

Understanding Human Enactment of Technology on Digital Labor Platforms

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Abstract

This study examines gig workers' interactions with digital platforms to reveal how workers see technology in relation to their conduct of work. Gig workers are paid labors who find short-term tasks or projects through a digital labor platform (DLP) that connects clients and workers. Workers are intertwined with technologies in gig work. On DLPs such as Uber, tensions arise between humans and algorithmic management. Yet, our understanding of worker perceptions of DLP technologies remains limited. This study focuses on place-based gig work of delivery and grocery shopping (e.g., Instacart, Postmates) and draws upon sociomateriality research to reveal workers' perceptions. Analysis of worker narratives revealed three themes related to worker enactments of technology on DLPs (affording, constraining, and seeking alternatives) and two co-existing, contradictory identities of technology (aid vs. obstacle). The dual relations suggest new dimensions of sociomateriality on DLPs and offer practical implications on the digitalization of work.

Key words: Digital labor platform, platform work, digitalization, gig worker, sociomateriality

1. Introduction

Digital platforms such as Uber and Instacart provide a technology-enabled labor marketplace characterized by the prevalence of short-term contracts or freelance work as opposed to permanent jobs. The paid labors who find short-term tasks or projects through a digital labor platform (DLP) are referred to as gig workers (Kuhn & Galloway, 2019). Technology is essential for the operation of the platform companies. Digital platforms produce a marketplace by aggregating demand and supply while performing duties of an organization (i.e., task oversight and administrative support) (Möhlmann et al., 2020). Likewise, technology is essential for gig workers to conduct their work on digital platforms. Gig workers have found their daily work increasingly inseparable from technology (i.e., apps and mobile

computer devices). In the gig economy, a new kind of flexible structure replaces the fixed employer-employee relationship in traditional organizations, and on-demand apps such as Uber and Instacart automate key business processes ranging from assigning work to disbursing pay (Gandini, 2019).

The close coupling of technology and humans on the digital labor platforms motivates us to examine the relationship between humans and technologies, i.e., how the gig workers identify the variety of technology artifacts (e.g., platform, app, and smartphone) in relation to their work and work performance. In traditional organizations, technology facilitates work processes and influences the experiences and perceptions of employees. Research has shown that information technology (IT) was able to change organizational work processes and practices and influence the identity of its users in relation to technology artifacts (Lamb & Davidson, 2005) and even to challenge existing identities, cause loss of control, and generate user resistance (Alvarez, 2008). Even though employees held the same work roles and interacted with the same enterprise technology such as enterprise resource planning (ERP) systems, their perceptions of and experiences with the technology artifacts led to the formation of different identities, which influenced their work performance (Boudreau & Robey, 2005; Stein et al., 2013).

However, digital labor platforms have transformed the landscape of our workplace. Such platforms apply data-driven algorithms to automatically manage transactions between thousands of gig workers and their clients. One common concern in the technology-mediated and technology-managed work environment is information asymmetry (Rosenblat & Stark, 2016): workers lack understanding about how algorithms on DLPs make important work-related decisions such as assigning work and evaluating workers (Möhlmann et al., 2020). Moreover, workers encounter difficulty using some technologies on the platforms, giving rise to worker frustration on DLPs (Strunk et al., 2022). When working through the platforms, workers find it difficult for them to gain control of their work performance. However, they do not always perceive

the algorithmic management as a negative factor in their work conduct (Wiener et al., 2021). Unlike employees working with technology in an organizational setting (Alvarez, 2008; Boudreau & Robey, 2005; Stein et al., 2013), gig workers are freelancers who independently interact with a variety of technology (Gandini, 2019; Kuhn & Galloway, 2019). The design of the digital labor platforms leads to the conclusion that human and technology artifacts do not exist independently of each other; workers and their technology devices and applications are intertwined in the performance of every piece of gig work. Such a new gig work environment characterized by the complexity of technology and the close coupling of technology and humans has highlighted an urgency for us to examine workers' interactions with technology on DLPs.

Thus, in this study, we examine gig workers' use of technology on digital platforms and reveal how workers see technology in relation to their conduct of work. Specifically, this study addresses the research question: *How do gig workers enact technology to perform work through digital labor platforms?*

We view an enactment as an interaction between a user and technology: humans may use technology as it is designed or intended, or they may improvise and use the technology in an unintended manner, consistent with prior research (Orlikowski & Scott, 2008). To inform our data analysis and interpretation of the findings, we adopt the research on sociomateriality (e.g., Orlikowski & Scott, 2008) that argues the interdependence of humans and technological artifacts.

The study focuses on workers participating in place-based gig work through digital labor platforms for delivery and grocery shopping. For the place-based gig work, each completion requires activities that are both situated in a physical location and through a digital medium. Through interviews, fifteen workers from multiple digital labor platforms (Instacart, Postmates, and others) shared their daily work experiences with the platform technology. Analysis of their narratives revealed three key themes (affording, constraining, and seeking alternatives) on worker enactments of IT and two co-existing, contradictory identities of technology (aid vs. obstacle) that the workers perceived in relation to their gig work. Research contributions are discussed.

2. Investigative context: Digital labor platforms

Digital labor platforms vary in the type of work the platforms support, ranging from fully digitized work to space-based work. Some platforms, such as Amazon Mechanical Turk (MTurk) and Upwork,

enable the completion and delivery of digitized work such as graphic design or computer programming (Deng & Joshi, 2016; Taylor & Joshi, 2019). Other platforms (e.g., Uber) facilitate work requiring physical labor, such as transporting a passenger (Möhlmann et al., 2020). Digitized activities can often be completed anytime from anywhere, whereas manual tasks, such as driving, will generally be completed in a specific place at a specific time. Thus, gig work on (or through) digital platforms has shown different levels of digitization in its work elements, i.e., work equipment, task assignment, performance evaluation, and administrative support etc.

The variability in work digitalization has given rise to differing levels of technical capabilities embedded in different platforms. For highly digitized work, such as graphic design or computer coding, a platform (e.g., MTurk, Upwork) digitizes most of the work-related tasks, from task search to task completion and delivery (Deng & Joshi, 2016, Tylor & Joshi, 2019). However, for work that requires space and time-specific services (e.g., ridesharing), a platform often digitizes some administrative tasks, such as using an algorithm to do a dispatcher's job and using an online payment disbursing service to do an accountant's job (Möhlmann et al., 2020), but the transportation services are provided in person by physical labor using physical assets such as vehicles.

Digital variability exists in different types of crowd-based work. In their recent editorial, Joshi, Taylor, and Deng (2022) call for future research of DLPs to account for digital variability across platforms. They define digital variability as "the variations in online platforms that are primarily determined by the degree to which the work elements are digitized, i.e., programmed and codified on the platform (e.g., digitalization of tasks, assets, governance, and support services)" (p.7). The digital variability across the online labor platforms affects worker behaviors and how workers perceive their interactions with a platform. The power of the platforms in the platform design (both technical and processual) affects workers' perceptions of the lack of workplace fairness, leading to worker frustration (Fieseler et al., 2019).

Research has paid increasing attention to worker concerns and work conditions on DLPs. Some researchers focus on task design and financial compensation. For example, by surveying individuals on 23 German crowd working platforms, Durward and colleagues (2020) study how the nature of the performed tasks and the financial compensation jointly shape the work perceptions of crowdworkers. Their study shows that the workers need rather high levels of financial compensation before they consider

task characteristics relevant for shaping their favorable perceptions of working conditions. Some researchers examine the relationship between worker effort (such as time spent on the platform work) and earnings as an increasing portion of gig workers rely on gig work and DLPs for the major source of family income. For example, Margaryan (2019) reports that 25% are working more than 40 hours per week. Even though gig workers report long working hours (e.g., more than 40 hours per week), some of those hours are idle time when workers are not generating income (Carmody & Fortuin, 2019).

Technical problems have also emerged as one dominant antecedent to worker frustration in their conduct of work on DLPs (Strunk et al., 2022). It is important for DLPs to facilitate workers' enactment of their platform technology because such support will likely improve gig workers' on-the-job experience and satisfaction. Prior studies have examined the role of technology in worker experiences and behaviors on the digital platforms. Some research shows the benefits of the technology-enabled work environment for workers, e.g., affording considerable job autonomy and work flexibility (Deng & Joshi, 2016; Taylor & Joshi, 2019). However, other research has revealed the contrasting effects of the digital platforms on worker outcomes. For example, a study of MTurk workers shows that the digital platform creates opportunities for power asymmetry and worker exploitation on the platforms (Deng et al., 2016). Meanwhile, a study of Uber drivers' perceptions reveals Uber's employment of algorithms for two purposes—matching and control—to optimize matching and meet market needs led to platform workers' experiencing tensions relating to execution, compensation, and belonging (Möhlmann et al., 2020).

Although informative, prior studies on worker interaction with technology on DLPs do not focus on workers' problems with platform technology and workers' coping strategies. To enhance our understanding in this regard, this study focuses on worker experiences in using technology on DLPs for delivery and grocery shopping (e.g., Instacart, Postmates). In such place-based gig work, workers provide the required transportation tools or equipment (i.e., car, gas, GPS, mobile app) to deliver meals and shop for groceries. A deeper engagement with the platform work context requires a study to articulate its perspective (Joshi et al., 2022). In our study, we adopt the perspective on the interactions between worker and platform, the two key stakeholders in gig work.

We believe that applying the sociomateriality lens to our study context, technology use by gig workers, allows us to further investigate the interactions between humans and technology artifacts, helping to

explain how gig workers relate to the material properties of technology on DLPs.

3. Theoretical Background

Sociomateriality is a perspective from which to study technology in organizations. It implies that organizations, humans, and technology exist in interaction with each other: material objects are integral to human activities while human activities define the functions of material objects (Leonardi, 2013; Orlikowski & Scott, 2008). The relational view of sociomateriality considers organizations as constituting different sociomaterial practices that are produced from the interactions among material objects (e.g., digital functions, features, and algorithms), human activities, and social processes such as organizational policies, norms, and discourses (Orlikowski & Scott, 2008).

According to the sociomateriality perspective, we should focus on the materiality of technology and how such materiality enables or constrains human activities. The materiality of technology is defined as the “arrangements of an artifact's physical and digital materials into particular forms that endure across differences in pace and time” (Leonardi, 2013; p. 69). In this view, materials can be both physical and digital. For information technologies, the materials of technology are characterized by physical properties such as the hardware and networking devices and by digital properties such as the functions and algorithms.

Researchers have applied the sociomateriality perspective to the study of technology in organizations: they pay attention to the conceptualization of enactment, i.e., the use of technology's material artifacts to produce work outcomes (Leonardi & Barley, 2010). An enactment is associated with two possible outcomes: humans may use technology as intended by its design or improvise an unintended use of the technology. Revealing individuals' intentions (not necessarily the designers' intentions) for employing technology artifacts shows that individuals exercise the freedom to choose how to enact organizational practices by relating social processes (policies, norms) to material objects of technology through their own interpretation of both (Orlikowski & Scott, 2008).

In the flexible, on-demand structure of gig work and contractual relationship with the platform companies, gig workers will likely interpret their relationship with technology differently from those in the traditional organizations with fixed employer-employee relationships (e.g., Stein et al., 2013). For example, a study of food delivery gig work adopts the perspective of sociomateriality and shows us how

workers participating on a large Chinese service platform, Meituan Dianping, managed stacked multiple orders in sociomaterial negotiations in space and time (Wu & Zheng, 2020). In this study, we focus on the materiality of technology in platform work and attempt to reveal the nuances in individual enactments and interpretations of technology artifacts and social processes on the digital platforms.

4. Method

Our research objective is to understand how gig workers (human agents) made sense of their relationship with a set of technologies on the digital platforms through analyzing their narratives on how they use the material artifacts of technology (physical properties, digital capabilities and limitations) in their work activities. Thus, we adopt an interpretive perspective (Walsham, 1993) and draw upon research on sociomateriality (Leonardi, 2013; Orlikowski & Scott, 2008).

4.1. Data collection

The data collection was completed during the period of May to September 2020. Only U.S. workers on food and grocery delivery platforms were interviewed. In total, we conducted 15 semi-structured interviews, all of which were recorded and transcribed. Four participants (P1- P4) were interviewed via phone and the remaining 11 participants (P5-P15) were interviewed via Zoom. Each interview lasted 30-45 minutes, and each participant received a \$25 Amazon gift card to compensate them for their time. Four respondents were recruited in a snowball sample and 11 respondents were recruited after individuals completed an online survey where they expressed willingness to participate in an in-depth interview.

We asked respondents open-ended questions about their routine use of the platforms to conduct daily work, such as how they set up work schedules and what their work experiences were like (e.g., setting up work schedules, picking up orders/riders, or learning about using the app for income). We also asked about their experiences specific to the app/platform, with questions like “What is your overall experience with the digital platform (the app)?”, “What do you like about the app/platform? What do you dislike?”, and “What do you wish to have on the app/platform?” We also asked respondents about their motivations for using the app/platform: “Why did you start working for this app/platform?” We also collected their demographic background information, such as age, gender, household income, and employment status.

During the challenging times of the coronavirus (COVID-19) pandemic in 2020, we were only able to complete 15 interviews from multiple platforms. Nevertheless, we believe our data are detailed and rich enough to provide interesting insights into the relation between technology and humans in the emerging platform work environment. Moreover, we adopted an open interview protocol, probing and encouraging participants to provide detailed description of their encounters with an app/platform, which has facilitated the unfolding of technology-related practices through the participants’ storytelling.

The 15 participants include five Instacart shoppers, five Postmates workers, and five from other platforms (DoorDash, Uber Eats, Scripts and Grubhub). They came from different age groups, ethnicities, and family backgrounds, and had different employment statuses. However, among the 15 participants, those working on delivery platforms (Postmates, Instacart) were mostly white or Hispanic/Latino female.

4.2. Data analysis

To code and analyze our data, we first examined the five elements of a narrative: *act* (what was done); *scene* (when or where it was done); *agent* (who did it); *agency* (how did they do it), and *purpose* (why did they do it) (Myers, 2009). Then, we focused on an act that involved both technology and humans (such as completing a delivery order) and the outcome of the act to understand the agency (how each act was performed) and the expressed identity of the humans (workers) toward the technology. When we analyzed the data from the 15 interviews, we reached the saturation point at the tenth interview.

Coding categories and examples are presented in Table 1. The respondents’ names listed in the table and in the paper are pseudonyms to ensure confidentiality.

Table 1. Coding categories and examples	
Coding categories	Examples of quotes
(1)-Enactment of technology features as intended: Material property of technology <i>supports</i> human activities.	“It’s pretty intuitive, I think. You can see products pretty easily and the way the things are kind of grouped together making sense between categories and things.” (Instacart: Lisa)
(2)- Enactment of technology as improvised: Material property of technology <i>constrains</i> human activities.	“None of those drop-down options [on the App] applied to my situation [the Walmart order had been picked up by another worker]. You have to complete it. So I just marked [the app option] that I picked it up, even though I didn’t pick it up.” (Postmates: Marlene)

(3)-Value creation for workers: Simplicity, ease of use, convenience	"It's pretty clear and easy to understand. So, it's very simple to follow along with." (Instacart: Lisa)
(4)-Value creation for workers: To break the deadlock in the algorithm and be able to accept new jobs	"I can't get any more rides until I complete that one." (Postmates: Marlene)
(5)-Worker identity in relation to technology: Subordinate-supervisor (monitoring/control relationship)	"There's got to be a person to clear this up. But there isn't. . . Just me and the App." (Postmates: Marlene)
(6)-Worker identity in relation to technology: Allies (co-operative relationship)	"What I like with that is they show you a map of where your stops are before so you can pick." (Postmates: Amanda)

5. Findings

Analysis of the participants' narratives revealed technology as an integral part of their daily routines. Individual interaction with the material properties of technology started when they opened the app to view available jobs (orders) at that moment for their specific locations. The material properties of the technology (i.e., app and other mobile devices) that matter to the workers are those properties (both physical and digital) that enable or constrain the functions of the app. Overall, our data analysis revealed three themes on the interactions between social processes by the workers and material properties of technology, and two types of relationships co-existing among workers across different digital platforms.

5.1. Material properties of technology that afforded human activities

When the material properties of the technology were used as intended by the technology design, workers found value from their enactment of the properties, as is evidenced by worker enactment of technical functionalities built into the platforms and apps. Applying the material properties of technology in carrying out their delivery work, workers became more appreciative of the convenience and simplicity of the digital platforms. These perceptions are reflected in the remarks below:

I like [the App] that I can just click on the [App] – it navigates right from the app. I don't have to copy and paste and try and mess between Google Maps and the Postmates app. Yes. It just pulls it right up. Opening, it's just simple. [Postmates: Laura]

The App Is convenient; everything's in one spot. It's not like a separate app for picking up the orders, as it is for, like, checking my earnings for

the week, or past orders, it's all in the same app. [Instacart: Ashley]

As shown above, the workers perceived the material properties of the app as being easy to understand and simple to use. More importantly, they appreciated the properties of the app, that "everything is in one spot" but is optimized for a mobile device with a "one item at a time" view. Users' values of convenience and simplicity were embedded in the technology as intended by design.

Moreover, by employing the functions of the app in their daily work activities, the workers perceived a new set of values, including safety, gamification, and the meaning of work. For example, with the map feature in the delivery app, Postmates worker Amanda perceived safety from using the technology in her daily delivery routines. Amanda commented:

What I like with that is they show you a map of where your stops are before so you can pick up a restaurant order for delivery. You know how far you're going. I like to be able to pick where I'm going because I am – as a female, I want to be in areas where I feel safe. [Postmates: Amanda]

Another value perceived by workers using the app is gamification: workers experienced excitement when interacting with the app during their daily work routines. Instacart shopper Susan was looking forward to the excitement every morning when Costco orders were released, and she even used the analogy of "gamble" in her narrative. Here is how the Instacart shopper described her experience on the app:

What I like about the app is that when you open it up, you can see what jobs are available close by. If I want to start working at 10:00 because the Costco orders come out at 10:00, I know that . . . I can open the app[and]. . . see the order—it's kind of like "Oh, well, am I going to be able to make any money today?" It's kind of like when you gamble. You get a "Oh, am I going to win or not?" So, it's kind of like you're looking to win the app, getting the good jobs, and when you do get a good one, it's kind of exciting. [Instacart: Susan]

Finally, the value of the work was demonstrated through delivery activities during the time of the study, the COVID-19 pandemic in 2020. Grocery workers and food delivery workers were considered essential workers during the global health crisis. As a result of the lockdown and shelter-in-place orders across the country, gig workers on delivery platforms were in high demand. These essential workers were able to meet increasing customer needs through using digital platforms. The interplay between technology and humans during the crisis allowed the gig workers, such

as Daniel on the Instacart platform, to realize the meaning of the work. This is reflected in his remark:

Obviously you were putting yourself on the line as a first responder for COVID-19, especially in California. It was a virus city. So when you delivered, people were very grateful. They were giving you stuff; they were giving you face masks, they were giving you alcohol gel, all those types of things. People were being very grateful with you because of what you were doing. [Instacart: Daniel]

The narratives by Daniel and his fellow gig workers demonstrate their role as active agents relying on the functions and instructions on an app to complete each work order, whether it was a job to deliver a hot restaurant meal or a grocery order of 50 items. Under these circumstances, technology became their indispensable aid, one that not only made their job easier and simpler but also made them feel the excitement of a game and meaning of their work. All these experiences resulted from human enactment with the technology as intended.

5.2. Being left alone to fend for oneself: Material properties of technology that constrained human activities

Our data analysis also showed that not all the enactments of technology followed the prescribed procedure. This occurred when the built-in functions of technology did not accommodate a specific work activity or circumstance. As technology design is standardized, it does not necessarily reflect the dynamic, complex customer and business situations on the spot, causing anomalies in the use of digital platforms and apps. For example, workers using the Postmates platform expressed helplessness when the app did not give them an option to remove an ordered item that was unavailable in a local grocery store. Similarly, on the Instacart platform, when an order was completed, a shopper could no longer access the details. This design logic worked well in most circumstances—until a customer disputed an order detail after order completion. Workers' helplessness and frustration in relation to a technical function are evidenced in the two remarks below:

One time, I was sitting waiting for help because one of the items wasn't available. I had to sit and wait on hold for customer support to pull off one of the items, so that I could close it out and deliver. I felt like I lost money sitting there waiting, and there was no kind of compensation for it. I can't take on another job, and I'm sitting there waiting. In that half hour, I could've done

three or four deliveries, but instead I was on hold for a \$4 job. [Postmates; Laura]

[In a grocery store] where you pick and put the orders, you actually scan the barcode of the items. And I had a customer—she was like, "This is not the item that was ordered." Her sister had placed the order to be delivered to her house for their mother. And she goes, "This is not what my sister ordered, she knows this isn't the kind of yogurt we get." I'm like, "I can't pick out any other kind of yogurt; I have to scan the barcode of the item," and I didn't have her order up on my phone anymore because . . . once you close out an order, you can't see the items that were in that order. [Instacart, Ashley]

In the case of Postmates worker Laura, the app did not support the exceptional handling of a pick-up order. As a result, Laura acted as expected, waiting for customer support on the phone to remove the item and clear the order processing. The constraints of technology led to Laura's financial loss, i.e., being put on hold for 30 minutes for a \$4 job. Similarly, in Ashley's case of the "closed-out order" on the Instacart platform, an incongruence arose between the material property of the app (capability to verify a customer's order) and the social practice (the worker verifies an order). Ashley, who held her phone (with the app) standing in a grocery store, could not show proof to the customer because of the missing elements in the technology design. Luckily, Ashley called Instacart customer service, which was able to verify the product that was ordered by the customer and helped Ashley respond to the unhappy customer. Both cases, the "order pick up" and "closed-out order," show the constraints of the material properties of technology on human agents and such constraints are partly due to the lack of considering unexpected situations in a local context.

Human agency is also subject to the constraints caused by technical glitches or system downtime. In this regard, workers shared incidents of their disrupted work routines when the app was down or a technical glitch arose. The remark below illustrates such an incident:

They [Postmates] don't give you a phone number. Now, they have a chat [person] that you can wait for, but if something happens, there's these long, crazy waits. There was a time the app went down, and I was in the middle of the order and had to cancel it, and there was a 180-minute wait on the chat. And plus, they penalize the driver for canceling things, and sometimes you can't help but cancel because the restaurant's closed or they won't make the food. There are all kinds of things that happen, and they just don't give you the

option to do that [cancel an order in emergency situations]. [Postmates: Amanda]

In the above attempt to “cancel an order in limbo” because the app was down, Amanda took the painful approach of waiting for the support person on the online chat to listen to her case and cancel the order for her without a penalty. Otherwise, Amanda may have found herself being penalized with a temporary block before getting access to the next work order. In this case, the human enactment of technology followed the expected social practice (i.e., waiting for an order to be cancelled under special occasions), but the worker paid a high price for such an act, i.e., the opportunity cost of 180 minutes for earning income. Unlike the case of Ashley, when Instacart support was available on the phone, the support by the Postmates app was frustrating to Amanda.

In most cases, workers acted as expected when technical design did not accommodate special circumstances or technical glitches occurred. However, some workers improvised their acts during those usual circumstances. In one case, Instacart shopper Susan found herself playing a game with the app algorithm when the app did not show her available jobs near her actual location. She described her frustration with the app and how she found a workaround solution:

Yeah, the app crashes all the time. So, I live in xx, California, so I'm super close, less than two miles, to Ralph's, Vons, Costco, CVS. I can be there in a couple of minutes. It was frustrating because you knew there were jobs here, but it [the app] was showing me jobs in yy (a different location). I used to have to drive. . . and find where the algorithm saw me as being in my hometown. So it would all of a sudden pop up with jobs in the town near my home. So that's probably my most frustrating thing, is the algorithm that is seeing where you are. [Instacart; Susan]

As described by Susan, it seems that she and the app algorithm were in a constant battle. To make the app show her correct location and provide jobs near that location, Susan had to drive away from her house and then drive back to a nearby area to allow the app to update her job listings. To some extent, Susan's behavior was manipulated by the invisible algorithm. Her enactment of technology in an unintended way was not uncommon among the workers across different digital platforms. Workers showed a variety of improvised acts when the technical design did not accommodate special circumstances or technical glitches occurred. A Walmart pick-up incident described by worker Marlene shows a different kind of human-technology battle with the Postmates platform:

The frustration comes because it's all on an app. I've never talked to a person from Postmates. I've needed, like, help a couple of times, like, there was a glitch in the app or there was[sic] things that came up. For instance, I had showed up to pick up something out of Walmart. . . it [the app] puts it on your screen and says, Okay, this is your order. I went to pick it up. And the Walmart lady was like “Well, somebody already came and picked it up”. And I was like “Well, here it's on my phone. I'm supposed to pick it up.” So I couldn't clear it. None of those drop-down options [on the App] applied to my situation. There's got to be a person to clear this up. But there isn't. . . And I'm like, “Okay, what do I do in this situation?” [Postmates: Marlene]

In the Postmates incident above, there were no options in the drop-down box in the app to accommodate exceptional situations, and no interface existed between humans (Marlene) and the technology (the app) to resolve the issue and allow the worker to continue her activities. At that moment, Marlene sighed, “It was really just me and the app,” and the app was not co-operating: The app showed that the pick-up order was incomplete, but at the physical store the order had been picked up. There was no item for Marlene to pick up but the incomplete status on the app prevented her from accepting the next work assignment. It's like a stalemate in a chess game. To work around the algorithm and to break the deadlock, Marlene took an unusual move:

And I can't get any more rides until I complete that one [the Walmart order that had been picked up]. You have to complete it. So I just marked . . . that I picked it up, even though I didn't pick it up. And then once you have it, you have to actually go to the location the drop off location before you can mark you can complete it. When I've marked I had it, it gave me the address of where to take it. I just drove to the address. So once I was there, I completed it. Walmart makes sure I just signed like, not available, and checked it as complete and then [the app] moves on. But I mean, it shouldn't be that way. [Postmates: Marlene]

In Marlene's thinking, she should not pay for the cost of the app's malfunctioning. When asked about whether she got paid for that delivery and whether it was a real technical glitch, Marlene replied:

Well, I guess it was a glitch in the fact that they assigned it to two people at once. You know, I don't know, either way I collected my money, and I was a little like, sketched out, like, Oh, I wonder if there is, if it's not going to be valid, or they're going to take that one away. But I did. I ended up doing, like, two more that night because then my

queue opened back up and I could accept a delivery. I'm sure I probably did get paid. But then again, I did go there to pick up and I did have to drive to the location. [Postmates: Marlene]

Marlene's improvised use of the app is not uncommon; it has been reported in organizations' implementation of enterprise technology. For example, employees were found working around system constraints in unintended ways, the reinvention of technology use (Boudreau & Robey, 2005). In the enterprise technology context, employees achieved their improvised learning through social influence from project leaders, power users, and peers. Unlike technology use in organizations, workers on the DLPs are left alone to cope with the lack of functionalities or with technology glitches; as the Postmates worker Marlene said, *"It was really just me and the app."* Under this circumstance, gig workers' enactment of technology that imposes constraints on platform-controlled work becomes extremely difficult.

5.3. Seeking alternatives: Using material properties of other technologies to improve platform work conditions

The narratives of gig workers show that they sought out functions of other technologies to allow them to complete their gig work and to satisfy customers. For example, when an item in an Instacart was not available in the store, shoppers contacted customers and suggest alternative items by sending photos. The workers took the initiative to communicate with customers to ensure customer satisfaction, even if they knew this could reduce their earning due to less time for new orders. Instacart worker Daniel, for example, explained how he handled unfillable orders:

My approach was I'm going to talk as much as I can with the customer unless the customer doesn't reply; then, at that point, I'm just going to substitute items. I try to find them cheap [prices for items]. If the customer's replying, I'm just going to send them pictures. "Hey, this is not here, but I have these three options. Which one do you like?" And they were like, thank you so much for calling." [Instacart: Daniel]

As reflected above, Daniel took the initiative to manage the customer relationship. Such emotional labor can directly impact a worker's income (i.e., tips). In addition to using supporting tools (a phone call, text, photos) to improve customer service, workers were also using the tools to cope with customer fraud/scamming to get free groceries. Below Susan details how she used a timestamp camera app to take

pictures of the delivered groceries and send the photos to customers to prove the order was delivered:

There's been a lot of fraud about people not receiving their groceries and trying to get free groceries. So, you have to take pictures yourself that stay on your camera because if you take a picture through Instacart, for some reason, they don't keep the pictures. I have a timestamp camera app that I take a picture of almost everything so that if someone calls and says they didn't get their groceries, then I can send the pictures to the customer through a message and say, "Here's your groceries," so I haven't really had that much of a problem. There's a lot of scamming going on; if you get a big order for, say, a lot of alcohol, a \$500.00 order, you can say, "Oh, I'd better take extra pictures of this because it sounds like a weird order." [Instacart; Susan]

In sum, patterns of continued app use may not be influenced only by how the workers perceive the material properties of these technologies and social influences (e.g., customer requests and scamming) but also by how the workers identify the technologies on the app in relation to their work (e.g., as an aid or as an obstacle). Our data analysis shows that the co-occurrence of the two opposing relationships (aid or obstacle) have been experienced by gig workers on the different DLPs performing different types of space-based gig work (delivery and grocery shopping).

6. Discussion and Implications

How workers view their relationships with the IT artifacts has become an important question in the gig work environment. On the digital labor platforms, workers complete key work processes ranging from task search to pay disbursement. Their daily routines are closely tied with various technology artifacts (i.e., the apps and mobile devices). Among all the work processes, a gig workplace differs significantly from a traditional workplace in the management practices: while employees in organizations are managed by their supervisors, workers in the gig workplace are subject to control by the algorithms embedded on the digital platforms.

Our findings suggest that for gig workers, two technology identities co-exist: they perceived technology as an aid and an obstacle simultaneously. When the material properties of the technology afforded social practices (i.e., the work activities), the workers found the app a tremendous help, making their activities easy, intuitive, safe, exciting, and meaningful. However, when the technical functions were deficient or failed to support practices, the workers found the app an opposing force, obstructing

their continuation of daily work (i.e., cannot accept new orders). Thus, on the DLPs, workers perceived their relations to technology differently from those revealed in the use of organizational IT systems. For example, the study by Stein and colleagues (2013) revealed that employees from the back office of a big consulting firm perceived the technology as having one of five unique professional identities: creator, mediator, teacher, gatekeeper, and agent. Yet, on the DLPs, workers interacted directly with the apps to conduct work activities. Under these circumstances, technology became either an aid or an obstacle to the workers. In the latter case, the workers found themselves interacting with technology in a way not intended by the apps. The dual nature of identity and the complex relationship between workers and platform technology suggest new dimensions of sociomateriality in the study of technology and work.

In our study, workers have a perception of what functions the technological objects (online platforms and apps) are designed to accomplish. However, the unexpected nuances arising in the local places (such as grocery stores or pharmacies) may conflict with the business rules and workflows embedded in the technology design, thus hindering the completion of a delivery order. These problematic cases of human enactment of platform technology are reflected in the example of the duplicate order that caused a deadlock between the worker and the platform app. Our data analysis reveals the human improvisation act of working around the technology to “fool” the technology by marking the order as “complete” so as to move on to the next work order. This is not considered an “intended use” of the technology. Rather, it is a “reinvention” of technology that allows humans to work around the system design (Boudreau & Robey, 2005). It occurred in the human enactment of platform technology when workers in the field could not receive timely technical support from the head office. Our finding echoes the research of location-based platforms in European Union countries that concludes that the time-delay between platform support and workers often leaves the workers to fend for themselves on a local site (De Groen et al., 2018).

The worker experience of interacting with technology may differ depending on the particular service type, be it microtask crowdwork such as on MTurk, ride sharing using Uber and Lyft, or delivery services such as Instacart and Postmates. We argue that the broad challenges arising in the individual enactment of technology discussed above apply to all types of services, but with different facets. On DLPs for remote work such as MTurk, one key element of workers’ fairness perception is the evaluation and acceptance of their digitized work, as the platform

allows requesters to reject work deemed unsatisfactory and withhold payment with only minimal or no explanation (Fieseler et al., 2019). However, on the DLPs for place-based work such as food and grocery delivery, one key factor that negatively affected workers’ income capability was the idle time resulting from resolving unexpected situations not supported by the material properties of the platform technology, as reflected in the “Order pick up” and “Closed out order” cases. Without sufficient technical support readily available on the site, gig workers were left coping with the apps by “reinventing” technology use.

Prior sociomateriality perspective suggests the focus on materiality of technology and its enabling or constraining effect on human activities and work outcomes (Leonardi, 2013; Leonardi & Barley, 2010). Our study of gig workers’ enactment of technology shows a range of platform governance mechanisms embedded in the apps, which automatically manage work practices, such as the “closed-out orders” or “duplicate orders,” in a rigid way. The embedded platform governance affected the workers’ choices and use of technical features on the apps. In this regard, our findings pivot to the importance of platform governance, extending our understanding of sociomateriality perspective on the new environment of platform-mediated and enabled gig work. Broadly speaking, this emphasis reflects the relational view of sociomateriality that consider material objects, human activities, and organizational as integral parts to produce different sociomaterial practices in organizations (Orlikowski & Scott, 2008). Moreover, our study points out the heterogeneity in the policies and norms embedded on different digital platforms, calling for deeper engagement with the nature of task and context of work through different platforms.

7. Concluding Remarks

Our paper has made an initial attempt to unpack complex interdependencies stemming from platform-oriented actor (human and technology) interactions (Kapoor et al., 2021). However, we would like to acknowledge the small data sample (e.g., 15 interviews) and a potential bias inherent in the data sample. Another limitation of the study is the focus on one type of digital labor platforms, the platforms for delivery and grocery shopping. To account for digital variability across digital platforms (Joshi et al., 2022), future research with larger data sample collected from different types of platforms would allow us to have a deeper engagement with the gig work context. Meanwhile, adopting theoretical lens of affordance and identity is a promising avenue to provide further insights in this important area of inquiry.

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