIs. As we outlined in the previous section, existing safety technologies such as safety apps aim to address DMOI-related harm, but actually have no mechanisms for prevention. Instead they function as alerts to use during or after the harm has occurred. An area where computing may be appropriate is in limiting people's exposure to offline harm in the first place. Researchers should consider the potential to use existing defensive security techniques, such as authentication, training to detect potentially malicious interactions (e.g., phishing), and automated detection of malicious accounts/users. For

example, how may we create collective or social authentication protocols that leverage the community's experience with an individual to determine what features, services, or individuals they have access to on the platform? Similarly, how can we crowdsource the detection of abusers based on people's reports of negative experiences with Meets in bad client/aggressor lists?

Trading off privacy and safety. Platforms that enable DMOIs are notoriously bad at protecting users' safety [284]. This leads individuals to feel they must go outside the platform to protect themselves. For example, our participants reported vetting potential Meets by looking them up using search tools and social media, and consulting whisper networks. While this may find more information about a potential Meet to make the interaction safer, it can also violate the privacy of the Meet. This echos results reported in [100], where researchers found that safety concerns might lead online daters to behave in ways that violate their own or others' privacy.

The results of our survey suggest that even though individuals often look up others using the information Meets have shared on the platform, they are wary of sharing their own information and hide personal information in the pre-meet stage. While participants reported doing this for safety reasons, this behavior makes it difficult for Meets to protect their safety by vetting them in return. These behaviors create an interesting design paradox that needs to be considered when thinking about what safeguards platforms should implement to support safety in DMOIs.

One approach we encourage future research to consider is consensual access to vetting information. This could alleviate the need to "stalk" Meets outside the platform

prior to meeting, but raises concerns around information sharing and abuse. These should be examined through a trust and abusability lens using the toolkit described in [447]. For instance, future work would need to consider the types of data that are appropriate and necessary to collect from users for a consensual vetting system. If such a system is centralized, platforms will serve as consensual vetting brokers (as they already do to some degree); this requires that users trust the company running the platform, and believe the company cares about protecting their safety. Therefore, future work should also explore the degree to which users trust platforms to support their safety, and how their level of trust influences the information they are willing to share.

Consensual vetting systems will be vulnerable to abuse. Users and/or malicious actors may take advantage of their access to others' information to cause a variety of harms such as coercive control and manipulation. While it will never be possible to entirely design out this harm [443], engineers and designers will need to examine the abusability of the system at various stages of its implementation and whether there are risks of greater harm than those that may be mitigated. Learning from community-owned and community-run harm reduction tools such as sex workers' bad client and aggressor lists [444] and similar fora [308, 37] may be useful here – the work necessary to build and maintain these trusted, cared for, and community-maintained systems is built on notions of restorative justice rather than the traditionally punitive systems we build into security and other digital safety tools.

5.5.3 Cautious Design

It is clear that DMOIs constitute a complex ecosystem with various actors (e.g., the platform, users, and bystanders in the offline environment where interactions occur). Each of these actors has different goals and priorities, which may factor into their perceptions of and experiences with safety. We urge researchers to consider what is ethical when researching solutions to safety and security issues. Researchers should be sure to examine their own privilege and take active steps to mitigate their own biases in deciding whose safety and well-being to protect and reflecting on the consequences of those decisions. We encourage researchers to consider a feminist orientation to safety, following the guidelines described in [443], and to follow recent guidelines on trauma-informed computing [91].

Further, while our work focuses on individuals' experiences with safety in offline interactions broadly, we note that women, non-binary folks, and people of color are at especially pronounced risk of harm in DMOIs [448, 193, 352]. People of color and women experience physical harm such as sexual assault, rape, and murder at a higher rate [34, 193]. Risk of emotional harm related to hate and harassment may be especially pronounced among marginalized groups [21, 493, 459]. Furthermore, these groups often have to engage in additional emotionally taxing "safety work" [199, 450, 171] to try to protect their safety, and manage post-harm trauma. We encourage future work to both consider how individuals' identities (e.g., gender, race, education level) influence protective behaviors and to engage and amplify marginalized voices in the creation of

safety DMOIs. When we design for those who are most at risk for harm, we are creating safer spaces not only for them, but for everyone.

Finally, perhaps the most important questions to consider when designing for post-digital safety in DMOIs are whether people want to use technology at all. We encourage future work to critically consider when it is appropriate to introduce technology and when it is most appropriate to abstain. Homewood [212] lays out a plan about the opportunities that *inaction* as a design decision brings to a research space, and Strohmayer et al. [444] argue that vital human interaction that aims to reduce harms in DMOIs may be digitally mediated, but should not be replaced with novel digital technologies. Especially when considering safety in our post-digital world, 'inaction' on the novel technology-development front becomes an important point of reflection. This 'inaction' can create space of action for the improvement of existing technologies and, importantly, non-digital services: creating space to empower safety experts in anti-violence and post-violence support services and/or reallocate funds away from technology and into violence-reduction work.

5.6 Conclusion

In this chapter I systematized prior work on the harms and protective safety behaviors of three groups that engage in digitally-mediated offline introductions (DMOIs): online daters, gig workers, and sex workers. I developed a robust taxonomy and threat model from prior work. Through a large-scale survey of online daters and gig workers

I measured the prevalence of users' safety threats and protective behaviors, extending prior work. I found that physical and emotional harm are the most prevalent safety concerns and that the most prevalent protective behaviors are those that involve leveraging users' close contacts and social networks. We also noticed differences between user-reported safety threats and the types of harms that have been the focus of prior work. In particular, despite a strong focus on financial scams for both groups in prior work, relatively few participants mentioned these in their definitions of safety. Additionally, autonomy-related harms have been alluded to in the context of gig work, but have received little attention in online dating despite it being a commonly reported safety threat in our survey. Finally, our preliminary results that users have low adoption of dedicated safety apps suggests that people primarily appropriate existing and available technologies (e.g., other users' profiles on the matching platform) for safety. Therefore, platforms are in a strong position to help protect users' safety simply through the affordances they choose to implement.

In Chapter 6, I consider directions for future work that extends my work into other matching market platforms and leverages our findings to support users' safety in these contexts.

Chapter 6

Discussion and Future Work

The work in this dissertation provides insight into the harms users experience when interacting via social computing systems that support matching markets and the protective behaviors they engage in to mitigate these harms.

To understand how harm occurs in interactions that have a strong financial motive and feature an uneven balance of power between individuals, I looked at career development in crowdwork. The results from this work showed that crowdworkers' financial need and lack of platform support for career development forces them to prioritize immediate financial gain over their long-term goals and the safety those goals could provide (Chapter 3). I then wanted to understand how financial motives and power dynamics impact harms and users' protective behaviors in interactions that feature a non-trivial offline component. Therefore, I looked at women gig workers' experiences with bias and harassment in ridesharing, food delivery, and home-based tasks (Chapter 4). I found that gig platforms are gender agnostic: they further perpetuate socially-

grounded harms, like bias and harassment, when they do not take into account the increased risk some groups face. This also limits the protective behaviors women can engage in when harm occurs. Finally, I developed a cohesive framework of harms and protective behaviors among groups that engage in digitally-mediated offline introductions, drawing on prior work. This allowed me to understand the broader categories of harm, actors involved in perpetuating these through matching market platforms, and types of protective behaviors users engage in (Chapter 5). I measured the prevalence of user-defined safety threats and their protective behaviors through a large-scale survey of online daters and gig workers (Chapter 5).

In this chapter I first discuss the high-level implications of my work, focusing on the underlying cause of harm in matching market platforms, who has the responsibility for mitigating harm, and how safety in matching market platforms can be considered in conversation with existing security and privacy research agendas. Then I outline three directions for future research that build on the work contained in this thesis.

6.1 Discussion

6.1.1 Further contextualizing the root cause of harm

My work shows that there are various harms users experience when interacting with one another via matching market platforms, but the underlying root cause of that harm is less clear. From Figure 5.1 in Chapter 5 we see that even though there are various actors that cause the five harms included in the framework I presented

(Chapter 5), the platform is complicit in all those harms; either the platform directly causes harm, or it provides a vessel by which another actor can cause harm. However, more work is needed to understand the root cause of harm, especially work that considers the factors that drive harmful experiences (e.g. how socio-demographics or the type of job a worker engages in might impact their susceptibility to scams).

From my work, I hypothesize that a primary cause of harm in matching market platforms is lack of awareness and agreement on what constitutes harm. Oftentimes platforms will give users general safety tips [6], usually related to physical safety, which suggests they are considering safety. However, users' safety concerns, and the harms they experience, extend beyond physical threats. Furthermore, because many of the harms that occur in matching market platform interactions occur offline, platforms may not be sure what role they need to play in protecting users. This lack of awareness, especially among the designers and engineers developing matching market platforms, might make it easier for malicious actors to use the platform to cause harm, or for the platform to inadvertently cause harm. A consequence of lack of awareness around safety in the construction of matching market platforms is that many of the protective behaviors platforms sometimes support are reactive in nature; they only take place after harm has occurred (e.g. reporting) or while harm is ongoing (e.g. panic buttons for emergency alerts).

In addition to further unpacking how harms occur and how people experience them differently through more user-centered studies, education may also play an important role in shaping safer matching market platform interactions. In particular, incor-

porating discussions of harm into undergraduate and graduate engineering and design courses can help students be more cognizant of the safety implications of the technologies they design in the future. Therefore, courses on ethics in technology and responsible computing should consider discussions and activities that engage students in unpacking different types of harms that may befall users of social computing systems [423]. Because addressing these harms requires an interdisciplinary perspective [502], these courses should also aim to provide students with the tools to have conversations about harm with their future coworkers and promote greater awareness around safety issues. This includes exposing students to the perspectives and expertise of industry practitioners. I introduced a course for the UC Santa Cruz Human-Computer Interaction Professional Master's program that works towards this vision, Ethics and Activism in Technology and Design. Course materials for the Winter 2023 offering are available on the course website[1].

6.1.2 Considering responsibility for mitigating harm

My work in this dissertation focused on the role platforms play in the harms users experience and in the protective safety behaviors they engage in. Therefore, that naturally lends itself to discussions of how platforms should change their structure through design and engineering to better support safety and mitigate various harms. However, there are limitations to this, especially since prioritizing safety may not be aligned with platforms' financial goals and incentives.

[1] https://sites.google.com/ucsc.edu/hci220w23/home?pli=1

Mitigating harm in matching market platform interactions requires an interdisciplinary approach from multiple stakeholders including platform designers and engineers, policy experts, and educators. Not only does spreading responsibility across multiple stakeholders help keep platforms accountable, it also helps address limitations in each stakeholder's ability to effect change.

While design and engineering are distinct practices with their own values and challenges, designers and engineers both contribute to the design of the system (e.g., creating and enabling the rules that decide how a system will work). Therefore, I group them both in suggesting how these two disciplines can work towards promoting a safer future for interactions via matching market platforms. These two fields should be working together constantly to devise new structures for interaction via social computing platforms, using each of their strengths to contribute to the conversation.

Some of the strengths of design are that the field is well-versed in the conception and creation of new ideas and has a history of drawing from disparate disciplines (e.g. architecture, social science, art) [110]. As such, designers may be well-equipped to lead conversations on how safety has been considered in other areas and what computing should adopt from these. Designers also often have experience working directly with users. As such, they can help lead interdisciplinary teams in conducting user studies of new prototypes, or run participatory design sessions to understand open questions, like those described in Section 6.2.

Engineers, especially in computer science, think about what can be efficiently automated [119]. Therefore, engineers could play an important role in delineating what's

technically feasible in potential digital safety interventions. They are also in a strong position to think about how existing structures beyond the visible user interface may change to support safety (e.g., how algorithms that manage workers could be more safety conscious).

There are of course limitations in what design and engineering are able to accomplish. Designers and engineers within companies could help design interfaces that better support users' protective safety behaviors and new ways of connecting individuals that reduce harm. However, improving safety in interactions that occur via matching market platforms will require regulation to hold platforms accountable. For example, regulation could oversee the percentage of users reporting negative experiences on a platform and provide that information to users in a website or database.

Many of the interactions (and resulting harms) that occur via matching market platforms are similar to those of their non-digital counterparts. This may be helpful in considering how to construct policies and regulation. For example, in Chapter 3 I showed how the resources crowdworkers lack in their career progression are the same that support career development in more traditional, offline, forms of work. Thus, we might turn to the rules that govern behavior in broader society as examples to inform regulation for interactions via matching market platforms. For example, the Fair Employment and Housing Act in California prohibits discrimination, harassment, and retaliation and requires that employers take reasonable steps to prevent and correct wrongful behavior in the workplace, such as harassment and discrimination [78]. Future work on policy and regulation within matching market platform interactions may think

about how to extend such a law to include contract-based workers in the context of gig work. While safety may not align with an organization's bottom line, regulation like FEHA in California holds organizations accountable. Therefore, looking at offline interactions as an example can also help guide how various stakeholders may help promote safety in matching market platforms even when platforms are not immediately incentivized to do so.

6.1.3 Broader implications of safety in matching market platforms

The findings in this dissertation contribute to, and build on, notions of harm in the security and privacy community. Therefore, we can draw on prior work in security and privacy to help address safety in matching market platform interactions.

One of the ways in which future work on safety in matching market platforms could build on security and privacy research is in thinking about the role of users. A lot of recent work on usable security and privacy, especially around phishing, password strength, and multi-factor authentication, rests on the belief that the technical system should be designed to protect users [426], rather than blame users for security and privacy harms. This has led to important work looking at users' mental models of phishing [525, 126], what makes users more likely to adopt particular pieces of security advice (e.g. adoption rates of two-factor authentication) [174], and how to create tools to support crowdsourced phishing detection within organizations [70]. There are several parallels between the harms I described in Chapter 5 and the mechanisms of phishing and security within organizational settings. However, unlike in the security and privacy

community, safety in social computing systems is still very much the users' problem. If we reframe this to think about how to change systems to support safety, we may be able to adopt some of the techniques of security and privacy, like crowdsourced phishing detection, to support users' protective behaviors (e.g., vetting) in matching market platform interactions.

To illustrate this idea, let's consider another example of the technological mediation of work. In addition to the forms of gig work I studied in my dissertation, digital systems are involved in matching individuals to more long-term forms of work within organizations (e.g. Linkedin). But this also introduces potential for harm; users may feel pressured to share more information than they are comfortable with for the sake of obtaining a job, similar to some harms in gig work.

To address potential harms from sharing information on platforms that broker work-related matching we can look to prior work on cognitive heuristics in privacy decision-making [451, 452, 9]. In security, users engage in cognitive heuristics when making decisions about what information they are willing to disclose and how to protect their online privacy. Similarly, users of work-related matching platforms may engage in heuristics to decide what to share and make tradeoffs. Future work could look at how these decisions are made (e.g., what factors influence users' decisions and how). Results from this may also inform security and privacy literature. A key difference between matching market platforms and the contexts in which privacy decision-making have been studied previously is that in the former, decisions are much more purposeful than the latter: for example, people must weigh safety considerations against the utility

value of the match (e.g., job alignment and potential for income). Meanwhile, security and privacy research on cognitive heuristics has primarily focused on how users make these decisions in more recreational uses of technologies (e.g., social media, consumer behavior).

6.2 Future Research Directions

The research agenda I pursued in this dissertation shows that harm is readily occurring in interactions that occur via matching market platforms. These harms are dynamic, influenced by a myriad of factors including the design of the platform facilitating the interaction (and the power dynamics embedded within these systems), users' social context, and the motives for the interaction. In the face of a lack of platform support for safety, users develop protective safety behaviors to mitigate the harms they experience. However, these are similarly impacted (often constrained) by similar factors. Moving beyond this dissertation, I hope other researchers and myself can draw on this work to explore safety in other types of matching market platforms and to design systems that support users' preferred protective behaviors. In this section I present three ideas for this type of future work.

6.2.1 Cooperative safety in the face of conflicting power dynamics

The work in Chapters 3 and 4 in this dissertation looked at the harm experienced by people in low-power positions (e.g. workers). In the forms of gig work I studied, a power imbalance in favor of the client is a feature of the platform. There-

fore, focusing on gig platforms where workers are in low-power positions allowed us to focus on how workers' safety and protective behaviors are influenced by this platform structure.

However, there are some interactions facilitated by matching market platforms where the client may experience safety concerns as well. An example of these are DMOIs where an individual invites someone into their home. I considered some of these in Chapters 4 and 5 from the workers' perspective: carework and other home-based tasks. In these interactions, workers are financially in the low-power position, putting them at risk. However, clients may also experience safety concerns related to leaving a loved one in the care of a stranger or being home alone with someone they perceive as threatening. Peer-to-peer accommodation, such as Airbnb, is another example where there may be similar safety concerns on both sides. In fact, prior work has looked at safety-related topics on both sides, such as how Airbnb hosts self-disclose information in a way that makes them appear more trustworthy to potential guests [286] and risk perceptions of hosts [292].

Given both parties' interest in preventing harm, it may make sense for individuals on both sides to collaborate in protecting their safety when engaging in these types of DMOIs. A first step is for people to have accurate mental models of how individuals on the other side conceptualize safety (e.g. what their concerns are). However, there has been little prior work looking at how individuals engaging in DMOIs think about the other parties' safety needs. Future work should consider doing this through interviews and participatory co-design sessions with both parties. For example, a co-design

session could have parties take turns storyboarding scenarios that would make them feel unsafe to promote shared understanding of concerns. Another session could have parties jointly prototype a single system based on each of their storyboards.

6.2.2 Assessing trust in digital safety interventions

Designing tools to support safety in interactions that occur via matching market platforms can be approached from various angles. Digital support tools can be embedded directly within the platform or as standalone tools; they can be managed by the platform, an industry organization, a government regulator, and/or a nonprofit organization. Oftentimes, when a design solution is introduced, we focus heavily on its design and technical implementation and not enough on who will be managing it and how that affects adoption.

People's prior experiences with matching market platforms may shape their trust in particular institutions to protect their safety, especially given the myriad ways in which platform design choices provoke harm. For example, their level of trust in the organizations offering a safety support tool may affect their willingness to adopt that tool. Ultimately, adoption is an important factor in ensuring that these safety interventions and tools are effective, as has been shown with COVID-19 tracking technologies [219, 215]. Thus, an important factor in designing tools to support safety in interactions that occur via matching market platforms is considering who should offer the tool in the first place.

When developing systems like those discussed in the design implications of

Chapters 3, 4, and 5, future researchers should consider who users trust to implement and manage those interventions. Specifically, researchers may consider asking: How does a person's previous experiences with safety in this context influence their level of trust in a particular organization implementing and managing a tool or intervention? Additionally, researchers may want to consider users' social contexts and how those influence which institutions they trust the most. As my work in Chapter 4 showed, matching market platforms extend societal biases and marginalization. Therefore, future work may also consider how a person's demographic background correlates with trust in institutions that may implement safety tools.

6.2.3 Implementation of protective safety behaviors in XR

Matching market platforms are increasingly mediating interactions in emerging technologies. For example, many apps are able to facilitate dates in virtual reality (VR) and display the profiles of potential dates in augmented reality (AR) [414, 530, 328]. These applications further blur the line between online and offline interactions. Researchers have suggested extended reality (XR), including VR and AR, may exacerbate harm given what we know about unsafe interactions in social VR environments, such as virtual harassment and groping of VR avatars [44]. We have been able to apply previous research on online hate and harassment to this new context, considering potential XR dating harms before the prevalence of these systems increases further.

We know less about how XR dating will shape users' protective safety behaviors. However, future work can draw on the survey results presented in Chapter 5

to evaluate how the most prevalent protective behaviors may be supported in a new environment. For example, I found that "covering" – informing a trusted contact (a guardian [19]) of a meeting so that they can assist if the meeting becomes unsafe – is one of the most prevalent protective safety behaviors in online dating. In some cases, the guardian waits at or near the meeting, so that they can physically intervene if needed (e.g., waiting in the car while a worker visits a client's home). Ultimately, covering requires a guardian to be ready to intervene immediately when a situation becomes unsafe. By blurring the line between the physical and the virtual, XR presents a setting in which covering might work very differently. For example, access to XR devices may prevent someone from being a guardian. Additionally, XR devices could provide guardians with detailed information about how the meeting is going. Yet, this level of data transfer might be seen as invasive, or the XR devices might be too difficult to use. In short, XR raises a number of questions about covering implementation.

Future work might consider using participatory co-design techniques to investigate questions around the implementation of covering and other protective safety behaviors in online dating. For example, during co-design sessions participants could be asked to create prototypes and guidelines that depict how they envision XR support for these behaviors and the security and their security and privacy concerns around safety support in emerging technologies. Future research should also evaluate how users' safety support needs differ between online dating, where dates occur in physical space, and XR dating, where dates occur in virtual space and/or are digitally augmented.

6.3 Conclusion

This dissertation contributes an exploratory understanding of: (1) the harms that occur when users interact via social computing systems that support matching markets and (2) the protective safety behaviors users engage in an attempt to mitigate those harms.

I considered primarily two types of social computing systems that supporting matching markets: online dating and gig work platforms. Taken together, these systems are interesting to consider from a safety perspective because of the power dynamics, financial motives, and offline interactions they collectively share, which all contribute to harm. In particular, my work shows that the financial incentives and power structures of gig platforms limit workers' ability to work toward safety in the form of stability and financial security (Chapter 3). When gig platforms fail to acknowledge the increased risk of harm workers from vulnerable groups face, they increase the harm that occurs in the offline engagements they facilitated (Chapter 4). Finally, people's concerns about the harm they may experience when engaging in digitally-mediated offline introductions relate to the type of interaction they seek (Chapter 5). In the absence of platform support for safety, individuals develop their own safety practices, often relying on technologies and resources immediately available to them (Chapter 5). In some cases, the same platform structures that create harm also limit the types of protective safety behaviors they can engage in (Chapters 3 and 4).

Bibliography

[1] Uber's emergency button, Sep 2019.

[2] 26+ game-changing gig economy statistics, Aug 2020.

[3] Uber's community guidelines — following the law — uber, 2022.

[4] Uber's community guidelines — respect everyone — uber, 2022.

[5] Uber's community guidelines — safety — uber, 2022.

[6] Prioritizing safety while driving with uber, 2023. Publisher: Uber.

[7] Katharine Abraham, John Haltiwanger, Kristin Sandusky, and James Spletzer. Measuring the gig economy: Current knowledge and open issues. *Measuring and Accounting for Innovation in the 21st Century*, 2017. Publisher: University of Chicago Press.

[8] Joan Acker. Hierarchies, jobs, bodies: A theory of gendered organizations. *Gender & society*, 4(2):139–158, 1990.

[9] Alessandro Acquisti, Stefanos Gritzalis, Costos Lambrinoudakis, and Sabrina

di Vimercati. What can behavioral economics teach us about privacy? In *Digital privacy*, pages 385–400. Auerbach Publications, 2007.

[10] Abi Adams-Prassl and Janine Berg. When home affects pay: An analysis of the gender pay gap among crowdworkers. *Available at SSRN 3048711*, 2017.

[11] Rachel F Adler and Raquel Benbunan-Fich. Juggling on a high wire: Multitasking effects on performance. *International Journal of Human-Computer Studies*, 70(2):156–168, 2012.

[12] Canan Akoglu and Kathrina Dankl. Co-creation for empathy and mutual learning: a framework for design in health and social care. *CoDesign*, 17(3):296–312, 2021.

[13] Kendra Albert, Emily Armbruster, Elizabeth Brundige, Elizabeth Denning, Kimberly Kim, Lorelei Lee, Lindsey Ruff, Korica Simon, and Yueyu Yang. FOSTA in legal context. *Columbia Human Rights Law Review*, 52:1084, 2020.

[14] Martin R Albrecht, Jorge Blasco, Rikke Bjerg Jensen, and Lenka Mareková. Collective information security in large-scale urban protests: The case of hong kong. In *30th USENIX Security Symposium (USENIX Security 21)*, pages 3363–3380, 2021.

[15] Kath Albury and Paul Byron. Safe on my phone? same-sex attracted young people's negotiations of intimacy, visibility, and risk on digital hook-up apps. *Social Media + Society*, 2(4):2056305116672887, October 2016.

[16] Kath Albury, Paul Byron, Anthony McCosker, Tinonee Pym, Jarrod Walshe,

Kane Race, Doreen Salon, Tim Wark, Jessica Botfield, Daniel Reeders, and Christopher Dietzel. Safety, risk and wellbeing on dating apps: Final report. Report, Swinburne University of Technology, December 2019.

[17] Kath Albury, Paul Byron, Anthony McCosker, Tinonee Pym, Jarrod Walshe, Kane Race, Doreen Salon, Tim Wark, Jessica Botfield, Daniel Reeders, et al. Safety, risk and wellbeing on dating apps. 2019.

[18] Kath Albury, Anthony McCosker, Tinonee Pym, and Paul Byron. Dating apps as public health 'problems': Cautionary tales and vernacular pedagogies in news media. *Health Sociology Review*, 29(3):232–248, September 2020.

[19] Hanan Khalid Aljasim and Douglas Zytko. Foregrounding women's safety in mobile social matching and dating apps: A participatory design study. *Proc. ACM Hum.-Comput. Interact.*, 7(GROUP), dec 2022.

[20] Ali Alkhatib, Justin Cranshaw, and Andrés Monroy-Hernández. Laying groundwork for a worker-centric peer economy. *CoRR*, abs/1807.08189, 2018.

[21] Mashael Yousef Almoqbel and Donghee Yvette Wohn. Individual and collaborative behaviors of rideshare drivers in protecting their safety. *Proc. ACM Hum.-Comput. Interact.*, 3(CSCW), November 2019.

[22] Antonio Aloisi. Commoditized workers. case study research on labour law issues arising from a set of'on-demand/gig economy'platforms. *Case Study Research*

on Labour Law Issues Arising from a Set of'On-Demand/Gig Economy'Platforms (May 1, 2016). Comparative Labor Law&Policy Journal, 37(3), 2016.

[23] Ricardo S Alonso, Javier Prieto, Óscar García, and Juan M Corchado. Collaborative learning via social computing. *Frontiers of Information Technology & Electronic Engineering*, 20(2):265–282, 2019.

[24] Micah Altman, Alexandra Wood, and Effy Vayena. A harm-reduction framework for algorithmic fairness. *IEEE Security & Privacy*, 16(3):34–45, 2018.

[25] Dario Ortega Anderez, Eiman Kanjo, Amna Amnwar, Shane Johnson, and David Lucy. The Rise of Technology in Crime Prevention: Opportunities, Challenges and Practitioners Perspectives. *arXiv:2102.04204 [cs]*, January 2021. arXiv: 2102.04204.

[26] Monica Anderson, Vogels A. Emily, and Erica Turner. The virtues and downsides of online dating. Pew Research Center, 2020.

[27] Athanasios Andreou, Giridhari Venkatadri, Oana Goga, Krishna Gummadi, Patrick Loiseau, and Alan Mislove. Investigating ad transparency mechanisms in social media: A case study of facebook's explanations. In *NDSS 2018-Network and Distributed System Security Symposium*, pages 1–15, 2018.

[28] Ira Anjali Anwar, Joyojeet Pal, and Julie Hui. Watched, but moving: Platformization of beauty work and its gendered mechanisms of control. *Proc. ACM Hum.-Comput. Interact.*, 4(CSCW3), January 2021.

[29] Kofi Annan. Definitions of human security. *Global Development*, 2001.

[30] Mohammad Amir Anwar and Mark Graham. Between a rock and a hard place: Freedom, flexibility, precarity and vulnerability in the gig economy in africa. *Competition & Change*, 25(2):237–258, 2021.

[31] Lauren M Aquino Shluzas, Martin Steinert, Larry J Leifer, et al. Designing to maximize value for multiple stakeholders: a challenge to med-tech innovation. In *DS 68-10: Proceedings of the 18th International Conference on Engineering Design (ICED 11), Impacting Society through Engineering Design, Vol. 10: Design Methods and Tools pt. 2, Lyngby/Copenhagen, Denmark, 15.-19.08. 2011*, pages 159–166, 2011.

[32] Dennis Arnold and Joseph R Bongiovi. Precarious, informalizing, and flexible work: Transforming concepts and understandings. *American Behavioral Scientist*, 57(3):289–308, 2013.

[33] Michael B Arthur. The boundaryless career at 20: where do we stand, and where can we go? *Career Development International*, 19(6):627–640, 2014.

[34] Avi Asher-Schapiro. U.S. gig worker murders expose apps' safety gaps, says labor group. *Thomson Reuters Foundation*, 2022.

[35] Susan J Ashford, Brianna Barker Caza, and Erin M Reid. From surviving to thriving in the gig economy: A research agenda for individuals in the new world of work. *Research in Organizational Behavior*, 38:23–41, 2018.

[36] L Bannon. Situating workplace studies within the human-computer interaction field. *Workplace studies: Recovering work practice and informing system design*, page 230, 2000.

[37] Hanna Barakat and Elissa M Redmiles. Community under surveillance: Impacts of marginalization on an online labor forum. In *Proceedings of the International AAAI Conference on Web and Social Media*, volume 16, pages 12–21, 2022.

[38] Shaowen Bardzell. Feminist hci: Taking stock and outlining an agenda for design. In *Proceedings of the SIGCHI conference on human factors in computing systems*, pages 1301–1310, 2010.

[39] Shaowen Bardzell and Jeffrey Bardzell. Towards a feminist hci methodology: Social science, feminism, and hci. In *Proceedings of the SIGCHI conference on human factors in computing systems*, pages 675–684, 2011.

[40] Shaowen Bardzell, Jeffrey Bardzell, Jodi Forlizzi, John Zimmerman, and John Antanitis. Critical design and critical theory: the challenge of designing for provocation. In *Proceedings of the Designing Interactive Systems Conference*, pages 288–297, 2012.

[41] Anat BarNir, Warren E. Watson, and Holly M. Hutchins. Mediation and moderated mediation in the relationship among role models, self-efficacy, entrepreneurial career intention, and gender. *Journal of Applied Social Psychology*, 41(2):270–297, 2011.

[42] Sabrine El Baroudi, Svetlana N. Khapova, Chen Fleisher, and Paul G. W. Jansen. How do career aspirations benefit organizations? the mediating roles of the proactive and relational aspects of contemporary work. *Frontiers in Psychology*, 9:2150, 2018.

[43] Catherine Barwulor, Allison McDonald, Eszter Hargittai, and Elissa M Redmiles. "Disadvantaged in the American-dominated internet": Sex, work, and technology. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, pages 1–16, 2021.

[44] Tanya Basu. The metaverse has a groping problem already. "MIT Technology Review", 2021.

[45] Janine Berg, Marianne Furrer, Ellie Harmon, Uma Rani, and M Six Silberman. Digital labour platforms and the future of work. *Towards Decent Work in the Online World. Rapport de l'OIT*, 2018.

[46] Annette Bernhardt, Chris Campos, Allen Prohofsky, Aparna Ramesh, and Jesse Rothstein. The "gig economy" and independent contracting: Evidence from california tax data. Technical report, University of California, Berkeley California Policy Lab, 2021.

[47] Deepti Bhatnagar and Ujvala Rajadhyaksha. Attitudes towards work and family roles and their implications for career growth of women: A report from india. *Sex Roles*, 45(7):549–565, 2001.

[48] Jeffrey P. Bigham, Kristin Williams, Nila Banerjee, and John Zimmerman. Scopist: Building a skill ladder into crowd transcription. In *Proceedings of the 14th Web for All Conference on The Future of Accessible Work*, W4A '17, New York, NY, USA, 2017. Association for Computing Machinery.

[49] Matt Bishop. What is computer security? *IEEE Security & Privacy*, 1(1):67–69, 2003.

[50] Allie Blaising, Chinmay Kulkarni, and Laura Dabbish. Career trajectories in online freelance platforms. *Microsoft New Future of Work Workshop*, 2020.

[51] Danielle Blunt and Ariel Wolf. Erased: The impact of FOSTA-SESTA and the removal of Backpage on sex workers. *Anti-trafficking Review*, (14):117–121, 2020.

[52] Danielle Blunt, Ariel Wolf, Emily Coombes, and Shanelle Mullin. Posting into the void: Studying the impact of shadowbanning on sex workers and activists. *Hacking/Hustling*, 2020.

[53] Donna Bobbitt-Zeher. Gender discrimination at work: Connecting gender stereotypes, institutional policies, and gender composition of workplace. *Gender & Society*, 25(6):764–786, 2011.

[54] Jessica E Bodford, Cameron J Bunker, and Virginia SY Kwan. Does perceived social networking site security arise from actual and perceived physical safety? *Computers in Human Behavior*, 121:106779, 2021.

[55] Julie Boesen, Jennifer A Rode, and Clara Mancini. The domestic panopticon:

Location tracking in families. In *Proceedings of the 12th ACM International Conference on Ubiquitous Computing*, pages 65–74, 2010.

[56] Stella U. Boess. *First Steps in Role Playing*, page 2017–2024. Association for Computing Machinery, New York, NY, USA, 2008.

[57] James Bohman. Critical theory. 2005.

[58] Erika Borrajo, Manuel Gámez-Guadix, and Esther Calvete. Cyber dating abuse: Prevalence, context, and relationship with offline dating aggression. *Psychological reports*, 116(2):565–585, 2015.

[59] David Boud, Ruth Cohen, and Jane Sampson. Peer learning and assessment. *Assessment & Evaluation in Higher Education*, 24(4):413–426, 1999.

[60] Virginia Braun and Victoria Clarke. Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2):77–101, 2006.

[61] Alice M Brawley and Cynthia LS Pury. Work experiences on mturk: Job satisfaction, turnover, and information sharing. *Computers in Human Behavior*, 54:531–546, 2016.

[62] Casey Breen, Cormac Herley, and Elissa M Redmiles. A large-scale measurement of cybercrime against individuals. In *CHI Conference on Human Factors in Computing Systems*, pages 1–41, 2022.

[63] Vanessa Breitschuh and Julia Göretz. User Motivation and Personal Safety on a Mobile Dating App. In Gabriele Meiselwitz, editor, *Social Computing and So-*

cial Media. Design, Human Behavior and Analytics, Lecture Notes in Computer Science, pages 278–292, Cham, 2019. Springer International Publishing.

[64] Carolyn Bronstein. Deplatforming sexual speech in the age of FOSTA/SESTA. *Porn Studies*, 8(4):367–380, 2021.

[65] Anna Brown. Key findings about the american workforce and the changing job market. Pew Research Center, 2016.

[66] Kellen Browning. At least 50 people have been killed doing gig driving since 2017, report says. *The New York Times*, 2022.

[67] Jed R Brubaker, Mike Ananny, and Kate Crawford. Departing glances: A sociotechnical account of 'leaving' Grindr. *New Media & Society*, 18(3):373–390, 2016.

[68] Eliane Léontine Bucher, Peter Kalum Schou, and Matthias Waldkirch. Pacifying the algorithm–anticipatory compliance in the face of algorithmic management in the gig economy. *Organization*, 28(1):44–67, 2021.

[69] Caroline Bull, Hanan Aljasim, and Douglas Zytko. Designing opportunistic social matching systems for women's safety during face-to-face social encounters. In *Companion Publication of the 2021 Conference on Computer Supported Cooperative Work and Social Computing*, CSCW '21, 2021.

[70] Pavlo Burda, Luca Allodi, and Nicola Zannone. Don't forget the human: a crowdsourced approach to automate response and containment against spear phishing

attacks. In *2020 IEEE European Symposium on Security and Privacy Workshops (EuroS&PW)*, pages 471–476. IEEE, 2020.

[71] Ronald J. Burke. Mentors in organizations. *Group & Organization Studies*, 9(3):353–372, 1984.

[72] Judith Butler. Performative acts and gender constitution: An essay in phenomenology and feminist theory. *Theatre journal*, 40(4):519–531, 1988.

[73] Yvette Butler. Aligned: Sex workers' lessons for the gig economy. *Michigan Journal of Race & Law*, 26:337, 2020.

[74] Graham Button and Wes Sharrock. Studies of work and the workplace in hci: Concepts and techniques. *Synthesis Lectures on Human-Centered Informatics*, 2(1):1–96, 2009.

[75] Mark Button, Carol McNaughton Nicholls, Jane Kerr, and Rachael Owen. Online frauds: Learning from victims why they fall for these scams. *Australian & New Zealand Journal of Criminology*, 47(3):391–408, 2014.

[76] Patrice M Buzzanell and Steven R Goldzwig. Linear and nonlinear career models: Metaphors, paradigms, and ideologies. *Management Communication Quarterly*, 4(4):466–505, 1991.

[77] Paul Byron, Kath Albury, and Tinonee Pym. Hooking up with friends: LGBTQ+ young people, dating apps, friendship and safety. *Media, Culture & Society*, 43(3):497–514, April 2021. Publisher: SAGE Publications Ltd.

[78] CA.gov. California department of fair employment and housing workplace harassment prevention guide for california employers.

[79] Banu Çaliş and Serol Bulkan. A research survey: review of ai solution strategies of job shop scheduling problem. *Journal of Intelligent Manufacturing*, 26(5):961–973, 2015.

[80] Chris Callison-Burch. Crowd-workers: Aggregating information across turkers to help them find higher paying work. In *Proceedings of the AAAI conference on human computation and crowdsourcing*, volume 2, pages 8–9, 2014.

[81] Lindsey Cameron, Angele Christin, Michael Ann DeVito, Tawanna R. Dillahunt, Madeleine Elish, Mary Gray, Rida Qadri, Noopur Raval, Melissa Valentine, and Elizabeth Anne Watkins. "this seems to work": Designing technological systems with the algorithmic imaginations of those who labor. In *Extended abstracts of the 2021 CHI conference on human factors in computing systems*, pages 1–5, 2021.

[82] Lindsey D Cameron and Hatim Rahman. Expanding the locus of resistance: Understanding the co-constitution of control and resistance in the gig economy. *Organization Science*, 33(1):38–58, 2022.

[83] Lindsey D Cameron, Bobbi Thomason, and Vanessa M Conzon. Risky business: Gig workers and the navigation of ideal worker expectations during the covid-19 pandemic. *Journal of Applied Psychology*, 106(12):1821, 2021.

[84] Rosie Campbell, Yigit Aydin, Stewart Cunningham, Rebecca Hamer, Kathleen

Hill, Camille Melissa, Jane Pitcher, Jane Scoular, Teela Sanders, and Matt Valentine-Chase. Technology-mediated sex work: Fluidity, networking and regulation in the UK. In *Routledge International Handbook of Sex Industry Research*, pages 533–543. Routledge, 2018.

[85] Lauren F Cardoso, Susan B Sorenson, Olivia Webb, and Sara Landers. Recent and emerging technologies: Implications for women's safety. *Technology in Society*, 58:101108, 2019.

[86] Bronwyn Carlson. Love and hate at the cultural interface: Indigenous australians and dating apps. *Journal of Sociology*, 56(2):133–150, 2020.

[87] Avner Caspi and Paul Gorsky. Online deception: Prevalence, motivation, and emotion. *CyberPsychology & Behavior*, 9(1):54–59, 2006.

[88] Kathy Charmaz and J Smith. Grounded theory. *Qualitative psychology: A practical guide to research methods*, 2:81–110, 2003.

[89] Rahul Chatterjee, Periwinkle Doerfler, Hadas Orgad, Sam Havron, Jackeline Palmer, Diana Freed, Karen Levy, Nicola Dell, Damon McCoy, and Thomas Ristenpart. The spyware used in intimate partner violence. In *2018 IEEE Symposium on Security and Privacy (SP)*, pages 441–458. IEEE, 2018.

[90] Guanliang Chen, Dan Davis, Markus Krause, Efthimia Aivaloglou, Claudia Hauff, and Geert-Jan Houben. From learners to earners: enabling mooc learners to apply

their skills and earn money in an online market place. *IEEE Transactions on Learning Technologies*, 11(2):264–274, 2016.

[91] Janet X. Chen, Allison McDonald, Yixin Zou, Emily Tseng, Kevin A Roundy, Acar Tamersoy, Florian Schaub, Thomas Ristenpart, and Nicola Dell. Trauma-informed computing: Towards safer technology experiences for all. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems*, CHI '22, 2022.

[92] Chun-Wei Chiang, Anna Kasunic, and Saiph Savage. Crowd coach: Peer coaching for crowd workers' skill growth. *Proc. ACM Hum.-Comput. Interact.*, 2(CSCW), November 2018.

[93] Edmond Pui Hang Choi, Janet Yuen Ha Wong, and Daniel Yee Tak Fong. An emerging risk factor of sexual abuse: The use of smartphone dating applications. *Sexual Abuse*, 30(4):343–366, 2018.

[94] Nicola Christie and Heather Ward. The health and safety risks for people who drive for work in the gig economy. *Journal of Transport & Health*, 13:115–127, 2019.

[95] Ritesh Chugh and Marika Guggisberg. Stalking and other forms of dating violence: Lessons learned from you in relation to cyber safety. *Journal of interpersonal violence*, 37(9-10):NP6760–NP6784, 2022.

[96] Brendan Churchill and Lyn Craig. Gender in the gig economy: Men and women

using digital platforms to secure work in australia. *Journal of Sociology*, 55(4):741–761, 2019.

[97] Jenn Clamen and Angelika Strohmayer. Stella, l'amie de Maimie: reflecting on the use of technologies and the Bad Client and Aggressor List. April 2019. Publisher: Newcastle University.

[98] Mitchell Clark. Doordash adds in-app safety features, but couriers need more protection, Nov 2021.

[99] Cathleen Clerkin. What women want–and why you want women–in the workplace. research report. *Center for Creative Leadership*, 2017.

[100] Camille Cobb and Tadayoshi Kohno. How public is my private life? privacy in online dating. In *Proceedings of the 26th International Conference on World Wide Web*, pages 1231–1240, 2017.

[101] Melinde Coetzee, Nadia Ferreira, and Ingrid Potgieter. Future fit career wellbeing: An introductory chapter. *Theory, Research and Dynamics of Career Wellbeing: Becoming Fit for the Future*, pages 1–11, 2019.

[102] Melinde Coetzee and Nisha Harry. Emotional intelligence as a predictor of employees' career adaptability. *Journal of Vocational Behavior*, 84(1):90–97, 2014.

[103] Lizzie Coles-Kemp, Rikke Bjerg Jensen, and Claude P. R. Heath. *Too Much Information: Questioning Security in a Post-Digital Society*, page 1–14. Association for Computing Machinery, New York, NY, USA, 2020.

[104] Cody Cook, Rebecca Diamond, Jonathan Hall, John A List, and Paul Oyer. The gender earnings gap in the gig economy: Evidence from over a million rideshare drivers. Technical report, National Bureau of Economic Research, 2018.

[105] Karen Corteen. Lesbian safety talk: Problematizing definitions and experiences of violence, sexuality and space. *Sexualities*, 5(3):259–280, 2002.

[106] Danielle Couch and Pranee Liamputtong. Online dating and mating: Perceptions of risk and health among online users. *Health, Risk & Society*, 9(3):275–294, 2007.

[107] Danielle Couch, Pranee Liamputtong, and Marian Pitts. What are the real and perceived risks and dangers of online dating? perspectives from online daters: Health risks in the media. *Health, Risk & Society*, 14(7-8):697–714, 2012.

[108] Jonathan R Crawshaw, Rolf Van Dick, and Felix C Brodbeck. Opportunity, fair process and relationship value: career development as a driver of proactive work behaviour. *Human resource management journal*, 22(1):4–20, 2012.

[109] Australian Institute of Criminology. Mobile dating applications and sexual and violent offending, November 2020. ISBN: 9781925304862.

[110] Nigel Cross. Design as a discipline. *Designerly ways of knowing*, pages 95–103, 2006.

[111] Yichao Cui, Naomi Yamashita, Mingjie Liu, and Yi-Chieh Lee. "so close, yet so far": Exploring sexual-minority women's relationship-building via online dating

in china. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems*, CHI '22, New York, NY, USA, 2022. Association for Computing Machinery.

[112] Arlene Kaplan Daniels. Invisible work. *Social problems*, 34(5):403–415, 1987.

[113] Sauvik Das, Tiffany Hyun-Jin Kim, Laura A Dabbish, and Jason I Hong. The effect of social influence on security sensitivity. In *10th Symposium On Usable Privacy and Security ({SOUPS} 2014)*, pages 143–157, 2014.

[114] Isha Datey, Hanan Khalid Aljasim, and Douglas Zytko. Repurposing ai in dating apps to augment women's strategies for assessing risk of harm. In *Companion Publication of the 2022 Conference on Computer Supported Cooperative Work and Social Computing*, CSCW'22 Companion, page 150–154, New York, NY, USA, 2022. Association for Computing Machinery.

[115] H David and David Dorn. The growth of low-skill service jobs and the polarization of the us labor market. *American Economic Review*, 103(5):1553–97, 2013.

[116] Paul J Davis. Implementing an employee career-development strategy: How to build commitment and retain employees. *Human Resource Management International Digest*, 2015.

[117] Arla Day and Karina Nielsen. What does our organization do 16 to help our well-being? creating healthy workplaces and workers. *An introduction to work and organizational psychology: An international perspective*, page 295, 2017.

[118] Alex De Ruyter, Martyn Brown, and John Burgess. Gig work and the fourth industrial revolution. *Journal of International Affairs*, 72(1):37–50, 2018.

[119] Peter J Denning. Computer science: The discipline. *Encyclopedia of computer science*, 32(1):9–23, 2000.

[120] Michael A. DeVito, Jeremy Birnholtz, and Jeffery T. Hancock. Platforms, people, and perception: Using affordances to understand self-presentation on social media. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*, CSCW '17, page 740–754, New York, NY, USA, 2017. Association for Computing Machinery.

[121] Judy Goldberg Dey and Catherine Hill. *Behind the pay gap*. ERIC, 2007.

[122] Tawanna R. Dillahunt and Amelia R. Malone. The Promise of the Sharing Economy among Disadvantaged Communities. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, pages 2285–2294. Association for Computing Machinery, New York, NY, USA, April 2015.

[123] Periwinkle Doerfler, Andrea Forte, Emiliano De Cristofaro, Gianluca Stringhini, Jeremy Blackburn, and Damon McCoy. "I'm a professor, which isn't usually a dangerous job": Internet-facilitated harassment and its impact on researchers. *Proceedings of the ACM on Human-Computer Interaction*, 5(CSCW2):1–32, 2021.

[124] Sarah A Donovan, David H Bradley, and Jon O Shimabukuru. What does the gig economy mean for workers? 2016.

[125] Mira Dontcheva, Robert R. Morris, Joel R. Brandt, and Elizabeth M. Gerber. Combining crowdsourcing and learning to improve engagement and performance. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '14, pages 3379–3388, New York, NY, USA, 2014. Association for Computing Machinery.

[126] Julie S Downs, Mandy B Holbrook, and Lorrie Faith Cranor. Decision strategies and susceptibility to phishing. In *Proceedings of the second symposium on Usable privacy and security*, pages 79–90, 2006.

[127] Susan M Dray, Andrea Peer, Anke M Brock, Anicia Peters, Shaowen Bardzell, Margaret Burnett, Elizabeth Churchill, Erika Poole, and Daniela K Busse. Exploring the representation of women perspectives in technologies. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems*, pages 2447–2454. 2013.

[128] Ryan D Duffy, David L Blustein, Matthew A Diemer, and Kelsey L Autin. The psychology of working theory. *Journal of counseling psychology*, 63(2):127, 2016.

[129] James Duggan, Ultan Sherman, Ronan Carbery, and Anthony McDonnell. Algorithmic management and app-work in the gig economy: A research agenda for employment relations and hrm. *Human Resource Management Journal*, 30(1):114–132, 2020.

[130] James Duggan, Ultan Sherman, Ronan Carbery, and Anthony McDonnell. Bound-

aryless careers and algorithmic constraints in the gig economy. *The International Journal of Human Resource Management*, pages 1–31, 2021.

[131] Stefanie Duguay. "He has a way gayer Facebook than I do": Investigating sexual identity disclosure and context collapse on a social networking site. *New media & society*, 18(6):891–907, 2016.

[132] Brianna Dym and Casey Fiesler. Social norm vulnerability and its consequences for privacy and safety in an online community. *Proceedings of the ACM on Human-Computer Interaction*, 4(CSCW2):1–24, 2020.

[133] Josh Dzieza. Revolt of the delivery workers. *Curbed*, 2021.

[134] Alice H Eagly and Antonio Mladinic. Gender stereotypes and attitudes toward women and men. *Personality and social psychology bulletin*, 15(4), 1989.

[135] Alice H Eagly and Valerie J Steffen. Gender stereotypes stem from the distribution of women and men into social roles. *Journal of personality and social psychology*, 46(4):735, 1984.

[136] Christopher A Ebberwein, Thomas S Krieshok, Jon C Ulven, and Ellie C Prosser. Voices in transition: Lessons on career adaptability. *The Career Development Quarterly*, 52(4):292–308, 2004.

[137] Charles Eesley and Yanbo Wang. Social influence in career choice: Evidence from a randomized field experiment on entrepreneurial mentorship. *Research Policy*, 46(3):636 – 650, 2017.

[138] Nicole Ellison, Rebecca Heino, and Jennifer Gibbs. Managing impressions online: Self-presentation processes in the online dating environment. *Journal of computer-mediated communication*, 11(2):415–441, 2006.

[139] Berrin Erdogan, Talya N Bauer, Donald M Truxillo, and Layla R Mansfield. Whistle while you work: A review of the life satisfaction literature. *Journal of management*, 38(4):1038–1083, 2012.

[140] Christy L Erving, Lacee A Satcher, and Yvonne Chen. Psychologically resilient, but physically vulnerable? exploring the psychosocial determinants of african american women's mental and physical health. *Sociology of Race and Ethnicity*, 7(1):116–133, 2021.

[141] Marcela Escobari and Sandy Fernandez. Measuring american gig workers is difficulty, but essential. March 2022. Publisher: Brookings Institute.

[142] Kimberly Fairchild. "But look at what she was wearing!": Victim blaming and street harassment. In *Gender, Sex, and Politics*, pages 22–32. Routledge, 2015.

[143] Ashley K Fansher and Sara Eckinger. Tinder tales: An exploratory study of online dating users and their most interesting stories. *Deviant Behavior*, 42(9):1194–1208, 2021.

[144] Anna Farmaki. Women in Airbnb: a neglected perspective. *Current Issues in Tourism*, 0(0):1–5, September 2019. Publisher: Routledge _eprint: https://doi.org/10.1080/13683500.2019.1674257.

[145] Stella Fayer, Alan Lacey, and Audrey Watson. Stem occupations: Past, present, and future. *Spotlight on Statistics*, pages 1–35, 2017.

[146] Federal Bureau of Investigation. Nigerian letter or "419" fraud. `https://www.fbi.gov/scams-and-safety/common-scams-and-crimes/nigerian-letter-or-419-fraud`, *n.d.* (Accessed on 12/14/2020).

[147] Julia R. Fernandez and Jeremy Birnholtz. "I don't want them to not know": Investigating decisions to disclose transgender identity on dating platforms. *Proceedings of the ACM on Human-Computer Interaction*, 3(CSCW):226:1–226:21, November 2019.

[148] Lauren S Ferro, Andrea Marrella, and Tiziana Catarci. A human factor approach to threat modeling. In *International Conference on Human-Computer Interaction*, pages 139–157. Springer, 2021.

[149] Eric Filice, Kavishka D Abeywickrama, Diana C Parry, and Corey W Johnson. Sexual violence and abuse in online dating: A scoping review. *Aggression and violent behavior*, page 101781, 2022.

[150] Eli J Finkel, Paul W Eastwick, Benjamin R Karney, Harry T Reis, and Susan Sprecher. Online dating: A critical analysis from the perspective of psychological science. *Psychological Science in the Public Interest*, 13(1):3–66, 2012.

[151] Andrew T. Fiore, Lindsay Shaw Taylor, G.A. Mendelsohn, and Marti Hearst. Assessing attractiveness in online dating profiles. In *Proceedings of the SIGCHI*

Conference on Human Factors in Computing Systems, CHI '08, page 797–806, New York, NY, USA, 2008. Association for Computing Machinery.

[152] Erica Fletcher. Gender inequality in the gig economy, Jun 2021.

[153] Eureka Foong and Elizabeth Gerber. Understanding gender differences in pricing strategies in online labor marketplaces. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, pages 1–16, 2021.

[154] Eureka Foong, Nicholas Vincent, Brent Hecht, and Elizabeth M. Gerber. Women (still) ask for less: Gender differences in hourly rate in an online labor marketplace. *Proc. ACM Hum.-Comput. Interact.*, 2(CSCW), November 2018.

[155] Monica L Forret. Networking as a job-search behavior and career management strategy. *The Oxford handbook of job loss and job search*, page 275, 2018.

[156] Anjuli Franz, Verena Zimmermann, Gregor Albrecht, Katrin Hartwig, Christian Reuter, Alexander Benlian, Joachim Vogt, et al. Sok: Still plenty of phish in the sea-a taxonomy of user-oriented phishing interventions and avenues for future research. In *SOUPS@ USENIX Security Symposium*, pages 339–358, 2021.

[157] Diana Freed, Jackeline Palmer, Diana Minchala, Karen Levy, Thomas Ristenpart, and Nicola Dell. "A stalker's paradise": How intimate partner abusers exploit technology. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, pages 1–13, 2018.

[158] R Edward Freeman and David L Reed. Stockholders and stakeholders: A new

perspective on corporate governance. *California management review*, 25(3):88–106, 1983.

[159] Carl Benedikt Frey and Michael Osborne. The future of employment. 2013.

[160] Gerald Friedman. Workers without employers: shadow corporations and the rise of the gig economy. *Review of keynesian economics*, 2(2):171–188, 2014.

[161] Cary Funk and Kim Parker. Diversity in the stem workforce varies widely across jobs. Pew Research Center, 2018.

[162] Snehal (Neil) Gaikwad, Durim Morina, Rohit Nistala, Megha Agarwal, Alison Cossette, Radhika Bhanu, Saiph Savage, Vishwajeet Narwal, Karan Rajpal, Jeff Regino, Aditi Mithal, Adam Ginzberg, Aditi Nath, Karolina R. Ziulkoski, Trygve Cossette, Dilrukshi Gamage, Angela Richmond-Fuller, Ryo Suzuki, Jeerel Herrejón, Kevin Le, Claudia Flores-Saviaga, Haritha Thilakarathne, Kajal Gupta, William Dai, Ankita Sastry, Shirish Goyal, Thejan Rajapakshe, Niki Abolhassani, Angela Xie, Abigail Reyes, Surabhi Ingle, Verónica Jaramillo, Martin Godínez, Walter Ángel, Carlos Toxtli, Juan Flores, Asmita Gupta, Vineet Sethia, Diana Padilla, Kristy Milland, Kristiono Setyadi, Nuwan Wajirasena, Muthitha Batagoda, Rolando Cruz, James Damon, Divya Nekkanti, Tejas Sarma, Mohamed Saleh, Gabriela Gongora-Svartzman, Soroosh Bateni, Gema Toledo Barrera, Alex Peña, Ryan Compton, Deen Aariff, Luis Palacios, Manuela Paula Ritter, Nisha K.K., Alan Kay, Jana Uhrmeister, Srivalli Nistala, Milad Esfahani, Elsa Bakiu, Christopher Diemert, Luca Matsumoto, Manik Singh, Krupa Patel, Ranjay Kr-

ishna, Geza Kovacs, Rajan Vaish, and Michael Bernstein. Daemo: A self-governed crowdsourcing marketplace. In *Adjunct Proceedings of the 28th Annual ACM Symposium on User Interface Software & Technology*, UIST '15 Adjunct, pages 101–102, New York, NY, USA, 2015. Association for Computing Machinery.

[163] Sally M Gainsbury, Matthew Browne, and Matthew Rockloff. Identifying risky internet use: Associating negative online experience with specific online behaviours. *New Media & Society*, 21(6):1232–1252, 2019.

[164] Dilrukshi Gamage and Mark E Whitting. Together we learn better: leveraging communities of practice for mooc learners. In *Asian CHI Symposium 2021*, pages 28–33, 2021.

[165] Carol Brooks Gardner. *Passing by: Gender and public harassment*. Univ of California Press, 1995.

[166] Christine Geeng, Jevan Hutson, and Franziska Roesner. Usable sexurity: Studying {People's} concerns and strategies when sexting. In *Sixteenth Symposium on Usable Privacy and Security (SOUPS 2020)*, pages 127–144, 2020.

[167] Jennifer L Gibbs, Nicole B Ellison, and Chih-Hui Lai. First comes love, then comes Google: An investigation of uncertainty reduction strategies and self-disclosure in online dating. *Communication Research*, 38(1):70–100, 2011.

[168] Donald E Gibson. Role models in career development: New directions for theory and research. *Journal of Vocational Behavior*, 65(1):134 – 156, 2004.

[169] Louisa Gilbert, Aaron L Sarvet, Melanie Wall, Kate Walsh, Leigh Reardon, Patrick Wilson, John Santelli, Shamus Khan, Martie Thompson, Jennifer S Hirsch, et al. Situational contexts and risk factors associated with incapacitated and non-incapacitated sexual assaults among college women. *Journal of Women's Health*, 28(2):185–193, 2019.

[170] Rosalie Gillett. Intimate intrusions online: Studying the normalisation of abuse in dating apps. In *Women's Studies International Forum*, volume 69, pages 212–219. Elsevier, 2018.

[171] Rosalie Gillett. "This is not a nice safe space": Investigating women's safety work on Tinder. *Feminist Media Studies*, pages 1–17, 2021.

[172] Nancy Glass, Amber Clough, James Case, Ginger Hanson, Jamie Barnes-Hoyt, Amy Waterbury, Jeanne Alhusen, Miriam Ehrensaft, Karen Trister Grace, and Nancy Perrin. A safety app to respond to dating violence for college women and their friends: The MyPlan study randomized controlled trial protocol. *BMC Public Health*, 15(1):1–13, 2015.

[173] Paul Glavin, Alex Bierman, and Scott Schieman. Über-alienated: Powerless and alone in the gig economy. *Work and Occupations*, 48(4):399–431, 2021.

[174] Maximilian Golla, Grant Ho, Marika Lohmus, Monica Pulluri, and Elissa M Redmiles. Driving 2fa adoption at scale: Optimizing two-factor authentication noti-

fication design patterns. In *30th USENIX Security Symposium*, pages 109–126. USENIX, 2021.

[175] Nikki Graf, Richard Fry, and Cary Funk. 7 facts about the stem workforce. Pew Research Center, 2018.

[176] Mark Graham, Isis Hjorth, and Vili Lehdonvirta. Digital labour and development: impacts of global digital labour platforms and the gig economy on worker livelihoods. *Transfer: European review of labour and research*, 23(2):135–162, 2017.

[177] Mary L Gray and Siddharth Suri. *Ghost work: How to stop Silicon Valley from building a new global underclass*. Eamon Dolan Books, 2019.

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

[179] Kathleen Griesbach, Adam Reich, Luke Elliott-Negri, and Ruth Milkman. Algorithmic control in platform food delivery work. *Socius*, 5:2378023119870041, 2019.

[180] Ana M Giménez Gualdo, Simon C Hunter, Kevin Durkin, Pilar Arnaiz, and Javier J Maquilón. The emotional impact of cyberbullying: Differences in perceptions and experiences as a function of role. *Computers & Education*, 82:228–235, 2015.

[181] Yvonne Guerrier and Amel S Adib. 'no, we don't provide that service': the harassment of hotel employees by customers. *Work, employment and society*, 14(4):689–705, 2000.

[182] Shruti Gupta. Gendered gigs: Understanding the gig economy in New Delhi from a gendered perspective. In *Proceedings of the 2020 International Conference on Information and Communication Technologies and Development*, ICTD2020, 2020.

[183] Norman C Gysbers, Mary J Heppner, and Joseph A Johnston. *Career counseling: Process, issues, and techniques*. Allyn & Bacon, 2003.

[184] Oliver L Haimson, Justin Buss, Zu Weinger, Denny L Starks, Dykee Gorrell, and Briar Sweetbriar Baron. Trans time: Safety, privacy, and content warnings on a transgender-specific social media site. *Proceedings of the ACM on Human-Computer Interaction*, 4(CSCW2):1–27, 2020.

[185] Oliver L. Haimson, Dykee Gorrell, Denny L. Starks, and Zu Weinger. Designing trans technology: Defining challenges and envisioning community-centered solutions. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, pages 1–13, April 2020.

[186] Vaughn Hamilton, Hanna Barakat, and Elissa M Redmiles. Risk, resilience and reward: Impacts of shifting to digital sex work. *Proceedings of the ACM on Human-Computer Interaction*, (CSCW), 2022.

[187] Catherine Han, Joseph Seering, Deepak Kumar, Jeffrey T Hancock, and Zakir Durumeric. Hate raids on twitch: Echoes of the past, new modalities, and implications for platform governance. In *Proceedings of the ACM on Human-Computer Interaction*, 2023.

[188] Kaitlin Hancock, Haley Keast, and Wendy Ellis. The impact of cyber dating abuse on self-esteem: The mediating role of emotional distress. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 11(2), 2017.

[189] Anikó Hannák, Claudia Wagner, David Garcia, Alan Mislove, Markus Strohmaier, and Christo Wilson. Bias in online freelance marketplaces: Evidence from taskrabbit and fiverr. In *Proceedings of the 2017 ACM conference on computer supported cooperative work and social computing*, pages 1914–1933, 2017.

[190] Benjamin V Hanrahan, Ning F Ma, and Chien Wen Yuan. The roots of bias on uber. *ECSCW*, 2018.

[191] Benjamin V Hanrahan, Jutta K Willamowski, Saiganesh Swaminathan, and David B Martin. Turkbench: Rendering the market for turkers. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, pages 1613–1616, 2015.

[192] Julia Hanson, Miranda Wei, Sophie Veys, Matthew Kugler, Lior Strahilevitz, and Blase Ur. Taking data out of context to hyper-personalize ads: Crowdworkers' privacy perceptions and decisions to disclose private information. In *Proceedings*

of the 2020 CHI Conference on Human Factors in Computing Systems, CHI '20, page 1–13, New York, NY, USA, 2020. Association for Computing Machinery.

[193] Kenneth R. Hanson. Becoming a (gendered) dating app user: An analysis of how heterosexual college students navigate deception and interactional ambiguity on dating apps. *Sexuality & Culture*, 25(1):75–92, February 2021.

[194] Kotaro Hara, Abigail Adams, Kristy Milland, Saiph Savage, Chris Callison-Burch, and Jeffrey P. Bigham. A data-driven analysis of workers' earnings on amazon mechanical turk. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI '18, New York, NY, USA, 2018. Association for Computing Machinery.

[195] Karthik Hariharan, Rishi Raj Jain, Anant Prasad, Mridhul Sharma, Prashant Yadav, S. S. Poorna, and K. Anuraj. A Comprehensive Study Toward Women Safety Using Machine Learning Along with Android App Development. In P. Karuppusamy, Isidoros Perikos, Fuqian Shi, and Tu N. Nguyen, editors, *Sustainable Communication Networks and Application*, Lecture Notes on Data Engineering and Communications Technologies, pages 321–330, Singapore, 2021. Springer.

[196] Ellie Harmon and M Six Silberman. Rating working conditions on digital labor platforms. *Computer Supported Cooperative Work (CSCW)*, 28(5):911–960, 2019.

[197] Paul Harpur and Peter Blanck. Gig workers with disabilities: opportunities, chal-

lenges, and regulatory response. *Journal of Occupational Rehabilitation*, 30:511–520, 2020.

[198] Alexa M Harris, Diego Gómez-Zará, Leslie A DeChurch, and Noshir S Contractor. Joining together online: the trajectory of cscw scholarship on group formation. *Proceedings of the ACM on Human-Computer Interaction*, 3(CSCW):1–27, 2019.

[199] Bridget A Harris and Delanie Woodlock. Digital coercive control: Insights from two landmark domestic violence studies. *The British Journal of Criminology*, 59(3):530–550, 2019.

[200] Ariane Hegewisch, Chandra Childers, and Heidi Hartmann. Women, automation, and the future of work. *Institute for Women's Policy Research*, 13, 2019.

[201] Helene Hembrooke and Geri Gay. The laptop and the lecture: The effects of multitasking in learning environments. *Journal of computing in higher education*, 15(1):46–64, 2003.

[202] Nicola Henry and Anastasia Powell. Technology-facilitated sexual violence: A literature review of empirical research. *Trauma, violence, & abuse*, 19(2):195–208, 2018.

[203] Edwin L Herr. Career development and mental health. *Journal of Career Development*, 16(1):5–18, 1989.

[204] Paul Heymann, Georgia Koutrika, and Hector Garcia-Molina. Fighting spam on

social web sites: A survey of approaches and future challenges. *IEEE Internet Computing*, 11(6):36–45, 2007.

[205] Steven Hick, Edward Halpin, and Eric Hoskins. *Human rights and the Internet*. Springer, 2016.

[206] Monica C. Higgins. Changing careers: the effects of social context. *Journal of Organizational Behavior*, 22(6):595–618, 2001.

[207] Laurie Collier Hillstrom. *The# MeToo Movement*. ABC-CLIO, 2018.

[208] Andreas Hirschi. The fourth industrial revolution: Issues and implications for career research and practice. *The Career Development Quarterly*, 66(3):192–204, 2018.

[209] Paul Hitlin. Research in the crowdsourcing age, a case study. Pew Research Center, 2016.

[210] Grant Ho, Asaf Cidon, Lior Gavish, Marco Schweighauser, Vern Paxson, Stefan Savage, Geoffrey M Voelker, and David Wagner. Detecting and characterizing lateral phishing at scale. In *28th USENIX Security Symposium (USENIX Security 19)*, pages 1273–1290, 2019.

[211] Karen Holtzblatt and Hugh Beyer. *Contextual Design: Defining Customer-centered Systems*. Elsevier, 1997.

[212] Sarah Homewood. Inaction as a design decision: Reflections on not designing self-

tracking tools for menopause. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI EA '19, page 1–12, 2019.

[213] Maureen Horcher. World wide web of love, lies, and legislation: Why online dating websites should screen members, 29 j. marshall j. computer & info. l. 251 (2012). *UIC John Marshall Journal of Information Technology & Privacy Law*, 29(2):3, 2012.

[214] Abbe Horswill and Ronald Weitzer. Becoming a Client: The Socialization of Novice Buyers of Sexual Services. *Deviant Behavior*, 39(2):148–158, 2018.

[215] Laszlo Horvath, Susan Banducci, and Oliver James. Citizens' attitudes to contact tracing apps. *Journal of Experimental Political Science*, 9(1):118–130, 2022.

[216] Md. Elias Hossain, Arshadina Umara Najib, and Md. Zahidul Islam. Combating Domestic Violence during COVID-19 Pandemic in Bangladesh: Using a Mobile Application integrated with an Effective Solution. In *2020 23rd International Conference on Computer and Information Technology (ICCIT)*, pages 1–6, December 2020.

[217] Jason N Houle, Jeremy Staff, Jeylan T Mortimer, Christopher Uggen, and Amy Blackstone. The impact of sexual harassment on depressive symptoms during the early occupational career. *Society and mental health*, 1(2):89–105, 2011.

[218] John Howard. Nonstandard work arrangements and worker health and safety. *American journal of industrial medicine*, 60(1):1–10, 2017.

[219] Yue Huang, Borke Obada-Obieh, Elissa M. Redmiles, Satya Lokam, and Konstantin Beznosov. Covid-19 information-tracking solutions: A qualitative investigation of the factors influencing people's adoption intention. In *Proceedings of the 2022 Conference on Human Information Interaction and Retrieval*, CHIIR '22, page 12–24, New York, NY, USA, 2022. Association for Computing Machinery.

[220] Lisa C Huebner. It is part of the job: Waitresses and nurses define sexual harassment. *Sociological Viewpoints*, 24:75, 2008.

[221] Julie Hui, Kentaro Toyama, Joyojeet Pal, and Tawanna Dillahunt. Making a living my way: Necessity-driven entrepreneurship in resource-constrained communities. *Proceedings of the ACM on Human-Computer Interaction*, 2(CSCW), Nov 2018.

[222] Abigail Hunt, Emma Samman, Sherry Tapfuma, Grace Mwaura, Rhoda Omenya, Kay Kim, Sara Stevano, and Aida Roumer. Women in the gig economy: paid work, care and flexibility in kenya and south africa. 2019.

[223] Lilly Irani. The cultural work of microwork. *New Media & Society*, 2013.

[224] Lilly C. Irani and M. Six Silberman. Turkopticon: Interrupting worker invisibility in amazon mechanical turk. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '13, pages 611–620, New York, NY, USA, 2013. Association for Computing Machinery.

[225] Lilly C. Irani and M. Six Silberman. Stories we tell about labor: Turkopticon and the trouble with "design". In *Proceedings of the 2016 CHI Conference on Human*

Factors in Computing Systems, CHI '16, pages 4573–4586, New York, NY, USA, 2016. Association for Computing Machinery.

[226] Mirela Ivanova, Joanna Bronowicka, Eva Kocher, and Anne Degner. Foodora and deliveroo: The app as a boss? control and autonomy in app-based management - the case of food delivery riders. Working Paper 107, Hans-Böckler-Stiftung, Düsseldorf, 2018.

[227] Ronald Jacobs and Christopher Washington. Employee development and organizational performance: a review of literature and directions for future research. *Human Resource Development International*, 6(3):343–354, 2003.

[228] Mohammad Hossein Jarrahi, Gemma Newlands, Min Kyung Lee, Christine T Wolf, Eliscia Kinder, and Will Sutherland. Algorithmic management in a work context. *Big Data & Society*, 8(2):20539517211020332, 2021.

[229] Mohammad Hossein Jarrahi and Will Sutherland. Algorithmic management and algorithmic competencies: Understanding and appropriating algorithms in gig work. In *International Conference on Information*, pages 578–589. Springer, 2019.

[230] Mohammad Hossein Jarrahi, Will Sutherland, Sarah Beth Nelson, and Steve Sawyer. Platformic management, boundary resources for gig work, and worker autonomy. *Computer supported cooperative work (CSCW)*, 29(1):153–189, 2020.

[231] Shagun Jhaver, Yoni Karpfen, and Judd Antin. Algorithmic anxiety and coping

strategies of airbnb hosts. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, pages 1–12, 2018.

[232] Baek-Kyoo Joo and Insuk Lee. Workplace happiness: work engagement, career satisfaction, and subjective well-being. In *Evidence-based HRM: A Global Forum for Empirical Scholarship*. Emerald Publishing Limited, 2017.

[233] Nicole Kalms. Digital technology and the safety of women and girls in urban space: Personal safety apps or crowd-sourced activism tools? In *Architecture and Feminisms*, pages 112–121. Routledge, 2017.

[234] Cosmas Ekwom Kamais. Emerging security risks of e-hail transport services: Focus on uber taxi in nairobi, kenya. *International Journal of Security, Privacy and Trust Management (IJSPTM) Vol*, 8, 2019.

[235] Toni Kaplan, Susumu Saito, Kotaro Hara, and Jeffrey P. Bigham. Striving to earn more: A survey of work strategies and tool use among crowd workers. In Yiling Chen and Gabriella Kazai, editors, *Proceedings of the Sixth AAAI Conference on Human Computation and Crowdsourcing, HCOMP 2018, Zürich, Switzerland, July 5-8, 2018*, pages 70–78. AAAI Press, 2018.

[236] Srikanth Karra. The gig or permanent worker: Who will dominate the post-pandemic workforce, 2021.

[237] Naveena Karusala and Neha Kumar. *Women's Safety in Public Spaces: Examining*

the Efficacy of Panic Buttons in New Delhi, page 3340–3351. Association for Computing Machinery, New York, NY, USA, 2017.

[238] Joseph Kasera, Jacki O'Neill, and Nicola J Bidwell. Sociality, tempo & flow: Learning from namibian ridesharing. In *Proceedings of the First African Conference on Human Computer Interaction*, pages 36–47, 2016.

[239] Ria Kasliwal. Gender and the gig economy: A qualitative study of gig platforms for women workers. *Observer Research Foundatio, ORF Issue Brief*, (359), 2020.

[240] Otto Kässi and Vili Lehdonvirta. Online labour index: Measuring the online gig economy for policy and research. *Technological forecasting and social change*, 137:241–248, 2018.

[241] Anna Kasunic, Chun-Wei Chiang, Geoff Kaufman, and Saiph Savage. Crowd work on a cv? understanding how amt fits into turkers' career goals and professional profiles. *arXiv preprint arXiv:1902.05361*, 2019.

[242] N. Kaufmann, Thimo Schulze, and Daniel Veit. More than fun and money. worker motivation in crowdsourcing–a study on mechanical turk. 01 2011.

[243] Katherine C Kellogg, Melissa A Valentine, and Angele Christin. Algorithms at work: The new contested terrain of control. *Academy of Management Annals*, 14(1):366–410, 2020.

[244] Douglas T. Kenrick, Vladas Griskevicius, Steven L. Neuberg, and Mark Schaller.

Renovating the pyramid of needs: Contemporary extensions built upon ancient foundations. *Perspectives on Psychological Science*, 5(3):292–314, 2010.

[245] Meshack M Khosa. Sisters on slippery wheels: women taxi drivers in south africa. *Transformation*, (33), 1997.

[246] Jennifer M Kidd. Exploring the components of career well-being and the emotions associated with significant career experiences. *Journal of Career Development*, 35(2):166–186, 2008.

[247] Patricia Kinsella, Steve Williams, Peter Scott, and Rita Fontinha. Varieties of flexibilisation? the working lives of information and communications technology professionals in the united kingdom and germany. *New Technology, Work and Employment*, 2021.

[248] Aniket Kittur, Jeffrey V. Nickerson, Michael Bernstein, Elizabeth Gerber, Aaron Shaw, John Zimmerman, Matt Lease, and John Horton. The future of crowd work. In *Proceedings of the 2013 Conference on Computer Supported Cooperative Work*, CSCW '13, pages 1301–1318, New York, NY, USA, 2013. Association for Computing Machinery.

[249] Alfred Kobsa, Sameer Patil, and Bertolt Meyer. Privacy in instant messaging: An impression management model. *Behaviour & Information Technology*, 31(4):355–370, 2012.

[250] Michael Koch, Gerhard Schwabe, and Robert O Briggs. Cscw and social computing: the past and the future, 2015.

[251] Merlijn Kouprie and Froukje Sleeswijk Visser. A framework for empathy in design: stepping into and out of the user's life. *Journal of Engineering Design*, 20(5):437–448, 2009.

[252] Kathy E. Kram and Lynn A. Isabella. Mentoring alternatives: The role of peer relationships in career development. *The Academy of Management Journal*, 28(1):110–132, 1985.

[253] Markus Krause, Doris Schiöberg, and Jan David Smeddinck. Mooqita: Empowering hidden talents with a novel work-learn model. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI EA '18, page 1–10, New York, NY, USA, 2018. Association for Computing Machinery.

[254] Laura J Kray, Jessica A Kennedy, and Alex B Van Zant. Not competent enough to know the difference? gender stereotypes about women's ease of being misled predict negotiator deception. *Organizational Behavior and Human Decision Processes*, 125(2):61–72, 2014.

[255] Roman Kuhar and Mojca Pajnik. Negotiating professional identities: Male sex workers in Slovenia and the impact of online technologies. *Sexuality Research and Social Policy*, 16(2):227–238, 2019.

[256] A. Kulkarni, P. Gutheim, P. Narula, D. Rolnitzky, T. Parikh, and B. Hartmann.

Mobileworks: Designing for quality in a managed crowdsourcing architecture. *IEEE Internet Computing*, 16(5):28–35, 2012.

[257] Neha Kumar, Nassim Jafarinaimi, and Mehrab Bin Morshed. Uber in bangladesh: The tangled web of mobility and justice. *Proc. ACM Hum.-Comput. Interact.*, 2(CSCW), November 2018.

[258] Isak Ladegaard, Alexandrea J Ravenelle, and Juliet Schor. 'God is protecting me... and i have mace': Defensive labour in precarious workplaces. *The British Journal of Criminology*, 62(3):773–789, 2022.

[259] Mary Laing, Del Campbell, Matthew Jones, and Angelika Strohmayer. Trans sex workers in the UK: security, services and safety. *Policing the Sex Industry: Protection, Paternalism and Politics*, pages 39–52, December 2017. Publisher: Taylor & Francis.

[260] Airi Lampinen and Barry Brown. Market design for hci: Successes and failures of peer-to-peer exchange platforms. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, pages 4331–4343, 2017.

[261] Negin Larti, Elaheh Ashouri, and Akram Aarabi. The effects of an empathy role-playing program for operating room nursing students in iran. *Journal of educational evaluation for health professions*, 15, 2018.

[262] John Law. Notes on the theory of the actor-network: Ordering, strategy, and heterogeneity. *Systems practice*, 5(4):379–393, 1992.

[263] Helene M Lawson and Kira Leck. Dynamics of internet dating. *Social Science Computer Review*, 24(2):189–208, 2006.

[264] Amanda Lazar, Norman Makoto Su, Jeffrey Bardzell, and Shaowen Bardzell. *Parting the Red Sea: Sociotechnical Systems and Lived Experiences of Menopause*, page 1–16. Association for Computing Machinery, New York, NY, USA, 2019.

[265] Maurizio Lazzarato. Immaterial labor. *Radical thought in Italy: A potential politics*, 1996:133–47, 1996.

[266] David T. Lee, Emily S. Hamedian, Greg Wolff, and Amy Liu. Causeway: Scaling situated learning with micro-role hierarchies. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, page 1–12, New York, NY, USA, 2019. Association for Computing Machinery.

[267] Min Kyung Lee, Daniel Kusbit, Evan Metsky, and Laura Dabbish. Working with machines: The impact of algorithmic and data-driven management on human workers. In *Proceedings of the 33rd annual ACM conference on human factors in computing systems*, pages 1603–1612, 2015.

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

[269] Vili Lehdonvirta. Flexibility in the gig economy: managing time on three online piecework platforms. *New Technology, Work and Employment*, 33(1):13–29, 2018.

[270] Robert W Lent and Steven D Brown. Social cognitive model of career self-management: Toward a unifying view of adaptive career behavior across the life span. *Journal of counseling psychology*, 60(4):557, 2013.

[271] Robert W. Lent, Steven D. Brown, and Gail Hackett. Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior*, 45(1):79 – 122, 1994.

[272] Robert W Lent, Steven D Brown, and Gail Hackett. Social cognitive career theory. *Career choice and development*, 4:255–311, 2002.

[273] Robert W Lent, Ijeoma Ezeofor, M Ashley Morrison, Lee T Penn, and Glenn W Ireland. Applying the social cognitive model of career self-management to career exploration and decision-making. *Journal of Vocational Behavior*, 93:47–57, 2016.

[274] Rhonda Lenton, Michael D Smith, John Fox, and Norman Morra. Sexual harassment in public places: Experiences of canadian women. *Canadian Review of Sociology/Revue canadienne de sociologie*, 36(4):517–540, 1999.

[275] Rachel Lerman. Tinder's upcoming feature for singles? A criminal background check on potential dates. *Washington Post*, March 2021.

[276] Asaf Levanon, Paula England, and Paul Allison. Occupational feminization and

pay: Assessing causal dynamics using 1950–2000 us census data. *Social Forces*, 88(2):865–891, 2009.

[277] Ruth Lewis, Elizabeth Sharp, Jenni Remnant, and Rhiannon Redpath. 'Safe spaces': Experiences of feminist women-only space. *Sociological Research Online*, 20(4):105–118, 2015.

[278] Sarah F Lewis and William Fremouw. Dating violence: A critical review of the literature. *Clinical psychology review*, 21(1):105–127, 2001.

[279] Linfeng Li, Tawanna R Dillahunt, and Tanya Rosenblat. Does driving as a form of "gig work" mitigate low-skilled job seekers' negative long-term unemployment effects? *Proceedings of the ACM on Human-Computer Interaction*, 3(CSCW):1–16, 2019.

[280] Calvin Liang, Jevan Hutson, and Os Keyes. Surveillance, stigma & sociotechnical design for HIV. *arXiv preprint arXiv:2006.04882*, 2020.

[281] Jennifer Hickes Lundquist and Celeste Vaughan Curington. Love me Tinder, love me sweet. *Contexts*, 18(4):22–27, 2019.

[282] Ning F Ma and Benjamin V Hanrahan. Part-time ride-sharing: Recognizing the context in which drivers ride-share and its impact on platform use. *Proceedings of the ACM on Human-Computer Interaction*, 3(GROUP):1–17, 2019.

[283] Ning F Ma and Benjamin V Hanrahan. Unpacking sharing in the peer-to-peer

economy: The impact of shared needs and backgrounds on ride-sharing. *Proceedings of the ACM on Human-Computer Interaction*, 4(CSCW1):1–19, 2020.

[284] Ning F. Ma, Veronica A. Rivera, Zheng Yao, and Dongwook Yoon. "Brush it off": How women workers manage and cope with bias and harassment in gender-agnostic gig platforms. In *CHI Conference on Human Factors in Computing Systems*, CHI '22, 2022.

[285] Ning F Ma, Chien Wen Yuan, Moojan Ghafurian, and Benjamin V Hanrahan. Using stakeholder theory to examine drivers' stake in uber. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, pages 1–12, 2018.

[286] Xiao Ma, Jeffrey T. Hancock, Kenneth Lim Mingjie, and Mor Naaman. Self-disclosure and perceived trustworthiness of airbnb host profiles. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*, CSCW '17, page 2397–2409, New York, NY, USA, 2017. Association for Computing Machinery.

[287] Zhuang Ma, Woon Kian Chong, and Linpei Song. How arousing benefits and ethical misgivings affect AI-based dating app adoption: The roles of perceived autonomy and perceived risks. In *International Conference on Human-Computer Interaction*, pages 160–170. Springer, 2022.

[288] Michael Maffie and Allison Elias. Platform design as a managerial act: Analyzing sexual harassment in the gig economy. *LERA For Libraries*, 23(2), 2019.

[289] Michael David Maffie. The perils of laundering control through customers: A study of control and resistance in the ride-hail industry. *ILR Review*, page 0019793920972679, 2020.

[290] Christian Maggiori, Claire S Johnston, Franciska Krings, Koorosh Massoudi, and Jérôme Rossier. The role of career adaptability and work conditions on general and professional well-being. *Journal of Vocational Behavior*, 83(3):437–449, 2013.

[291] Nicola Magnavita and Francesco Chirico. New and emerging risk factors in occupational health, 2020.

[292] Nahid Malazizi, Habib Alipour, and Hossein Olya. Risk perceptions of airbnb hosts: Evidence from a mediterranean island. *Sustainability*, 10(5):1349, 2018.

[293] Sridhar Mandapati, Sravya Pamidi, and Sriharitha Ambati. A mobile based women safety application (I Safe apps). *IOSR Journal of Computer Engineering (IOSR-JCE)*, 17(1):29–34, 2015.

[294] Anoush Margaryan. Understanding crowdworkers' learning practices. 2016.

[295] Anoush Margaryan. Comparing crowdworkers' and conventional knowledge workers' self-regulated learning strategies in the workplace. *Human Computation: A Transdisciplinary Journal*, 6(1):83–97, 2019.

[296] Anoush Margaryan. Workplace learning in crowdwork. *Journal of Workplace Learning*, 2019.

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

[298] Patricia Yancey Martin. Practising gender at work: Further thoughts on reflexivity. *Gender, work & organization*, 13(3):254–276, 2006.

[299] Christina Masden and W. Keith Edwards. Understanding the role of community in online dating. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, page 535–544, New York, NY, USA, 2015. Association for Computing Machinery.

[300] Sarah Maslen. (Dis) connected parenting: Other-tracking in the more-than-human sensorium. *The Senses and Society*, 16(1):67–79, 2021.

[301] A. H. Maslow. A theory of human motivation. *Psychological Review*, 50(4):370–396, 1943.

[302] Tara Matthews, Kathleen O'Leary, Anna Turner, Manya Sleeper, Jill Palzkill Woelfer, Martin Shelton, Cori Manthorne, Elizabeth F Churchill, and Sunny Consolvo. Stories from survivors: Privacy & security practices when coping with

intimate partner abuse. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, pages 2189–2201, 2017.

[303] Sylvia Maxfield, Mary Shapiro, Vipin Gupta, and Susan Hass. Gender and risk: women, risk taking and risk aversion. *Gender in Management: An International Journal*, 2010.

[304] Lucy Maxwell, Alex Sanders, Jason Skues, and Lisa Wise. A content analysis of personal safety apps: Are they keeping us safe or making us more vulnerable? *Violence Against Women*, 26(2):233–248, 2020.

[305] Douglas C Maynard and Bernardo M Ferdman. The marginalized workforce: How io psychology can make a difference. *The industrial-organizational psychologist*, 46(4):25–29, 2009.

[306] Bronwyn McBride, Kate Shannon, Brittany Bingham, Melissa Braschel, Steffanie Strathdee, and Shira M Goldenberg. Underreporting of violence to police among women sex workers in Canada: Amplified inequities for im/migrant and in-call workers prior to and following end-demand legislation. *Health and Human Rights*, 22(2):257, 2020.

[307] Bronwyn McBride, Kate Shannon, Alka Murphy, Sherry Wu, Margaret Erickson, Shira M Goldenberg, and Andrea Krüsi. Harms of third party criminalisation under end-demand legislation: Undermining sex workers' safety and rights. *Culture, Health & Sexuality*, 23(9):1165–1181, 2021.

[308] Allison McDonald, Catherine Barwulor, Michelle L Mazurek, Florian Schaub, and Elissa M Redmiles. "It's stressful having all these phones": Investigating sex workers' safety goals, risks, and practices online. In *30th USENIX Security Symposium (USENIX Security 21)*, pages 375–392, 2021.

[309] Kimberly S McDonald and Linda M Hite. Reviving the relevance of career development in human resource development. *Human Resource Development Review*, 4(4):418–439, 2005.

[310] Sean Mcginley, John O'Neill, Sarah Damaske, and Anna Mattila. A grounded theory approach to developing a career change model in hospitality. *International Journal of Hospitality Management*, 38:89–98, 04 2014.

[311] Clare McGlynn and Erika Rackley. Image-based sexual abuse. *Oxford Journal of Legal Studies*, 37(3):534–561, 2017.

[312] Susan E McGregor, Elizabeth Anne Watkins, Mahdi Nasrullah Al-Ameen, Kelly Caine, and Franziska Roesner. When the weakest link is strong: Secure collaboration in the case of the panama papers. In *26th USENIX Security Symposium (USENIX Security 17)*, pages 505–522, 2017.

[313] Brian McInnis, Dan Cosley, Chaebong Nam, and Gilly Leshed. Taking a hit: Designing around rejection, mistrust, risk, and workers' experiences in amazon mechanical turk. In *Proceedings of the 2016 CHI Conference on Human Factors*

in Computing Systems, CHI '16, pages 2271–2282, New York, NY, USA, 2016. Association for Computing Machinery.

[314] Saul McLeod. Maslow's hierarchy of needs. *Simply psychology*, 1(1-18), 2007.

[315] Summer McWilliams and Anne E Barrett. Online dating in middle and later life: Gendered expectations and experiences. *Journal of Family Issues*, 35(3):411–436, 2014.

[316] Robert C Merchant Jr. The role of career development in improving organizational effectiveness and employee development. *Florida Department of Law Enforcement*, 2010.

[317] Metropolitan Police. Request information under Clare's Law: Make a domestic violence disclosure scheme (DVDS) application. `https://www.met.police.uk/advice/advice-and-information/daa/domestic-abuse/alpha2/request-information-under-clares-law/`, *n.d.* (Accessed on 08/31/2022).

[318] Ruth Milkman, Luke Elliott-Negri, Kathleen Griesbach, and Adam Reich. Gender, class, and the gig economy: The case of platform-based food delivery. *Critical Sociology*, 47(3):357–372, 2021.

[319] Jaron Mink, Licheng Luo, Natã M Barbosa, Olivia Figueira, Yang Wang, and Gang Wang. Deepphish: Understanding user trust towards artificially generated profiles in online social networks. In *Proc. of USENIX Security*, 2022.

[320] Krista Lynn Minnotte and Elizabeth M Legerski. Sexual harassment in contemporary workplaces: Contextualizing structural vulnerabilities. *Sociology Compass*, 13(12):e12755, 2019.

[321] Mareike Möhlmann, Lior Zalmanson, Ola Henfridsson, and Robert Wayne Gregory. Algorithmic management of work on online labor platforms: When matching meets control. *MIS quarterly*, 45(4), 2021.

[322] Eva Moog. *Design for Safety*. A Book Apart, 2021.

[323] Phoebe V Moore. *The threat of physical and psychosocial violence and harassment in digitalized work*. International Labour Office Geneva, 2018.

[324] Mara Morelli, Dora Bianchi, Roberto Baiocco, Lina Pezzuti, Antonio Chirumbolo, et al. Sexting, psychological distress and dating violence among adolescents and young adults. *Psicothema*, 2016.

[325] Max Morris. The limits of labelling: Incidental sex work among gay, bisexual, and queer young men on social media. *Sexuality Research and Social Policy*, 18(4):855–868, 2021.

[326] Tatenda Mpofu, Pitso Tsibolane, Richard Heeks, and Jean-Paul Van Belle. Risks and risk-mitigation strategies of gig economy workers in the Global South: The case of ride-hailing in Cape Town. In Julian M. Bass and P. J. Wall, editors, *Information and Communication Technologies for Development*, IFIP Advances in

Information and Communication Technology, pages 26–38, Cham, 2020. Springer International Publishing.

[327] Imani Munyaka, Eszter Hargittai, and Elissa Redmiles. The misinformation paradox: Older adults are cynical about news media, but engage with it anyway. *Journal of Online Trust and Safety*, 1(4), 2022.

[328] Cassie Murdoch. Dating app uses ar to make your search for love even weirder. "Mashable", 2017.

[329] Katie Myhill, James Richards, and Kate Sang. Job quality, fair work and gig work: The lived experience of gig workers. *The International Journal of Human Resource Management*, 32(19):4110–4135, 2021.

[330] National Sex Offender Database. Keeping children safe from sexual offenders. `https://www.meganslaw.com/`, *n.d.* (Accessed on 08/31/2022).

[331] M.M Nauta, D.L Epperson, and J. H Kahn. A multiple-groups analysis of predictors of higher level career aspirations among women in mathematics, science, and engineering majors. *Journal of counseling psychology*, 1998.

[332] Rory T Newlands, Dominic M Denning, Kaiya S Massey, and Lorraine T Benuto. Safe dating in the digital era: Protective behavioral strategies in dating behaviors facilitated by dating applications. *Violence and Victims*, 37(2):185–200, 2022.

[333] SJ Noronha and VVS Sarma. Knowledge-based approaches for scheduling prob-

lems: A survey. *IEEE Transactions on Knowledge and Data Engineering*, 3(2):160–171, 1991.

[334] Borke Obada-Obieh, Sonia Chiasson, and Anil Somayaji. "Don't break my heart!": User security strategies for online dating. In *Workshop on Usable Security (USEC)*, 2017.

[335] The Federal Reserve System Board of Governors. Economic well-being of u.s households 2022. May 2023.

[336] U.S Bureau of Labor Statistics. Contingent and alternative employment arrangements news release, Jun 2018.

[337] Anna Offenwanger, Alan John Milligan, Minsuk Chang, Julia Bullard, and Dongwook Yoon. Diagnosing bias in the gender representation of hci research participants: how it happens and where we are. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, pages 1–18, 2021.

[338] Ihudiya Finda Ogbonnaya-Ogburu, Angela DR Smith, Alexandra To, and Kentaro Toyama. Critical race theory for hci. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, pages 1–16, 2020.

[339] Norberth Okros and Delia Virga. Impact of workplace safety on well-being: the mediating role of thriving at work. *Personnel Review*, (ahead-of-print), 2022.

[340] Sara O'Brien, Neil Black, Curt Devine, and Drew Griffin. Cnn investigation: 103 uber drivers accused of sexual assault or abuse. *CNNTech, April*, 30, 2018.

[341] Maura O'Keefe. Teen dating violence: A review of risk factors and prevention efforts. *Harrisburg (PA): VAWnet, a project of the National Resource Center on Domestic Violence/Pennsylvania Coalition Against Domestic Violence*, 2005.

[342] Yok-Fong Paat and Christine Markham. Digital crime, trauma, and abuse: Internet safety and cyber risks for adolescents and emerging adults in the 21st century. *Social Work in Mental Health*, 19(1):18–40, 2021.

[343] Jessica A Pater, Moon K Kim, Elizabeth D Mynatt, and Casey Fiesler. Characterizations of online harassment: Comparing policies across social media platforms. In *Proceedings of the 19th international conference on supporting group work*, pages 369–374, 2016.

[344] Kun Peng, Wan-Ying Lin, and Hexin Chen. Consequences of deceptive self-presentation in online dating. *Chinese Journal of Communication*, pages 1–29, 2022.

[345] Caroline Criado Perez and Pushpanjali Jha. Invisible women: exposing data bias in a world designed for men. 2020.

[346] Maria Verena Peters. From the Whisper Network to #MeToo—Framing gender, gossip and sexual harassment. *European Journal of American Studies*, 15(4), December 2020.

[347] Susan E Peters, Jack T Dennerlein, Gregory R Wagner, and Glorian Sorensen.

Work and worker health in the post-pandemic world: a public health perspective. *The Lancet Public Health*, 7(2):e188–e194, 2022.

[348] Gianpiero Petriglieri, Susan J Ashford, and Amy Wrzesniewski. Agony and ecstasy in the gig economy: Cultivating holding environments for precarious and personalized work identities. *Administrative Science Quarterly*, 64(1):124–170, 2019.

[349] Anh Phan, Kathryn Seigfried-Spellar, and Kim-Kwang Raymond Choo. Threaten me softly: a review of potential dating app risks. *Computers in human behavior reports*, 3:100055, 2021.

[350] Jane Pitcher. Sex work and modes of self-employment in the informal economy: Diverse business practices and constraints to effective working. *Social Policy and Society*, 14(1):113–123, 2015.

[351] Angelisa C Plane, Elissa M Redmiles, Michelle L Mazurek, and Michael Carl Tschantz. Exploring user perceptions of discrimination in online targeted advertising. In *26th USENIX Security Symposium (USENIX Security 17)*, pages 935–951, 2017.

[352] Kamarah Pooley and Hayley Boxall. Mobile dating applications and sexual and violent offending. *Trends and Issues in Crime and Criminal Justice*, (612):1–16, 2020.

[353] Ingrid Potgieter. Workplace friendship and career wellbeing: The influencing role

of mood, health and biographical variables. In *Theory, Research and Dynamics of Career Wellbeing: Becoming Fit for the Future*, pages 237–258. Springer, 2019.

[354] Anastasia Powell and Nicola Henry. Sexual violence and harassment in the digital era. *The Palgrave handbook of Australian and New Zealand criminology, crime and justice*, pages 205–220, 2017.

[355] Urszula Pruchniewska. "I like that it's my choice a couple different times": Gender, affordances, and user experience on Bumble Dating. *International Journal of Communication*, 14:18, April 2020.

[356] Tinonee Pym, Paul Byron, and Kath Albury. 'I still want to know they're not terrible people': Negotiating 'queer community' on dating apps. *International Journal of Cultural Studies*, 24(3):398–413, May 2021.

[357] Si Qiao, Guan Huang, and Anthony Gar-On Yeh. Who are the gig workers? evidence from mapping the residential locations of ride-hailing drivers by a big data approach. *Cities*, 132:104112, 2023.

[358] Julie L. Quimby and Angela M. De Santis. The influence of role models on women's career choices. *The Career Development Quarterly*, 54(4):297–306, 2006.

[359] Emilee Rader and Rick Wash. Identifying patterns in informal sources of security information. *Journal of Cybersecurity*, 1(1):121–144, 2015.

[360] Andrew Rae and David Provan. Safety work versus the safety of work. *Safety Science*, 111:119–127, 2019.

[361] Lee Rainie and Janna Anderson. The future of jobs and jobs training. Pew Research Center, 2017.

[362] Giulia Ranzini and Christoph Lutz. Love at first swipe? Explaining Tinder self-presentation and motives. *Mobile Media & Communication*, 5(1):80–101, 2017.

[363] Noopur Raval and Paul Dourish. Standing out from the crowd: Emotional labor, body labor, and temporal labor in ridesharing. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work amp; Social Computing*, CSCW '16, page 97–107, 2016.

[364] Noopur Raval and Joyojeet Pal. Making a "pro": 'professionalism' after platforms in beauty-work. *Proc. ACM Hum.-Comput. Interact.*, 3(CSCW), November 2019.

[365] Alexandrea J Ravenelle, Erica Janko, and Ken Cai Kowalski. Good jobs, scam jobs: Detecting, normalizing, and internalizing online job scams during the COVID-19 pandemic. *New Media & Society*, 24(7):1591–1610, 2022.

[366] Jana L Raver and Lisa H Nishii. Once, twice, or three times as harmful? ethnic harassment, gender harassment, and generalized workplace harassment. *Journal of Applied Psychology*, 95(2):236, 2010.

[367] Dave E Redekopp and Michael Huston. The broader aims of career development: Mental health, wellbeing and work. *British Journal of Guidance & Counselling*, 47(2):246–257, 2019.

[368] Elissa M Redmiles, Yasemin Acar, Sascha Fahl, and Michelle L Mazurek. A summary of survey methodology best practices for security and privacy researchers. Technical report, 2017.

[369] Elissa M Redmiles, Jessica Bodford, and Lindsay Blackwell. "I just want to feel safe": A diary study of safety perceptions on social media. In *Proceedings of the International AAAI Conference on Web and Social Media*, volume 13, pages 405–416, 2019.

[370] Elissa M Redmiles, Neha Chachra, and Brian Waismeyer. Examining the demand for spam: Who clicks? In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, pages 1–10, 2018.

[371] Elissa M Redmiles, Sean Kross, and Michelle L Mazurek. How i learned to be secure: a census-representative survey of security advice sources and behavior. In *Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security*, pages 666–677, 2016.

[372] Elissa M Redmiles, Michelle L Mazurek, and John P Dickerson. Dancing pigs or externalities? measuring the rationality of security decisions. In *Proceedings of the 2018 ACM Conference on Economics and Computation*, pages 215–232, 2018.

[373] Lauren A Reed, Richard M Tolman, and L Monique Ward. Gender matters: Experiences and consequences of digital dating abuse victimization in adolescent dating relationships. *Journal of adolescence*, 59:79–89, 2017.

[374] Daniela Retelny, Michael S. Bernstein, and Melissa A. Valentine. No workflow can ever be enough: How crowdsourcing workflows constrain complex work. *Proc. ACM Hum.-Comput. Interact.*, 1(CSCW), December 2017.

[375] Daniela Retelny, Sébastien Robaszkiewicz, Alexandra To, Walter S. Lasecki, Jay Patel, Negar Rahmati, Tulsee Doshi, Melissa Valentine, and Michael S. Bernstein. Expert crowdsourcing with flash teams. In *Proceedings of the 27th Annual ACM Symposium on User Interface Software and Technology*, UIST '14, pages 75–85, New York, NY, USA, 2014. Association for Computing Machinery.

[376] Susan R Rhodes and Mildred Doering. An integrated model of career change. *Academy of Management Review*, 8(4):631–639, 1983.

[377] Veronica A. Rivera and David T. Lee. I want to, but first i need to: Understanding crowdworkers' career goals, challenges, and tensions. *Proc. ACM Hum.-Comput. Interact.*, 5(CSCW1), apr 2021.

[378] Peter J Robertson. The well-being outcomes of career guidance. *British Journal of Guidance & Counselling*, 41(3):254–266, 2013.

[379] Larry D Rosen, L Mark Carrier, and Nancy A Cheever. Facebook and texting made me do it: Media-induced task-switching while studying. *Computers in Human Behavior*, 29(3):948–958, 2013.

[380] Alex Rosenblat. *Uberland: How algorithms are rewriting the rules of work*. Univ of California Press, 2018.

[381] Alex Rosenblat and Luke Stark. Algorithmic labor and information asymmetries: A case study of uber's drivers. *International journal of communication*, 10:27, 2016.

[382] Joel Ross, Lilly Irani, M Six Silberman, Andrew Zaldivar, and Bill Tomlinson. Who are the crowdworkers? shifting demographics in mechanical turk. In *CHI'10 extended abstracts on Human factors in computing systems*, pages 2863–2872. 2010.

[383] Tim Roughgarden. Algorithmic game theory. *Communications of the ACM*, 53(7):78–86, 2010.

[384] Janine Rowse, Caroline Bolt, and Sanjeev Gaya. Swipe right: The emergence of dating-app facilitated sexual assault. a descriptive retrospective audit of forensic examination caseload in an australian metropolitan service. *Forensic Science, Medicine and Pathology*, 16(1):71–77, 2020.

[385] Legacy Russell. Glitch feminism: A manifesto. *London: Verso*, 11:29–29, 2020.

[386] Manaswi Saha, Devanshi Chauhan, Siddhant Patil, Rachel Kangas, Jeffrey Heer, and Jon E. Froehlich. Urban accessibility as a socio-political problem: A multi-stakeholder analysis. *Proc. ACM Hum.-Comput. Interact.*, 4(CSCW3), January 2021.

[387] Susumu Saito, Chun-Wei Chiang, Saiph Savage, Teppei Nakano, Tetsunori Kobayashi, and Jeffrey P. Bigham. Turkscanner: Predicting the hourly wage of

microtasks. In *The World Wide Web Conference*, WWW '19, pages 3187–3193, New York, NY, USA, 2019. Association for Computing Machinery.

[388] Niloufar Salehi and Michael S. Bernstein. Hive: Collective design through network rotation. *Proc. ACM Hum.-Comput. Interact.*, 2(CSCW), November 2018.

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

[390] Niloufar Salehi, Lilly C. Irani, Michael S. Bernstein, Ali Alkhatib, Eva Ogbe, Kristy Milland, and Clickhappier. We are dynamo: Overcoming stalling and friction in collective action for crowd workers. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15, page 1621–1630, New York, NY, USA, 2015. Association for Computing Machinery.

[391] Niloufar Salehi, Andrew McCabe, Melissa Valentine, and Michael Bernstein. Huddler: Convening stable and familiar crowd teams despite unpredictable availability. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*, CSCW '17, page 1700–1713, New York, NY, USA, 2017. Association for Computing Machinery.

[392] Sara Salih. On judith butler and performativity. *Sexualities and communication in everyday life: A reader*, pages 55–68, 2007.

[393] Teela Sanders and Rosie Campbell. Designing out vulnerability, building in respect: violence, safety and sex work policy. *The British journal of sociology*, 58(1):1–19, 2007.

[394] Teela Sanders, Laura Connelly, and Laura Jarvis King. On our own terms: The working conditions of internet-based sex workers in the UK. *Sociological Research Online*, 21(4):133–146, 2016.

[395] Shruti Sannon, Natalya N. Bazarova, and Dan Cosley. Privacy lies: Understanding how, when, and why people lie to protect their privacy in multiple online contexts. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, CHI '18, page 1–13, 2018.

[396] Shruti Sannon and Dan Cosley. "It was a shady HIT": Navigating work-related privacy concerns on MTurk. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, pages 1–6, 2018.

[397] Shruti Sannon and Dan Cosley. Privacy, power, and invisible labor on Amazon Mechanical Turk. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, page 1–12, 2019.

[398] Shruti Sannon, Billie Sun, and Dan Cosley. Privacy, surveillance, and power in the gig economy. In *CHI Conference on Human Factors in Computing Systems*, CHI '22, 2022.

[399] Saiph Savage, Chun Wei Chiang, Susumu Saito, Carlos Toxtli, and Jeffrey Bigham.

Becoming the super turker:increasing wages via a strategy from high earning workers. In *Proceedings of The Web Conference 2020*, WWW '20, pages 1241–1252, New York, NY, USA, 2020. Association for Computing Machinery.

[400] Mark Savickas. *Career counseling*, volume 74. "American Psychological Association.

[401] Mark L Savickas. Career adaptability: An integrative construct for life-span, life-space theory. *The career development quarterly*, 45(3):247–259, 1997.

[402] Mark L. Savickas and Erik J. Porfeli. Career adapt-abilities scale: Construction, reliability, and measurement equivalence across 13 countries. *Journal of Vocational Behavior*, 80(3):661 – 673, 2012. Career Adaptability.

[403] Meredith Jean Scannell. Online dating and the risk of sexual assault to college students. *Building Healthy Academic Communities Journal*, 3(1):34–43, 2019.

[404] Robert F. Scherer, James D. Brodzinski, and Frank A. Wiebe. Assessing perception of career role-model performance: The self-employed parent. *Perceptual and Motor Skills*, 72(2):555–560, 1991.

[405] Morgan Klaus Scheuerman, Stacy M. Branham, and Foad Hamidi. Safe spaces and safe places: Unpacking technology-mediated experiences of safety and harm with transgender people. *Proceedings of the ACM on Human-Computer Interaction*, 2(CSCW):155:1–155:27, November 2018.

[406] Morgan Klaus Scheuerman, Jialun Aaron Jiang, Casey Fiesler, and Jed R

Brubaker. A framework of severity for harmful content online. *Proceedings of the ACM on Human-Computer Interaction*, 5(CSCW2):1–33, 2021.

[407] Juliet B Schor, William Attwood-Charles, Mehmet Cansoy, Isak Ladegaard, and Robert Wengronowitz. Dependence and precarity in the platform economy. *Theory and Society*, 49(5):833–861, 2020.

[408] Doug Schuler. Social computing. *Communications of the ACM*, 37(1):28–29, 1994.

[409] Paul A Schulte, George Delclos, Sarah A Felknor, and L Casey Chosewood. Toward an expanded focus for occupational safety and health: a commentary. *International journal of environmental research and public health*, 16(24):4946, 2019.

[410] Paul A Schulte, Sudha Pandalai, Victoria Wulsin, and HeeKyoung Chun. Interaction of occupational and personal risk factors in workforce health and safety. *American journal of public health*, 102(3):434–448, 2012.

[411] David Schwartz. Embedded in the crowd: Creative freelancers, crowdsourced work, and occupational community. *Work and Occupations*, 45(3):247–282, 2018.

[412] C Schwellnus, A Geva, and Veiel Rafael Pak Mathilde. Gig economy platforms: boon or bane? organisation for economic co-operation and development. *Economics department working papers*, 1550, 2019.

[413] Bhavani Seetharaman, Joyojeet Pal, and Julie Hui. Delivery work and the experience of social isolation. *Proc. ACM Hum.-Comput. Interact.*, 5(CSCW1), April 2021.

[414] Sarath S Shanker and Douglas Zytko. The... tinderverse?: Opportunities and challenges for user safety in extended reality (xr) dating apps. *arXiv preprint arXiv:2203.15120*, 2022.

[415] Liesel L Sharabi and John P Caughlin. Deception in online dating: Significance and implications for the first offline date. *New Media & Society*, 21(1):229–247, 2019.

[416] Liesel L Sharabi and Tiffany A Dykstra-DeVette. From first email to first date: Strategies for initiating relationships in online dating. *Journal of Social and Personal Relationships*, 36(11-12):3389–3407, 2019.

[417] Kristen Shinohara, Cynthia L. Bennett, Wanda Pratt, and Jacob O. Wobbrock. Tenets for social accessibility: Towards humanizing disabled people in design. *ACM Trans. Access. Comput.*, 11(1), March 2018.

[418] Adam Shostack. *Threat Modeling: Designing for Security.* John Wiley & Sons, 2014.

[419] M. S. Silberman, B. Tomlinson, R. LaPlante, J. Ross, L. Irani, and A. Zaldivar. Responsible research with crowds: Pay crowdworkers at least minimum wage. *Commun. ACM*, 61(3):39–41, February 2018.

[420] M. Six Silberman, Lilly Irani, and Joel Ross. Ethics and tactics of professional crowdwork. *XRDS*, 17(2):39–43, December 2010.

[421] Mariah Simmons and Joon Suk Lee. Catfishing: a look into online dating and

impersonation. In *Social Computing and Social Media. Design, Ethics, User Behavior, and Social Network Analysis: 12th International Conference, SCSM 2020, Held as Part of the 22nd HCI International Conference, HCII 2020, Copenhagen, Denmark, July 19–24, 2020, Proceedings, Part I 22*, pages 349–358. Springer, 2020.

[422] Vivek K Singh, Mary Chayko, Raj Inamdar, and Diana Floegel. Female librarians and male computer programmers? gender bias in occupational images on digital media platforms. *Journal of the Association for Information Science and Technology*, 71(11):1281–1294, 2020.

[423] Michael Skirpan, Nathan Beard, Srinjita Bhaduri, Casey Fiesler, and Tom Yeh. Ethics education in context: A case study of novel ethics activities for the cs classroom. In *Proceedings of the 49th ACM Technical Symposium on Computer Science Education*, pages 940–945, 2018.

[424] Sally Slocum. Woman the gatherer: male bias in anthropology. 1975.

[425] Julia Slupska and Leonie Maria Tanczer. Threat modeling intimate partner violence: Tech abuse as a cybersecurity challenge in the internet of things. In *The Emerald International Handbook of Technology-Facilitated Violence and Abuse*. Emerald Publishing Limited, 2021.

[426] Diana K Smetters and Rebecca E Grinter. Moving from the design of usable

security technologies to the design of useful secure applications. In *Proceedings of the 2002 workshop on New security paradigms*, pages 82–89, 2002.

[427] Elizabeth A Smith. The role of tacit and explicit knowledge in the workplace. *Journal of knowledge Management*, 2001.

[428] Glorian Sorensen, Jack T Dennerlein, Susan E Peters, Erika L Sabbath, Erin L Kelly, and Gregory R Wagner. The future of research on work, safety, health and wellbeing: A guiding conceptual framework. *Social science & medicine*, 269:113593, 2021.

[429] Ashley Southall. He used Tinder to hunt the women he raped and killed, police say. *The New York Times*, 2018.

[430] Nick Srnicek. *Platform capitalism*. John Wiley & Sons, 2017.

[431] Jim Stanford. The resurgence of gig work: Historical and theoretical perspectives. *The Economic and Labour Relations Review*, 28(3):382–401, 2017.

[432] Elizabeth Stanko. *Intimate Intrusions (Routledge Revivals): Women's Experience of Male Violence*. Routledge, 2013.

[433] Elizabeth Anne Stanko. *The Meanings of Violence*. Routledge London, 2003.

[434] Kate Starbird, Ahmer Arif, and Tom Wilson. Disinformation as collaborative work: Surfacing the participatory nature of strategic information operations. *Proceedings of the ACM on Human-Computer Interaction*, 3(CSCW):1–26, 2019.

[435] Zahra Stardust, Rosalie Gillett, and Kath Albury. Surveillance does not equal safety: Police, data and consent on dating apps. *Crime, Media, Culture*, page 17416590221111827, 2022.

[436] Zahra Stardust, Carla Treloar, Elena Cama, and Jules Kim. 'I wouldn't call the cops if I was being bashed to death': Sex work, whore stigma and the criminal legal system. *International Journal for Crime, Justice and Social Democracy*, 10(3):142–157, 2021.

[437] Denny L. Starks, Tawanna Dillahunt, and Oliver L. Haimson. Designing Technology to Support Safety for Transgender Women & Non-Binary People of Color. In *Companion Publication of the 2019 on Designing Interactive Systems Conference 2019 Companion*, DIS '19 Companion, pages 289–294, New York, NY, USA, June 2019. Association for Computing Machinery.

[438] Rock Stevens, Daniel Votipka, Elissa M Redmiles, Colin Ahern, Patrick Sweeney, and Michelle L Mazurek. The battle for New York: A case study of applied digital threat modeling at the enterprise level. In *27th USENIX Security Symposium (USENIX Security 18)*, pages 621–637, 2018.

[439] Bonnie L. Stice. The Lived Experiences of College Sugar Babies: A Consensual Qualitative Research Study. May 2021. Accepted: 2021-04-21T12:42:01Z Artwork Medium: 1 file (.pdf) Interview Medium: 1 file (.pdf).

[440] Maria Stoicescu and Cosima Rughinis. Perils of digital intimacy. A classification

framework for privacy, security, and safety risks on dating apps. In *2021 23rd International Conference on Control Systems and Computer Science (CSCS)*, pages 457–462, May 2021.

[441] Karlie E Stonard. "technology was designed for this": Adolescents' perceptions of the role and impact of the use of technology in cyber dating violence. *Computers in human behavior*, 105:106211, 2020.

[442] Elisabetta Stringhi. Addressing gendered affordances of the platform economy: The case of UpWork. *Internet Policy Review*, 11(1):1–28, 2022.

[443] Angelika Strohmayer, Rosanna Bellini, and Julia Slupska. Safety as a grand challenge in pervasive computing: Using feminist epistemologies to shift the paradigm from security to safety. *IEEE Pervasive Computing*, 2022.

[444] Angelika Strohmayer, Jenn Clamen, and Mary Laing. Technologies for social justice: Lessons from sex workers on the front lines. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, page 1–14, 2019.

[445] Angelika Strohmayer, Mary Laing, and Rob Comber. Technologies and social justice outcomes in sex work charities: Fighting stigma, saving lives. In *2017 ACM SIGCHI Conference on Human Factors in Computing Systems*, May 2017.

[446] Angelika Strohmayer, Mary Laing, and Rob Comber. Justice-oriented ecologies: a framework for designing technologies with sex work support services. *Routledge*

International Handbook of Sex Industry Research, November 2018. Publisher: Routledge.

[447] Angelika Strohmayer, Julia Slupska, Rosanna Bellini, Lynne Coventry, Tara Hairston, and Adam Dodge. *Trust and Abusability Toolkit: Centering Safety in Human-Data Interactions.* Northumbria University, 2021.

[448] Chiu-Ping Su and Tsung-Chiung Wu. The dark side of solo female travel: Negative encounters with male strangers. *Leisure Sciences*, 42(3-4):375–392, July 2020.

[449] Lucy A Suchman. *Plans and situated actions: The problem of human-machine communication.* Cambridge university press, 1987.

[450] Lisa Sugiura and April Smith. Victim blaming, responsibilization and resilience in online sexual abuse and harassment. In *Victimology*, pages 45–79. Springer, 2020.

[451] S Shyam Sundar, Hyunjin Kang, Mu Wu, Eun Go, and Bo Zhang. Unlocking the privacy paradox: do cognitive heuristics hold the key? In *CHI'13 extended abstracts on human factors in computing systems*, pages 811–816. 2013.

[452] S Shyam Sundar, Jinyoung Kim, Mary Beth Rosson, and Maria D Molina. Online privacy heuristics that predict information disclosure. In *Proceedings of the 2020 CHI conference on human factors in computing systems*, pages 1–12, 2020.

[453] Will Sutherland, Mohammad Hossein Jarrahi, Michael Dunn, and Sarah Beth

Nelson. Work precarity and gig literacies in online freelancing. *Work, Employment and Society*, 34(3):457–475, 2020.

[454] Ryo Suzuki, Niloufar Salehi, Michelle S. Lam, Juan C. Marroquin, and Michael S. Bernstein. Atelier: Repurposing expert crowdsourcing tasks as micro-internships. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, CHI '16, pages 2645–2656, New York, NY, USA, 2016. Association for Computing Machinery.

[455] Brian J Taber and Maureen Blankemeyer. Future work self and career adaptability in the prediction of proactive career behaviors. *Journal of Vocational Behavior*, 86:20–27, 2015.

[456] Mozhgan Tavakolifard and Kevin C Almeroth. Social computing: an intersection of recommender systems, trust/reputation systems, and social networks. *IEEE Network*, 26(4):53–58, 2012.

[457] Janelle S Taylor. Confronting "culture" in medicine's "culture of no culture". *Academic Medicine*, 78(6):555–559, 2003.

[458] Jacob Thebault-Spieker, Loren G. Terveen, and Brent Hecht. Avoiding the south side and the suburbs: The geography of mobile crowdsourcing markets. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, CSCW '15, page 265–275, 2015.

[459] Kurt Thomas, Devdatta Akhawe, Michael Bailey, Dan Boneh, Elie Bursztein,

Sunny Consolvo, Nicola Dell, Zakir Durumeric, Patrick Gage Kelley, Deepak Kumar, et al. SoK: Hate, harassment, and the changing landscape of online abuse. In *2021 IEEE Symposium on Security and Privacy (SP)*, pages 247–267. IEEE, 2021.

[460] Kurt Thomas, Patrick Gage Kelley, Sunny Consolvo, Patrawat Samermit, and Elie Bursztein. "It's common and a part of being a content creator": Understanding how creators experience and cope with hate and harassment online. In *CHI Conference on Human Factors in Computing Systems*, pages 1–15, 2022.

[461] Kurt Thomas, Damon McCoy, Chris Grier, Alek Kolcz, and Vern Paxson. Trafficking fraudulent accounts: The role of the underground market in Twitter spam and abuse. In *22nd USENIX Security Symposium (USENIX Security 13)*, pages 195–210, 2013.

[462] Juhu Thukral. Behind closed doors: An analysis of indoor sex work in New York City. *Siecus Report*, 33(2):3, 2005.

[463] Julia Ticona. Strategies of control: Workers' use of ICTs to shape knowledge and service work. *Information, Communication & Society*, 18(5):509–523, 2015.

[464] Julia Ticona. Beyond disruption: How tech shapes labor across domestic work & ridehailing. In *31st Annual Meeting*. SASE, 2019.

[465] Julia Ticona. Red flags, sob stories, and scams: The contested meaning of gov-

ernance on carework labor platforms. *New Media & Society*, 24(7):1548–1566, 2022.

[466] Julia Ticona and Alexandra Mateescu. How domestic workers wager safety in the platform economy. *Fast Company*, 2018.

[467] Julia Ticona and Alexandra Mateescu. Trusted strangers: Carework platforms' cultural entrepreneurship in the on-demand economy. *New Media & Society*, 20(11):4384–4404, November 2018.

[468] Julia Ticona, Alexandra Mateescu, and Alex Rosenblat. Beyond disruption: How tech shapes labor across domestic work and ridehailing. 2018.

[469] Catalina L Toma and Jeffrey T Hancock. Looks and lies: The role of physical attractiveness in online dating self-presentation and deception. *Communication Research*, 37(3):335–351, 2010.

[470] Catalina L Toma, Jeffrey T Hancock, and Nicole B Ellison. Separating fact from fiction: An examination of deceptive self-presentation in online dating profiles. *Personality and Social Psychology Bulletin*, 34(8):1023–1036, 2008.

[471] Carlos Toxtli, Angela Richmond-Fuller, and Saiph Savage. Reputation agent: Prompting fair reviews in gig markets. In *Proceedings of The Web Conference 2020*, WWW '20, pages 1228–1240, New York, NY, USA, 2020. Association for Computing Machinery.

[472] Carlos Toxtli, Siddharth Suri, and Saiph Savage. Quantifying the invisible labor in crowd work. *Proceedings of the ACM on human-computer interaction*, 5(CSCW2):1–26, 2021.

[473] Molly Tran and Rosemary K Sokas. The gig economy and contingent work: An occupational health assessment. *Journal of Occupational and Environmental Medicine*, 59(4):e63, 2017.

[474] Eileen M Trauth. The role of theory in gender and information systems research. *Information and Organization*, 23(4):277–293, 2013.

[475] Wei-Tek Tsai, Wu Li, Jay Elston, and Yinong Chen. Collaborative learning using wiki web sites for computer science undergraduate education: A case study. *IEEE Transactions on Education*, 54(1):114–124, 2010.

[476] Emily Tseng, Rosanna Bellini, Nora McDonald, Matan Danos, Rachel Greenstadt, Damon McCoy, Nicola Dell, and Thomas Ristenpart. The tools and tactics used in intimate partner surveillance: An analysis of online infidelity forums. In *29th USENIX Security Symposium (USENIX Security 20)*, pages 1893–1909, 2020.

[477] Emily Tseng, Diana Freed, Kristen Engel, Thomas Ristenpart, and Nicola Dell. A digital safety dilemma: Analysis of computer-mediated computer security interventions for intimate partner violence during COVID-19. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, CHI '21, 2021.

[478] Huahong Tu, Adam Doupé, Ziming Zhao, and Gail-Joon Ahn. Users really do

answer telephone scams. In *28th USENIX Security Symposium (USENIX Security 19)*, pages 1327–1340, 2019.

[479] Deborah Tuerkheimer. Unofficial Reporting in the #MeToo Era Law in the Era of #MeToo. *University of Chicago Legal Forum*, 2019:273–298, 2019.

[480] Zeynep Tufekci. Security in the wild for low-profile activists. 2017.

[481] Gareth Tyson, Vasile C. Perta, Hamed Haddadi, and Michael C. Seto. A first look at user activity on tinder. In *2016 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM)*, pages 461–466, San Francisco, CA, USA, August 2016. IEEE.

[482] Blase Ur, Fumiko Noma, Jonathan Bees, Sean M Segreti, Richard Shay, Lujo Bauer, Nicolas Christin, and Lorrie Faith Cranor. I added '!'at the end to make it secure": Observing password creation in the lab. In *Proc. SOUPS*, 2015.

[483] Melissa A. Valentine, Daniela Retelny, Alexandra To, Negar Rahmati, Tulsee Doshi, and Michael S. Bernstein. Flash organizations: Crowdsourcing complex work by structuring crowds as organizations. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, CHI '17, pages 3523–3537, New York, NY, USA, 2017. Association for Computing Machinery.

[484] Chad Van De Wiele and Stephanie Tom Tong. Breaking boundaries: The uses & gratifications of Grindr. In *Proceedings of the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing*, pages 619–630, 2014.

[485] Steve Viscelli. *The big rig: Trucking and the decline of the American dream*. Univ of California Press, 2016.

[486] Jessica Vitak. Balancing privacy concerns and impression management strategies on Facebook. In *Symposium on Usable Privacy and Security (SOUPS)*, pages 22–24, 2015.

[487] Claudia Wagner, David Garcia, Mohsen Jadidi, and Markus Strohmaier. It's a man's wikipedia? assessing gender inequality in an online encyclopedia. In *Ninth international AAAI conference on web and social media*, 2015.

[488] Stephen Walcott. Victimisation and fear of crime in the gig economy. Technical report, The Police Foundation, 2020.

[489] Matthias Waldkirch, Eliane Bucher, Peter Kalum Schou, and Eduard Grünwald. Controlled by the algorithm, coached by the crowd–how hrm activities take shape on digital work platforms in the gig economy. *The International Journal of Human Resource Management*, 32(12):2643–2682, 2021.

[490] Ari Ezra Waldman. Law, privacy, and online dating: "Revenge porn" in gay online communities. *Law & Social Inquiry*, 44(4):987–1018, 2019.

[491] Fei-Yue Wang, Kathleen M Carley, Daniel Zeng, and Wenji Mao. Social computing: From social informatics to social intelligence. *IEEE Intelligent systems*, 22(2):79–83, 2007.

[492] Adrian F Ward, Kristen Duke, Ayelet Gneezy, and Maarten W Bos. Brain drain:

The mere presence of one's own smartphone reduces available cognitive capacity. *Journal of the Association for Consumer Research*, 2(2):140–154, 2017.

[493] Noel Warford, Tara Matthews, Kaitlyn Yang, Omer Akgul, Sunny Consolvo, Patrick Gage Kelley, Nathan Malkin, Michelle L Mazurek, Manya Sleeper, and Kurt Thomas. SoK: A framework for unifying at-risk user research. *arXiv preprint arXiv:2112.07047*, 2021.

[494] Mark Warner, Andreas Gutmann, M. Angela Sasse, and Ann Blandford. Privacy unraveling around explicit HIV status disclosure fields in the online geosocial hookup app Grindr. *Proceedings of the ACM Conference on Human-Computer Interaction*, 2(CSCW), Nov 2018.

[495] Mark Warner, Agnieszka Kitkowska, Jo Gibbs, Juan F. Maestre, and Ann Blandford. Evaluating 'prefer not to say' around sensitive disclosures. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, CHI '20, page 1–13, 2020.

[496] Mark Warner, Juan F. Maestre, Jo Gibbs, Chia-Fang Chung, and Ann Blandford. Signal appropriation of explicit HIV status disclosure fields in sex-social apps used by gay and bisexual men. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI '19, page 1–15, 2019.

[497] Elizabeth Anne Watkins. "have you learned your lesson?" communities of practice under algorithmic competition. *New Media & Society*, 24(7):1567–1590, 2022.

[498] Beatrice Webb and Beatrice Potter Webb. *My apprenticeship*. Cambridge University Press, 1926.

[499] Kristine Webb, Jeanne Repetto, Janice Seabrooks-Blackmore, Karen B Patterson, and Kelsey Alderfer. Career development: Preparation, integration, and collaboration. *Journal of Vocational Rehabilitation*, 40(3):231–238, 2014.

[500] Sidney Webb. The economic theory of a legal minimum wage. *Journal of Political Economy*, 20(10):973–998, 1912.

[501] David Weil. *The fissured workplace*. Harvard University Press, 2014.

[502] Jeremy Weinstein, Rob Reich, and Mehran Sahami. *System error: Where big tech went wrong and how we can reboot*. Hachette UK, 2021.

[503] Miriam Wells. Reports of rape linked to online dating rise 450 percent in five years. 2016.

[504] Mark E Whiting, Dilrukshi Gamage, Snehalkumar (Neil) S Gaikwad, Aaron Gilbee, Shirish Goyal, Alipta Ballav, Dinesh Majeti, Nalin Chhibber, Angela Richmond-Fuller, Freddie Vargus, et al. Crowd guilds: Worker-led reputation and feedback on crowdsourcing platforms. In *Proceedings of the 2017 acm conference on computer supported cooperative work and social computing*, pages 1902–1913, 2017.

[505] Mark E Whiting, Grant Hugh, and Michael S Bernstein. Fair work: Crowd work

minimum wage with one line of code. In *Proceedings of the AAAI Conference on Human Computation and Crowdsourcing*, volume 7, pages 197–206, 2019.

[506] Monica T Whitty and Tom Buchanan. The online dating romance scam: The psychological impact on victims–both financial and non-financial. *Criminology & Criminal Justice*, 16(2):176–194, 2016.

[507] Sarah Widmer and Anders Albrechtslund. The ambiguities of surveillance as care and control: Struggles in the domestication of location-tracking applications by Danish parents. *Nordicom Review*, 42, 2021.

[508] Alex C. Williams, Gloria Mark, Kristy Milland, Edward Lank, and Edith Law. The perpetual work life of crowdworkers: How tooling practices increase fragmentation in crowdwork. *Proc. ACM Hum.-Comput. Interact.*, 3(CSCW), November 2019.

[509] Alex J Wood. Algorithmic management consequences for work organisation and working conditions. Technical report, JRC Working Papers Series on Labour, Education and Technology, 2021.

[510] Alex J Wood, Mark Graham, Vili Lehdonvirta, and Isis Hjorth. Good gig, bad gig: autonomy and algorithmic control in the global gig economy. *Work, employment and society*, 33(1):56–75, 2019.

[511] Eileen Wood, Lucia Zivcakova, Petrice Gentile, Karin Archer, Domenica De Pasquale, and Amanda Nosko. Examining the impact of off-task multi-

tasking with technology on real-time classroom learning. *Computers & Education*, 58(1):365–374, 2012.

[512] Mark A Wood, Stuart Ross, and Diana Johns. Primary crime prevention apps: A typology and scoping review. *Trauma, Violence, & Abuse*, page 1524838020985560, 2021.

[513] Jane E Workman and Robin L Orr. Clothing, sex of subject, and rape myth acceptance as factors affecting attributions about an incident of acquaintance rape. *Clothing and Textiles Research Journal*, 14(4):276–284, 1996.

[514] Bradley E Wright and Soonhee Kim. Participation's influence on job satisfaction: The importance of job characteristics. *Review of Public Personnel Administration*, 24(1):18–40, 2004.

[515] Cheryl A. Wright and Scott D. Wright. The role of mentors in the career development of young professionals. *Family Relations*, 36(2):204–208, 1987.

[516] Huichuan Xia, Yang Wang, Yun Huang, and Anuj Shah. "our privacy needs to be protected at all costs": Crowd workers' privacy experiences on amazon mechanical turk. *Proc. ACM Hum.-Comput. Interact.*, 1(CSCW), dec 2017.

[517] Shuzhe Yang and Andreas Albers. Overcoming information overload in online reputation management: A systematic literature review. In *ECIS 2013 - Proceedings of the 21st European Conference on Information Systems*, 06 2013.

[518] Zheng Yao, Silas Weden, Lea Emerlyn, Haiyi Zhu, and Robert E. Kraut. Together

but alone: Atomization and peer support among gig workers. *Proc. ACM Hum.-Comput. Interact.*, 5(CSCW), October 2021.

[519] Ming Yin, Siddharth Suri, and Mary L Gray. Running out of time: The impact and value of flexibility in on-demand crowdwork. In *Proceedings of the 2018 CHI conference on human factors in computing systems*, pages 1–11, 2018.

[520] Chuang-Wen You, Chien Wen Yuan, Nanyi Bi, Min-Wei Hung, Po-Chun Huang, and Hao-Chuan Wang. Go gig or go home: Enabling social sensing to share personal data with intimate partner for the health and wellbeing of long-hour workers. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, pages 1–16, 2021.

[521] Stella Zaryan. Truth and trust: How audiences are making sense of fake news, 2017. (student paper).

[522] Angie Zhang, Alexander Boltz, Chun Wei Wang, and Min Kyung Lee. Algorithmic management reimagined for workers and by workers: Centering worker well-being in gig work. In *CHI Conference on Human Factors in Computing Systems*, CHI '22, 2022.

[523] Sharon Zhou, Melissa Valentine, and Michael S. Bernstein. In search of the dream team: Temporally constrained multi-armed bandits for identifying effective team structures. In *Proceedings of the 2018 CHI Conference on Human Factors in*

Computing Systems, CHI '18, page 1–13, New York, NY, USA, 2018. Association for Computing Machinery.

[524] Elle Ziegler. Understanding the nature and experience of gig work in canada, Jun 2020.

[525] Olga Zielinska, Allaire Welk, Christopher B Mayhorn, and Emerson Murphy-Hill. Exploring expert and novice mental models of phishing. In *Proceedings of the 2015 Symposium and Bootcamp on the Science of Security*, pages 1–2, 2015.

[526] Yixin Zou, Allison McDonald, Julia Narakornpichit, Nicola Dell, Thomas Ristenpart, Kevin Roundy, Florian Schaub, and Acar Tamersoy. The role of computer security customer support in helping survivors of intimate partner violence. In *30th USENIX Security Symposium (USENIX Security 21)*, pages 429–446, 2021.

[527] Amin Zulkarnain. The mediating effect of quality of work life on the relationship between career development and psychological well-being. *International Journal of Research Studies in Psychology*, 2(3), 2013.

[528] Kathryn Zyskowski, Meredith Ringel Morris, Jeffrey P. Bigham, Mary L. Gray, and Shaun K. Kane. Accessible crowdwork? understanding the value in and challenge of microtask employment for people with disabilities. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, CSCW '15, page 1682–1693, New York, NY, USA, 2015. Association for Computing Machinery.

[529] Douglas Zytko and Hanan Aljasim. Designing AI for online-to-offline safety risks with young women: The context of social matching. *arXiv preprint arXiv:2204.00688*, 2022.

[530] Douglas Zytko and Jonathan Chan. The dating metaverse: Why we need to design for consent in social vr. *IEEE Transactions on Visualization and Computer Graphics*, 29(5):2489–2498, 2023.

[531] Douglas Zytko and Nicholas Furlo. Online dating as context to design sexual consent technology with women and lgbtq+ stakeholders. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*, CHI '23, New York, NY, USA, 2023. Association for Computing Machinery.

[532] Douglas Zytko, Nicholas Furlo, Bailey Carlin, and Matthew Archer. Computer-mediated consent to sex: The context of Tinder. In *Proceedings of the ACM on Human-Computer Interaction*, number CSCW1, pages 189:1–189:26, April 2021.

[533] Douglas Zytko, Sukeshini A. Grandhi, and Quentin Jones. Impression management struggles in online dating. In *Proceedings of the 18th International Conference on Supporting Group Work*, GROUP '14, page 53–62, 2014.

[534] Douglas Zytko, Victor Regalado, Nicholas Furlo, Sukeshini A. Grandhi, and Quentin Jones. Supporting women in online dating with a messaging interface that improves their face-to-face meeting decisions. *Proc. ACM Hum.-Comput. Interact.*, 4(CSCW2), oct 2020.

Appendix A

Supplemental Materials for Chapter 3

A.1 Survey Instrument

1. Please describe in a few sentences your reason(s) for becoming a worker on Amazon Mechanical Turk.

2. How much longer do you see yourself working on Amazon Mechanical Turk, and why?

3. What kind of tasks do you typically choose on Amazon Mechanical Turk? Why those tasks?

4. People have different priorities when choosing tasks. What are your biggest priorities when choosing tasks?

5. Have you worked on any collaborative tasks on Amazon Mechanical Turk? If so, please describe the most collaborative task you have worked on.

6. Do you have strong relationships with other workers or requesters on Amazon Mechanical Turk? If so, please describe how those relationships formed.

7. Do you feel you could reach out to those people for advice or help? If so, what kind of advice or help would you reach out to them for?

8. How do you determine your work schedule on Amazon Mechanical Turk?

9. Please describe in a few sentences your long term career goals (e.g. what is your dream job, where do you see yourself in a few years, etc...)

10. What are the skills that you think you will need to learn to achieve your career goals?

11. What is your current plan for working towards your career goals?

12. Have you starting working towards your career goals? If yes, what are challenges you've faced? If not, is there anything that is making it difficult for you to begin working towards your career goals or achieve them?

A.2 Interview Protocol

Some interview transcripts were follow-ups from survey responses and varied across participants. Below I include a sample of questions from one interview.

Understanding their experiences as workers

- Could you please describe what a typical day on AMT looks like for you? (e.g.

where do you work from, any things you need to attend to throughout the day that might interrupt your workflow)

- I've talked to other workers who said that they went through a process where they learned how to be more efficient on MTurk. Have you experienced something similar?
- What was that process like?
- What has been the most frustrating or stressful thing to you about working on AMT?
- It seems like you work really long days on MTurk. How do you stay motivated?
- You mentioned in one of the survey questions that the most collaborative task you've worked on is coming up with a slogan for ads with other workers. Could you describe this task a bit for me?(e.g. what was the nature of the task, how did you enjoy it relative to the tasks you typically complete)
- What was your interaction with other workers like in those tasks?
- And how did you like those tasks compared to the other tasks, like surveys, that you typically complete?
- You mentioned being a part of MTurk forums and making strong connections with others. Could you describe for me how those relationships formed?
- How do you maintain those relationships?

- What kind of topics do you converse about with the people you've met on these forums?
- When choosing tasks, do you prioritize the content of the tasks in anyway?

Understanding their career goals

- I saw in the survey that you have an associate's degree. What did your career path look like after you got your associate's degree?
- You mentioned that your dream is to own an art gallery. How did you become interested in art and wanting to go down this path?
- What do you consider your strongest attributes that could help you be successful in owning and running an art gallery?
- You also mentioned that you are a fine art photographer. Do you get to do much photography or art outside of MTurk?
- How does that fit in with your schedule?
- From the surveys it seems like right now your primary focus is being able to pay off debt before taking the next step in your career. Do you have any kind of support or guidance from others in overcoming this challenge (e.g., are they receiving any guidance from others)?
- Is there any kind of support or guidance you wish you had?

Understanding tension between learning & earning

- Do you feel like working on MTurk is helping with paying off the debt?
- Do you think it will help you be financially secure enough to pay it off and take the next step in your career, or do you think you might need to get another job in the future to help with finances?
- What kind of job would you be interested in getting?
- Do you feel like you've been able to learn something useful on MTurk, or has it mostly been to help pay off some of the debt and make money?
- Are there other challenges that you're facing in working towards your career besides the debt that you're trying to pay off?
- Do you feel like you have a clear career direction once you pay off the debt? Or are you in any way unsure of the next step you would have to take?
- Do you feel like you've had to weigh your career against other factors in your life?
- If you don't mind, could you describe some of the choices or tradeoffs that you've had to make that were the most difficult for you?

Appendix B

Supplemental Materials for Chapter 4

B.1 Interview Protocol

1. How did you find [PLATFORM] as a viable option to work and why this particular platform?

2. What considerations were important to you in choosing gig work and specifically this platform?

3. Why not other types of gig work? How are these decisions affected by your current situation?

4. What are alternatives if not the gig you are working right now? How does not working on the gig platform affect them financially And how does this shape your perception and practice?

5. What have your experiences been like working on [PLATFORM] as a woman?

6. As a woman working on [PLATFORM], what is something that stands out to you that's particularly challenging?

7. How do you navigate these challenges and form your work practices and strategies?

8. What have your experiences been like as a woman in your everyday life? (Follow up on this, let them talk more about this part of their experience, the challenges they faced etc.)

9. How does working in [PLATFORM] as a woman compare to your experiences as a woman in your surroundings? In other jobs?

10. How do you feel like your work on [PLATFORM] allows you to express yourself and what is important to you? (Followup and maybe try to discuss their sense of empowerment and agency on the platform)

11. What are interactions with your clients/passengers typically like?

12. How are these interactions shaped by your gender identity?

13. How do you interact with other workers?

14. What is the significance or importance of these interactions to you?

15. What do you consider your role to be in the gig economy as a woman working on [PLATFORM]?

16. What perspectives and experiences do you bring to your work on [PLATFORM]?

17. How do these perspectives and experiences shape and inform your work?

18. How do you engage with your broader community as a gig worker?

19. What groups/communities are you a part of, and what is your role in these groups?

20. Have you experienced any positive or pleasantly surprising outcomes of working on [PLATFORM] that you attribute to being a woman?

21. What specifically about your gender identity do you think led to that outcome/experience/etc?

22. What makes you feel safe/unsafe while working on [PLATFORM]?

23. When you are interacting with a client/passenger what do you do to ensure your safety?

24. Was there ever a time when you were interacting with a client/passenger where you did not feel in control of the situation? Please tell me about it.

25. Are there particular client/passenger actions or behaviors that make you feel unsafe?

26. (If they say they feel safe) Is there anything you do that helps you feel this way?

27. How do these experiences and safety considerations impact your work practices and outcome? (e.g. how does it affect your ability to earn income)?

28. What other safety concerns/considerations do you have on the platform?

29. Have you experienced any hostile/less than welcoming exchanges with others on the platform that was partly due to your gender/race?

30. Do you feel your work is judged differently because of your gender?

Appendix C

Supplemental Materials for Chapter 5

C.1 Behaviors Prevalence Charts

Screening Heuristics	**Daters**	**Gig Workers**
Availability of profile photo	80.0%	57.1%*
App profile is not blank	75.0%	58.1%*
Reputation of Meet within networks	4.3%	53.5%*
Enough info in profile for online search	34.3%	53.9%*
Personality or identity characteristics	79.3%	27.6%*
Perceived socio-economic status of Meet	18.6%	21.2%

Table C.1: Screening heuristics used to decide whether to meet someone in-person. Proportions shown are out of total number of people who answered the question. * indicates a significant difference between the two samples (alpha = 0.05). All data is from re-fielded samples.

C.2 Survey Instrument

Linked is a PDF version of our survey instrument, including both original

Self-Disclosure	Daters	Gig Workers
In online dating profile	35.1%	22.6%*
In online or text conversation	40.4%	15.2%*
On a date	23.9%	12.9%*

Table C.2: Self-disclosure methods used. Proportions shown are out of the total number of people who answered the question. * indicates a significant difference between the two samples (alpha = 0.05). Daters data is from original sample, gig workers data is from re-fielded sample.

Where people omit personal info	Daters	Gig Workers
In online profile within app	42.7%	16.6%*
In online or text conversation	34.5%	31.0%
During an in-person meeting	23.4%	22.0%

Table C.3: Where in the interaction people omit personal info. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05)

Methods used to obfuscate information	Daters	Gig Workers
Removing online profiles	14.9%	12.4%
Censoring images & personal info	8.7%	4.4%
Using burner phone & email for contact	19.1%	31.9%*

Table C.4: How people obfuscate information about themselves. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05)

Where people present inaccurate info	Daters	Gig Workers
In online profile within app	17.4%	6.7%*
In online or text conversation	20.2%	14.9%
During an in-person meeting	11.6%	13.5%

Table C.5: Where in the interaction people present inaccurate information about themselves. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05)

Vetting Strategies	Daters	Gig Workers
Search Engine	72.1%	88.0%*
Background Check / Court Record Search	13.8%	12.8%
Social media lookup	70.6%	41.8%*
Network: Online	6.2%	12.3%*
Network: Offline	28.6%	24.2%
Ask for PII directly	20.7%	13.4%*

Table C.6: Strategies for vetting. Proportions shown are among those who vet. * indicates a significant difference between the two samples (alpha = 0.05).

Info sought	Daters	Gig Workers
Personal info	36.4%	29.1%
Additional media	78.0%	47.7%*
Location	33.1%	34.9%
Reputation	20.3%	59.9%*
Personality	33.1%	22.7%

Table C.7: Information sought during vetting. Proportions shown are among those who vet and answered the question. * indicates a significant difference between the two samples (alpha = 0.05). All data is from re-fielded samples.

Environmental Precautions	Daters	Gig Workers
Bringing protective items to meeting	16.5%	16.6%
Advanced planning	18.0%	27.5%*
Selectively choosing time & location	62.4%	51.4%*
Not going alone	17.1%	20.2%
Personal behavior changes	29.0%	19.1%*

Table C.8: Environmental precautions people engage in. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05).

Covering Strategies	Daters	Gig Workers
Sharing location details	74.5%	84.5%*
Sharing details about Meet	37.1%	48.6%*
Sharing expected time back	48.7%	63.9%*
Ask someone to check in	35.0%	30.4%

Table C.9: Covering behaviors people engage in. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05).

Covering: Who Share	Daters	Gig Workers
Friend	91.4%	64.2%*
Family	18.5%	26.0%*
Roommate	30.2%	17.3%*
Co-Worker	8.1%	8.3%

Table C.10: Who people share details of the meeting location and the Meet with. Proportions shown are among those who cover and answered the questions. * indicates a significant difference between the two samples (alpha = 0.05).

Emergency Plans	Daters	Gig Workers
Person will call me	83.4%	75.9%
Person will come get me	64.4%	56.5%
Person will contact the police	44.9%	62.5%*
Person will contact an organization	0.976%	0.463%

Table C.11: What emergency plans people make with trusted individuals. Proportions shown are among those who cover and answered the question. * indicates a significant difference between the two samples (alpha = 0.05)

Info sent during meeting	Daters	Gig Workers
A distress text/silent call/silent alarm	12.3%	6.4%*
GPS coordinates/other location details	14.2%	17.7%
Audio or video recording	5.5%	4.7%
Personal details about person you are meeting	14.6%	10.0%

Table C.12: Information people share with a trusted individual during the meeting if it becomes unsafe. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05)

Alarms used	Daters	Gig Workers
Played an audible alarm or panic button	4.0%	4.4%
Had someone (or app) give you a fake call	27.0%	12.9%*

Table C.13: The types of alarms people use when a meeting becomes unsafe. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05)

Technologies	Key features
Noonlight	share details about meeting location and time, create a safety network of friends & family to alert, silently call for help.
Kitestring	periodic check-ins, create a safety network of friends & family to alert
Circle of 6/Circulo	share details about meeting location, send fake phone call, create a safety network to ask for help
Flare	detects physical safety incident (e.g. fall), alerts emergency contacts
invisaWear	wearable that can text GPS location to emergency contacts upon triggered, alerts local emergency officials
Athena	wearable that can text GPS location to emergency contacts upon triggered
Birdie	personal safety alarm with flashing light
Sabre	share details about meting location and time with contacts, contact local emergency officials

Table C.14: List of emergency alert apps we included in our survey.

Surveillance strategies	Daters	Gig Workers
Record interactions (e.g. conversation)	2.3%	6.9%*
Live-share location with someone	30.0%	37.9%*

Table C.15: The surveillance behaviors people engage in. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05)

Negative experience reporting	Daters	Gig Workers
Report to platform	29.2%	49.3%*
Report to police	9.7%	10.3%
Report to safety organization	6.3%	8.5%
Report to other entity	1.0%	0.90%

Table C.16: Percentage of people who have had a negative experience who report that person to some authority. Proportions shown are among those who have had at least one negative experience. * indicates a significant difference between the two samples (alpha = 0.05)

Reporting: offline whisper networks	Daters	Gig Workers
Friends	83.8%	65.9%*
Acquaintances	13.7%	16.2%
Co-Workers	16.6%	20.4%
Family	34.1%	54.3%*
Other	0.63%	1.1%

Table C.17: Percentage of people who tell offline whisper networks about negative experiences with a Meet. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05)

Reporting: online whisper networks	Daters	Gig Workers
Social network for dating or gig work community	10.7%	29.0%*
General social network	7.1%	12.4%
Messaging group for dating or gig work community	10.7%	8.8%
General messaging group	7.9%	7.8%
Public “bad date” list	4.3%	10.6%

Table C.18: Percentage of people who tell online whisper networks about negative experiences with a Meet. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05). All data is from re-fielded samples.

Blocking behaviors	Daters	Gig Workers
On the app	39.9%	27.3%*
On social media	44.5%	19.1%*
Blocking from call/text/message	42.6%	25.5%*

Table C.19: Percentage of people who block the person they met with following a negative experience on various digital sites. Proportions shown are among those who answered the question. * indicates a significant difference between the two samples (alpha = 0.05)

and re-fielded questions. Kindly note that this contains survey options for both user populations observed in the study (i.e. daters and gig workers).

C.3 Respondent Demographics

Gender		
	Daters	Gig workers
Woman	46.0%	49.2%
Man	49.8%	48.1%
Agender	<1%	<1%
Genderqueer	1.47%	<1%
Non-binary	2.94%	1.33%
Other	<1%	<1%
Prefer not to say	0%	<1%

Education		
Less than high school graduate	1.26%	<1%
High school graduate	16.2%	11.8%
Some college, no degree	26.3%	28.2%
Associate's degree	8.61%	9.31%
Bachelor's degree	35.3%	38.1%
Advanced degree (e.g. master's, doctorate)	12.4%	12.0%

Ethnicity		
American Indian or Alaska Native	3.57%	2.22%
Asian or Asian American	8.19%	12.4%
Black or African American	9.66%	15.1%
Hispanic or Latino	10.7%	12.6%
Native Hawaiian or Pacific Islander	<1%	<1%
White	74.2%	66.1%
Other	<1%	<1%
Prefer not to say	<1%	<1%

Table C.20: Participant demographics