

Gigified Knowledge Work: Understanding Knowledge Gaps When Knowledge Work and On-Demand Work Intersect

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Online freelance platforms can transform knowledge work. However, ‘gigification’ also presents challenges, including how freelance workers can access and work with knowledge, which prior research has not examined. Through a qualitative interview study, we identify disparities in how freelancers who work for enterprise companies are able to utilize knowledge as part of their work, when compared with traditional employees of similar organizations. We examine how 38 knowledge workers (21 freelancers, 17 employees) deploy knowledge, work skillfully and mobilize resources to meet knowledge needs. We find that both employees and freelancers understand their own ability to act knowledgeably as a dynamic, collaborative, negotiated and emergent accomplishment. However, for freelancers, the dynamic dimensions of knowledge work - such as helping others see the meaning and value of their work, and creating ties between their work and the enterprise - are only minimally-legitimized and minimally-supported by organizing structures and tools. We present our results as ‘knowledge gaps’, and propose design recommendations to reduce these gaps and consequently make on-demand knowledge work more effective and sustainable.

CCS Concepts: • **Human-centered computing** → **Empirical studies in HCI**.

Additional Key Words and Phrases: Gig Economy; Freelance Work; Knowledge Work; Organizational Knowledge; Social Capital

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1 INTRODUCTION

Knowledge work is changing. Knowledge work is: “the acquisition, creation, packaging, or application of knowledge. Characterized by variety and exception rather than routine, it is performed by professional or technical workers with a high level of skill and expertise” [20]. The growth of online freelance platforms, such as Upwork [102], TopTal [100] and Fiverr [29], offers new opportunities for knowledge work. Jobs previously accomplished by enterprise employees, or contracted out to specialist organizations, can instead be accomplished by freelancers and employees working

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together, mediated via online platforms. These freelancers (sometimes called ‘gig workers’ or ‘on-demand workers’) are self-employed, and hired and remunerated on a task-by-task basis. They perform skilled macro-tasks such as video production and software development. For workers, platforms promise new work opportunities, and flexible working hours and locations [25]. Additionally, enterprises save time and costs [93] through fast hiring and on-boarding, and rapidly scaling human resources in response to business needs [30, 64]. However, these new possibilities require freelancers to build new relationships with the enterprise, including its people and knowledge, and the freelance platform itself. Here, we examine how freelance knowledge workers are able to utilize knowledge and work with others to accomplish their working goals.

Knowledge in general, and organizational knowledge in particular, are fundamental to working well. Organizational knowledge is not only the outputs that are purposefully generated through work (e.g., patents, reports, other deliverables), but also, “the codes (rules, formal and informal procedures and policies, mental maps, and so on) and routines (strategies for performing complex tasks) that guide organizational action” [80]. Existing research in HCI (Human-Computer Interaction) and CSCW (Computer-Supported Cooperative Work) has examined how workers create, share and apply organizational knowledge, demonstrating needs, practices and challenges [1, 3, 4, 9, 21, 22, 41, 76, 81, 84, 92]. However, existing research primarily examines employees, who are legally entitled to certain benefits (e.g., holiday pay, sick pay) and have easy access to enterprise resources (e.g., physical locations, professional relationships, digital tools). In contrast, freelancers are ‘outsiders’ who work with enterprise clients ‘on demand’ [37, 49, 65, 85]. Although prior research has examined on-demand work, these studies mainly examine labor issues in ride-hailing and micro-task work [6, 35, 39, 59, 88, 89]. Papers examining on-demand knowledge work are relatively few [45, 52, 56]. Thus, the CSCW community has a limited understanding of the intersection between knowledge work and on-demand work.

On the one hand, there are unanswered questions about what *productivity* and *collaboration* look like for freelance knowledge workers. Their outsider status and the individuated nature of on-demand work are likely to impact freelancers’ ability to create, share and apply organizational knowledge. These factors also challenge traditional notions of productivity and collaboration, which focus on the ratio of work outputs over inputs [82], and coordination, communication and sustained relationships [19] respectively. Simultaneously, prior research has criticized online freelance platforms for exacerbating the precarity (i.e., unpredictability, uncertainty, insecurity) that workers experience, through increased financial instability, loss of autonomy, and limited professional growth (e.g., [26, 30]). This work demonstrates that precarity can manifest in different ways and can have different implications for gig workers (see [95]). For example, Kalleberg and Dunn [54] are critical of the variability in the quality (worker control over job content, timing, terms, and wages) of jobs in the gig economy, and the lack of social safety-net benefits (e.g., minimum wage, health, retirement, unemployment insurance), which can leave workers vulnerable to insecurity. Similarly, Sutherland and colleagues [95] demonstrate how online freelancing entails critical challenges - such as a lack of direction, stability and steady work - which increase uncertainty for freelancers, and for which freelancers must develop critical literacies to navigate. Likewise, examining challenges in online labour markets relative to the pandemic arising from the spread of COVID-19, Stephany et al. [91] outline increased challenges due to greater competition, low commitment between worker and employer, lack of employment benefits such as healthcare, and increased scarcity of jobs due to more people seeking online freelance work. Accordingly, Ohrvik-Stott and Miller’s [26] framework of “better work” demonstrates how precarious work in the gig economy can entail financial instability, reductions in dignity and autonomy, and limited ability to plan for the future. Nevertheless, there is limited understanding of how such vulnerabilities might manifest for freelance knowledge workers.

In sum, prior research indicates that on-demand platforms and freelance knowledge work entail concerns about productivity, collaboration and precarity. However, research in CSCW is yet to examine the shape of these concerns for freelance knowledge work, and their implications for *freelance knowledge workers* and tool design. Here we seek to address this gap by asking: How do freelance knowledge workers utilize knowledge to get work done on the one hand, while guarding against precarious work conditions on the other?

We examine how freelance knowledge workers are able to build, share and apply knowledge to get work done and compare their experiences to those of employees. Through interviews with freelance and employed knowledge workers, we generate a series of ‘knowledge gaps’ (i.e., disparities in the ways workers are able to access, use and share knowledge [99, 104]) and use these gaps as a basis to examine how freelance platforms can support sustainable and productive knowledge work, including how to facilitate inclusive collaboration and financial security for freelancers. We find there are different types of organizational knowledge at play. First, for freelancers and employees alike, there is the knowledge pertaining to the *hiring organization* (i.e., the client for freelancers): rather than a difference in knowledge needs or challenges *per se*, participants described a difference in the resources and practices that they could mobilize to work knowledgeably. Second, freelancers uniquely deploy organizational knowledge relating to the *freelance platform* as an organizing structure for work: freelancers described how they worked knowledgeably within the platform’s structure to balance client needs and goals with their own. In particular, freelancers characterized how their desires to obtain fair pay for labour, to utilize their full expertise, and to achieve longer-term career goals, were bound up with the platform, as well as the resources and practices that could be deployed for work, and in turn, shaped their vulnerability to precarious work. However, they also described how these desires could be supported through the development of organizational knowledge about how to work with the platform’s structure and the hiring organization. We draw on these results to explore design implications for platforms that seek to support effective and sustainable freelance knowledge work. We suggest ways to support collaborative, negotiated and emergent knowledge processes between freelancers, hiring organizations and employees. Thus, our key contributions are in detailing: (1) differences in the types of organizational knowledge deployed by freelance and employed knowledge workers; (2) differences in the ways freelance and employed knowledge workers enact knowledge for work; and (3) design implications to help freelance knowledge workers utilize organizational knowledge, and consequently help reduce identified knowledge gaps.

We continue by outlining existing research examining organizational knowledge, on-demand knowledge work and knowledge gaps (Related Work). We then describe our interview method and analytic strategy (Methods), before outlining the results from our thematic analysis (Results). We close by considering our work’s theoretical and design implications (Discussion).

2 RELATED WORK

2.1 Knowledge in the Enterprise

Knowledge is fundamental for work. Workers need to know about the resources that can facilitate work, how to collaborate with others, and they need the skills to create deliverables. Accordingly, research in CSCW and beyond has examined how organizational knowledge supports work (for review see [2]).

First, research demonstrates how the structure of knowledge is different from data and information [22, 101]. Knowledge, for instance, has explicit, implicit and tacit dimensions, which represent whether knowledge can be - and has been - articulated: Explicit knowledge has already been

articulated, implicit knowledge has not been articulated yet, whereas tacit knowledge is impossible to articulate [71]. Accordingly, Nonaka and colleagues' seminal work [72–75] examining the creation of organizational knowledge demonstrates that the transformation of tacit knowledge to explicit knowledge is integral to turning knowledge into an organizational resource. Similarly, procedural knowledge (practical ability or skill, also called 'know how') and declarative knowledge (descriptions of things, also called 'know about') have been identified as important, but distinct types of knowledge that impact work [101, 110]. Likewise, Blackler [10] provides a comprehensive critique of popular approaches to categorizing and examining organizational knowledge. Reviewing research in organization studies, Blackler identifies five categories of knowledge: 'Embrained' knowledge represents knowledge that depends on cognitive skills and abilities (analogous to 'know about'); 'embodied' knowledge is action-oriented knowledge dependent on physical presence and practical thinking, such as users' in-the-moment interpretations of technology during interaction; 'encultured' knowledge entails socialization and acculturation processes that achieve shared understandings; 'embedded' knowledge is situated in systematic routines and relationships, such as the relationship between roles and formal procedures; and 'encoded' knowledge is captured in signs, symbols and artefacts such as books and manuals. Nevertheless, Blackler also critiques these perspectives, instead suggesting that research should turn to examine 'knowing' as an active, mediated and contested process that people do. Together, this work emphasizes the culturally situated systems, processes and changes that are central to knowledge generation and knowing. Thus, although some of these papers have a tendency to conceptualize knowledge as a static and compartmentalized resource that exists 'out there', they provide useful frameworks to consider how knowledge shows up in work, and furthermore demonstrate the need to examine how knowing is practically accomplished.

Moving beyond broad definitions, field studies demonstrate the importance of *social structure, social capital, relationships and interactions*. They demonstrate the collaborative and social challenges that are bound-up with utilizing knowledge for work [2, 4]. For example, Ackerman and Halverson's [3] study examined how organizational memories were used by workers in a telephone hotline; they found that processes, artefacts and memories are important places where knowledge lives. Likewise, Normak and Randall [76] demonstrated how local expertise about geography, community and resource availability were socially distributed across patients and workers in an emergency call centre, but effectively combined to enable help-giving. Orlikowski's [78, 79] practice perspective similarly conceptualizes knowledge as an enacted social accomplishment. Going further, there is a large body of work that examines the informal 'communities of practice' (self-organized groups that share common work roles and context) that exist within organizations. In particular, how organizational knowledge is bound-up with social capital, which describes the resources (e.g., familiarity, trust, shared language) that groups of individuals draw upon to deliver value to their organization [62]. Social capital can be understood from two perspectives. On the one hand, a network perspective (e.g., [34, 109]) focuses on how social capital functions to create ties between individuals: bonding social capital entails horizontal ties within a group of people who are strongly connected (e.g., members of a community); bridging social capital describes ties between groups; and linking social capital describes relationships between individuals at different levels of social hierarchy. Simultaneously, the social structural perspective (e.g., [70]) focuses on how the dimensions of social capital can be understood by considering its source: structural social capital describes the availability of a network of people and other resources; cognitive social capital entails the subjective and shared understanding that enables resources to be exchanged; and relational social capital is shared feelings of trust within a network that support resource exchange. Importantly, existing work demonstrates that social capital manifests in various ways to support organizational knowledge, such as by helping people identify others who have relevant

knowledge, reducing the time it takes to make connections or evaluate expertise, helping people reach agreements and make decisions, and by supporting the generation and sharing of knowledge artefacts [62]. Taken together, these papers demonstrate the social dimensions of knowledge, and how knowledgeability and human action are integral to working well. Therefore, although the focus is on employees, prior work indicates that knowledge is not merely an external resource, rather it is a social practice enacted through work.

Regarding technical explorations, researchers have designed many different tools to assist work by supporting knowledge flow. For example, organizational memory tools such as Answer Garden [5] are designed to help workers externalize their expertise and share it with others via repositories. In contrast to externalized repositories, expertise recommendation (sometimes called expertise locating) systems (e.g., Expertise Recommender [67]) are designed to help information seekers solve problems by recommending knowledgeable others who can share their expertise. A further category - 'workflow management' tools - support the procedural dimensions of knowledge, such as TaskNavigator [42], which helps users to structure knowledge-intensive work through tasks and delegation. Thus, various tools have been designed to address the knowledge challenges that workers face.

Nevertheless, prior research examining organizational knowledge has primarily examined employees. Consequently, existing tools are largely unable to facilitate knowledge sharing across organizational boundaries, which is integral for on-demand knowledge work. In the next section, we outline research that has examined on-demand work, although this research is yet to examine organizational knowledge.

2.2 On-Demand Knowledge Work

Whilst HCI and CSCW research has predominately examined micro-tasks workers [49, 58, 65, 106] and ride-sharing drivers [17, 35, 55, 59], our work focuses on the understudied area [44] of knowledge work mediated by online on-demand labour platforms [94]. These platforms enable enterprise clients to connect with online workers who provide on-demand knowledge work, such as macro-tasks on online freelancing platforms (e.g., Upwork, Fiverr), or micro-tasks on crowdworking platforms (e.g., Amazon Mechanical Turk, Appen) [47].

Platforms provide freelancers with finite tasks of a pre-determined duration, rather than full-time employment [108]. Thus, macro-tasks tend to be knowledge-intensive projects performed over a longer duration of time, requiring specialized knowledge and skills [33], whereas micro-tasks are shorter duration and often described as fragmented and deskilled [60]. Standing in contrast to micro-task platforms, and due to the complexity of macro-tasks, clients cannot be algorithmically matched to freelancers [53, 107].

Instead, macro-work platforms rely on 'algorithmic management' in the form of ratings and reputation [59, 86]. Combined with algorithmic ranking, freelancers who maintain a higher rating are positioned higher within search results and are consequently allocated more work [107]. Therefore, freelancers experience high levels of competition for work, having to bid for jobs as soon as they are made available [107]. As a result, freelancers navigate the algorithmic management exercised by the platform by developing new practices and literacies [59], such as learning how to maintain good ratings and build relationships with clients [95]. In the absence of these literacies, freelancers can experience job precarity due to intentional information asymmetry [86]. Therefore, freelancers are required to have an in-depth understanding of the platforms' technological features and guidelines.

Recent work in HCI has started to examine how freelance knowledge workers experience macro-task platforms. [16] identified challenges around freelancer autonomy, precarity and cultivating a network of clients due to issues such as platforms acting as gatekeepers between freelancer and

clients, a lack of employment benefits, and power imbalances in rating systems. However, this paper did not take an in-depth examination of the ways that knowledge was deployed and enacted in this context. A broader base of relevant work in CSCW has examined how ‘digital nomads’ perform knowledge work. Like freelancers, digital nomads are neither tied to physical location nor employer. However, standing in contrast to freelancers, digital nomads are not necessarily hired via online freelance platforms. Existing research demonstrates that digital nomads’ needs and experiences are different to those of employees. For example, Erickson et al. contrast digital nomads and employees, and demonstrate that their differences go beyond employment status, work location and benefits [28]. How work gets done is fundamentally reconfigured, which has implications for tool design [27, 51]. Accordingly, Houben et al. argue that mobile knowledge workers engage in ‘configuration work’, a type of meta-work in order to negotiate the knowledge that is distributed across multiple applications, services, and devices [43]. Similarly, Jarrahi et al. identify lack of interoperability amongst various technologies as a key constraint that necessitates such extraneous ‘configuration work’ [51]. These workers work with different clients often at the same time which, in turn, requires them to balance their personal preferences for specific applications, tools and services with those of the client for the collaboration to be accomplished smoothly. In turn, these workers need to learn to overcome infrastructural disconnects by acquiring ‘infrastructural competence’ to accomplish their work [27]. Thus, prior work not only indicates how knowledge is organized differently for freelancers compared to employees, it also indicates that knowledge requirements vary due to different ‘employer’ expectations and job demands.

Outside of CSCW, research has increasingly examined the sustainability of on-demand work. It demonstrates that sustainability entails important knowledge components. On the one hand, research has demonstrated information asymmetries between freelancers and employees. For example, enterprise clients have access to a range of information about workers (e.g., ratings, feedback, hours worked), whilst workers have limited information about the clients and the job (e.g., budget and a brief description of the project) [36]. Simultaneously, research has demonstrated how knowledge feeds into broader sustainability challenges. Although freelancing platforms can support workers’ career transition and entrepreneurial skill development [11], research is increasingly critical about a growing ‘Uberization’ of the workforce [40] and has called for an examination of the precarity and vulnerability of on-demand work [7].

Existing research has demonstrated that although certain vulnerabilities are *financial* - due to greater costs (e.g., equipment, training, subscriptions) and reduced rewards (e.g., sick pay, holiday pay, protection from low demand) associated with on-demand work - other vulnerabilities are bound-up with knowledge. For example, platforms risk reducing worker *dignity and autonomy* by eroding the importance of experience and expertise through simplistic tasks, one-sided communication and revenge ratings. Similarly, many freelancers are unable to *plan for the future* due to a lack of knowledge about demand and pay over time, and simplistic tasks and worker-borne costs that disincentivize professional development [26]. Freelance platforms have even been criticized for ‘dumbing down’ organizations and economies [30]. Although these papers do not consider knowledge workers in detail, they indicate that knowledge is an important factor for enabling sustainable on-demand work. Likewise, they demonstrate how safety nets can be designed to improve the security of on-demand work [26].

In sum, CSCW research is yet to examine how freelance knowledge workers: (1) work effectively to get work done, and (2) guard against vulnerabilities associated with on-demand work. We consider how these workers put knowledge into practice to navigate these concerns while completing skilled macro-tasks for the Upwork platform. Through interviews, we examine freelance knowledge workers’ own understandings and descriptions of how they use knowledge for work, and compare

their experiences to employed knowledge workers. We present our results through the lens of ‘knowledge gaps’.

2.3 Knowledge Gaps

Social power and action are based, in part, on the spread and possession of knowledge. However, knowledge is rarely equitably distributed in a social system: typically, there are groups who have lots of knowledge, and groups who chronically have less. These disparities are called ‘knowledge gaps’ [99], and research has examined their nature, effect on decision making, and how they might be bridged. Although primarily focusing on socio-economic status and mass media communications, existing research has demonstrated that knowledge inequalities lead to important power differentials that affect how social systems are able to equitably serve their members’ needs [99, 104]. Here we draw on the knowledge gap concept to examine how knowledge is differently deployed and enacted by knowledge workers in different contexts (i.e., freelancers vs. employees). Specifically, we consider how freelance knowledge workers act knowledgeably to advance their aims in a context of knowledge and power asymmetries between themselves, the hiring organization and freelance platform.

3 METHODS

To explore how freelancers and employees utilize knowledge for work, and to identify disparities in how these groups can access and deploy knowledge, we undertook in-depth qualitative interviews with freelancers and employees.

3.1 Participants

As knowledge work encompasses a wide range of occupations and is completed across the globe, we sought participants from a variety of professional backgrounds, geographical regions and who had worked for a range of hiring organizations. Despite this heterogeneity, all participants were knowledge workers who had worked for large multinational organizations. Thus their work entailed remote collaboration with colleagues in different time zones, geographical regions, and cultural backgrounds. All participants spoke, and were interviewed in, English.

Freelancers ($n = 21$) were recruited by advertising the study as a ‘job’ on Upwork, which is the world’s largest online freelance marketplace [103]. Inclusion criteria for freelance participants was completion of at least one paid job for a specific multinational organization, which had headquarters in the USA, via Upwork. Freelancers had diverse backgrounds (e.g., software development, research, audio production, video editing, marketing, copywriting). Typical tasks included designing business presentations, creating e-learning videos, ghost writing articles for social media, conducting market research, and producing and editing podcasts. Interviews lasted around 50 minutes and participants were compensated \$50. All freelancer interviews were conducted by the second author.

Employees ($n = 17$) were employed by one of three multinational organizations, which had headquarters in UK and Europe. Employees were recruited by advertising the study through a contact in their employing organization. Employees had diverse backgrounds (e.g., software development, data analysis, sales and marketing, research) and described various tasks that were typical for their work including creating presentations and learning materials, conducting client research, and producing and editing videos. Because the interviews took place during normal working hours with permission from the employing organization, no compensation was provided for participation. All employee interviews were conducted by the first author. See Table 1 for participant demographics.

Table 1. Participant Demographics

Participant No.	Gender	Location	Professional Background/ Area of Expertise	Worker Status	Experience in years (Freelancing/Employed by organization)
F1	M	US	Design	Freelancer	10
F2	W	US	Technical Writing/Email Marketing	Freelancer	2
F3	M	US	Voiceover	Freelancer	15
F4	W	US	Writing	Freelancer	20
F5	W	US	Business Consultancy/Financial Modelling	Freelancer	10
F6	M	US	Writing/Editing	Freelancer	3
F7	M	US	Software Development	Freelancer	3
F8	M	US	Video Production	Freelancer	10
F9	M	US	Content Creation/ Animation	Freelancer	20
F10	M	US	Translation and Software Localization	Freelancer	12
F11	W	US	Writing/Editing	Freelancer	1.5
F12	M	US	Audio Production/Engineering	Freelancer	5
F13	M	India	Graphic Design	Freelancer	13
F14	W	US	Motion Graphics/Visual Effects	Freelancer	3
F15	W	India	Academic Research/Statistical Modelling/Writing	Freelancer	3
F16	W	US	Graphic Design/Animation	Freelancer	14
F17	M	US	Video Production	Freelancer	4
F18	M	India	Design	Freelancer	6
F19	W	US	Marketing/CRM	Freelancer	10
F20	M	India	Market Research and Design	Freelancer	3
F21	M	India	Design/Content Creation	Freelancer	3
E1	W	Ireland	Data Science/Statistical Modelling/Analytics	Employee	5
E2	W	Ireland	Product Management	Employee	20
E3	M	Ireland	Research/Analytics	Employee	3
E4	M	Ireland	Sales/Marketing/Leadership	Employee	22
E5	M	Ireland	Product Management	Employee	3
E6	M	Ireland	Business Consultancy	Employee	1
E7	M	France	Software Development	Employee	2
E8	M	France	Software Architect	Employee	20
E9	M	France	Project Management	Employee	20
E10	W	France	Functional Assistant	Employee	13
E11	M	France	Software Development	Employee	21
E12	M	France	Software Development/Leadership	Employee	16
E13	M	UK	Software Development/Leadership	Employee	1
E14	W	UK	Digital Transformation/Leadership	Employee	3
E15	M	US	Research/Leadership	Employee	16
E16	M	UK	Software Development	Employee	1
E17	M	UK	Software Development	Employee	1

3.2 Procedure

Interviews were semi-structured and conducted either face-to-face or via videoconferencing software. All interviews followed the same interview schedule, with five topics. Topic 1, *finding out about the work you do in your job*, asked about daily work activities, highlights and challenges (e.g., “can you tell me about your job”). Topic 2, *working in an enterprise setting*, aimed to find out how participants’ work fit into a broader enterprise, including with tools and other workers (e.g., “can you give me a recent example of when working with others went particularly well”). After providing a description of knowledge as: “any type of information that is relevant to the business; for example, information about processes, projects, partners, clients”, Topic 3 asked *how you produce, use and share knowledge at work* (e.g., “how do you draw on knowledge from others”). To test the

authors' assumptions about knowledge, Topic 4 focused on *how you understand knowledge as a concept, applied to organizations* (e.g., "what does knowledge mean to you", "how do you establish validity"). Topic 5 aimed to *find out about any salient missing information* (e.g., "is there anything else that you wanted to say about your work or knowledge that you feel like you haven't had the opportunity to say"). The interview concluded with thanks and a debrief. All interviews were audio recorded, transcribed verbatim and analyzed using reflexive thematic analysis [12, 14].

3.3 Analytic Strategy

Transcripts from freelancers' and employees' interviews were analyzed separately, using reflexive thematic analysis [12–14, 97], by the second and first authors respectively. The analytic process involved the six iterative phases of reflexive thematic analysis (data familiarisation, generating codes, constructing themes, reviewing potential themes, defining and naming themes, report production), outlined by Braun, Clarke and colleagues [12, 13, 97]. Themes were generated inductively (i.e., bottom-up) primarily at the semantic level, which is in the explicit meaning of speech. A critical realist approach was employed for analysis [66]. Critical realism recognizes that participants interact with a real world, which their concepts, theories and language refer to. However, rather than suggesting participants provide an 'objective' perspective, critical realism accepts their accounts as their own understanding of the world constructed from their own perspectives.

After initial coding, the separate analyses were triangulated and a qualitative comparison [38] was performed to generate knowledge gaps in four steps: (1) During freelance data collection, the first and second authors held weekly meetings to discuss interview content; (2) first author read a sub-sample of the freelance transcripts; (3) first author read freelance analysis; and (4) all authors participated in workshops to discuss the separate analyses, and generate, iterate and refine knowledge gaps. For the workshops themselves, the first and second authors shared their own understandings about the general organization of work for each of the participant groups (e.g., working practice, processes, resources, challenges, tools, contacts, collaborators). Similarly, they shared their understandings of the range of different knowledge types and processes (e.g., sharing knowledge, building knowledge, generating knowledge, combining knowledge) utilized by participants. To ground understanding, these discussions were supported by sharing thematic analysis themes, quotes and examples throughout, which were shared verbally and in writing through a collaborative working document. All authors asked clarifying, critical and probing questions to enable shared understanding, and in turn discussed their own perceptions of similarities and differences between the groups to enable a foundation for consensus building.

The aim of qualitative comparison is to deepen an understanding of the issue at hand, rather than provide objectivity or validation [23, 31, 32]. It can aid understanding of lived experiences and processes, and deepen the view a researcher can gain by studying one group alone [63]. The use of a comparative group is particularly beneficial because it enables participants to share experiences without being asked to make comparisons, and avoids the researcher making comparisons based on their own implicit socio-cultural perspectives [69]. To ensure similar conditions across data collection events, qualitative comparison requires semi-structured interview guides that contain the same questions [38]. Prior research has employed qualitative comparison in different ways. Comparison is particularly prominent in health research, which normally carefully matches samples in order to identify and develop medical services, and to identify high-risk groups for service delivery [63]. However, matched samples are not always required, even in health research [8, 24]. Moreover, qualitative comparison is increasingly being used in the social sciences to examine participant groups in more naturalistic settings without participant matching (for examples see [38]). Accordingly, comparison has recently been utilized to study the world of on-demand work. In a qualitative comparison of two case studies, Tassinari and Maccarrone [96] examined food delivery

couriers working in the gig economy in the UK (Deliveroo) and Italy (Foodora); they demonstrated *common conditions* affecting worker solidarity and collective action across the two contexts, and *diversity in organizational forms* between the cases.

Inspired by the work of Tassinari and Maccarrone [96], the present comparative analysis supports a study of the nexus between similar knowledge work tasks, different contextual conditions (i.e., freelance vs. employee) and the needs and challenges expressed by knowledge workers. It offers a way to theorize about how platform design and working conditions affect knowledge workers' ability to work productively and sustainably in different contexts. We generated two categories, which are the primary knowledge gaps, with three sub-categories in each. Each sub-category was generated from two themes that describe the patterns of shared meaning within the freelancer and employee groups about the ways in which knowledgeable practice was enacted for work (for hierarchy and description see Table 2).

4 RESULTS

This section will begin by describing the shape of knowledge work in the enterprises where the study was conducted. The following two subsections will go through our knowledge gap categories: (1) Shaping and defining knowledge work; and (2) Integrating knowledge. When presenting our results, we include the number of freelancers or employees that presented the described discourses in parentheses (round brackets).

4.1 The Shape of Modern Knowledge Work

Although employed by different organizations, our employees all worked with a mixture of co-located and remote team members. They communicated with each other face-to-face and via computer-mediated technologies. Some employees were members of cross-functional and project-based teams: workers were assigned to a team for the duration of the project (e.g., 12 weeks), after which the team would disband, and workers would join a new team to tackle a new problem. Other employees were members of teams with a more stable lifespan and/or centered around a specific discipline (e.g., an engineering team). Employees performed a mixture of fully remote, partly remote, and fully in-office work, including times based out of their clients' sites. In all cases, team-building events, regular meetings and project planning tools meant that team members were largely aware of each others' knowledge and work. Additionally, many employees (12/17) described working with colleagues, beyond their immediate team, who were spread across time zones. Similarly, some employees (7/17) had team members located in different geographies and time zones.

Freelancers brought a broad basis of enterprise experience to the table. Although recruited on the basis of their work for a specific organization, we found that freelancers had completed tasks for a variety of different enterprise clients. Additionally, many freelance participants worked with repeat clients: Twenty out of twenty-one participants completed at least two tasks for the specific organization that they were recruited on the basis of completing work for. In terms of broader repeat clients, ten out of twenty-one participants said they worked with a specific individual hiring manager time and again. Similarly, many freelance participants (11/21) had previous occupational backgrounds as employees. We learned that enterprises used freelancers to augment the skills and capabilities of employees. Enterprises and hiring managers typically outsourced tasks on an ad-hoc basis. Thus, freelancers came in at a specific point in a team's workflow and for a limited duration, as and when needs arose. Due to the nature of freelance work on the Upwork platform, all freelancers worked fully remotely. Their work involved, *task-oriented* collaboration, with freelancers typically communicating with a *single point-of-contact* in the enterprise. Consequently, their expertise, contribution and workflow were frequently obscured from the wider enterprise.

Working with the enterprise from the ‘outside’, our freelancers described gate-keeping that was largely non-existent for ‘insider’ employees, even those located remotely. As we will proceed to outline, freelancers characterized both the enterprise and the freelance platform as organizing structures for work: both had specific requirements that shaped work. Nevertheless, they defined their relationship with the enterprise as mediated through the platform and the individual who created the task (‘individual client’). Such gate-keeping created dependencies for freelancers because the individual client was the only point of contact for all needs. In contrast, our employees described various points of contact and ways to find help beyond their immediate manager. Interestingly, although freelancers’ work was oriented around tasks, whereas employees’ work was oriented around roles, our participants described performing similar tasks during the course of work. For example, both groups of participants described completing work that involved writing, editing, video production, research, statistical modelling, software development, content creation, design, consultancy, managing customer relations and marketing. In the proceeding analysis we will provide an in-depth account of freelancers’ and employees’ knowledge needs and experiences. Although freelancers and employees shared many similarities, in order to highlight knowledge disparities as challenges to sustainable and productive work we draw on the concept of ‘knowledge gaps’ - which are inequalities in how workers are able to utilize knowledge [99, 104] - to frame our work.

4.2 Knowledge Gaps: Shaping and Defining Knowledge Work

Here, we describe the different ways that workers and the enterprise get a handle on the work that needs to be done. Specifically, we discuss how knowledge work is co-constructed through the interactions between workers and the enterprise. Consistent with research that demonstrates how communities of practice drive the development of organizational knowledge by drawing on social capital (e.g., [62]), employees described how their work was largely understood by the enterprise, and consequently how they were able to draw on ‘networks of expertise’ to get a better understanding of ‘what to do and how to do it’. They also described how the enterprise recognized and supported an open and flexible approach to their work, which enabled employees to shape work bottom-up. In contrast, freelancers described a single-point-of-contact within the enterprise who did not always understand their work. Nevertheless, the job was typically defined *a priori* by the individual client, with freelancers left to adapt their practices to fit with client needs. When freelancers were able to provide input to shape the work, their efforts received limited recognition from the enterprise and freelance platform. Consequently, freelancers were required to spend more time and resources on a job when the enterprise misunderstood their work, leaving productivity and fair pay vulnerable to negative impact.

4.2.1 Knowing what needs to be done. Participants described how the enterprise (mis)understands the tasks that are needed to complete a job, and in turn, the resources workers need to complete those tasks. Employees portrayed the enterprise as largely understanding their work. In contrast, freelancers reported instances of misunderstanding. Furthermore, the resources available to workers when attempting to resolve misunderstandings differed markedly.

Employees’ (15/17) narratives highlighted a nexus of relevant — and readily available - expertise, which was located within the enterprise. Their teams frequently included experienced managers who provided concrete definitions of work (although two managers were described as less helpful due to creating unnecessary work in the first example, and providing abstract descriptions of work in the second). For example, one participant, a scrum master on a development team, described how a key component of his work involved helping others in his team know what to do: “*I’m trying to help and dispatch the work and see how we can expedite things [...] I can unblock them if they are*

stuck." (E7). Project management software (e.g., Jira, DevOps) was often available to make process definitions and task-tracking transparent. In fact, one employee described an enterprise-wide network of subject-matter expertise, which was facilitated by Slack and designed to help "*software engineers and business people knit together*". This network provided help in form of "*philosophies and tools*". It enabled employees to reach out and say: "*Has anyone got any experience of doing this? Can you help me out?*" (E17). Going further, employees (10/17) explained how they could legitimately access expertise from outside the enterprise to help build an understanding of work and required resources. For example, one participant in R&D (Research and Development) described how he would attend "*one or two conferences a year, or participate in a professional organisation*" to learn how to do business collaborations and partnership better, with the aim of bringing the knowledge "*back in-house*" and "*allowing others in our organisation to leverage that*" (E15). Thus, our employees described an ecosystem that largely understood their work, and in turn a network of expertise that they were able to plug into so that they themselves were able to know what needs to be done.

In contrast, freelancers reported working independently and in isolation, with no immediate assistance other than the individual client. This, in turn, shaped freelancers' expectations that the client ought to know and be able to specify what needs to be done: The nature of the task, its fit with broader work activities, and deliverable parameters were characterized as the client's responsibility. A lack of clarity on the client's part was deemed problematic. In particular, open-ended tasks often resulted in 'scope creep' for freelancers (described by 19/21 freelancers), who were not always compensated fairly for the resulting additional workload. For example, one freelancer said:

"I've had some jobs where we agreed on one thing but then they might add something in last minute that could constitute a project increase, but [...] if it's a repeat client it might be something I let go." (F1)

Based on previous encounters, experienced freelancers described developing an early sense of whether scope creep could be an issue with specific projects, which enabled them to adopt strategies to protect their pay, such as charging by the hour rather than by the job. In this way, freelancers could deploy their expertise to guard against some of the risks associated with on-demand knowledge work. As described by one freelancer:

"Usually, when I speak to the client right before taking on the job, I have a pretty good idea if there's going to be a scope creep. It really informs how I bill them. So, any extra work that is beyond the initial scope, is subject to an hourly charge." (F2)

4.2.2 Procedural knowledge about the work. Second, participants characterized how the enterprise and workers come to understand how work is done. Consistent with prior research examining procedural knowledge and know how (e.g., [22, 78, 87]), 'procedural knowledge about the work' entailed an understanding of practices and process, and the required resources to support these things. Both employees and freelancers described scenarios in which they did not know how to do something. However, employees were able to build knowledge of process collaboratively with specialist teams. In contrast, freelancers were functionally prohibited from reaching out to their network or the enterprise for help. In fact, freelancers described needing to educate the client about their process and needs.

Many employees (13/17) described how a significant component of their work involved trying to understand how to get the job done, which was often cognitively difficult and took time. To support this aim, participants drew on their own expertise and engaged in a collaborative process of meaning-making, knowledge exchange and consensus-building with colleagues. For example, a software engineer described being involved in a project that required a contract to be signed for a new technology implementation. He needed to work with the internal legal team to gain

understanding of procedure and risks, and business leaders to sign the contract. Simultaneously, employees (9/17) described how the enterprise sought to understand the procedural dimensions of their work. Specifically, employees were supported by in-house professional service teams who: (1) had expertise around specific areas of the business; and (2) sought to enable the enterprise to focus on its core offerings. Several of our employee participants (9/17) were embedded in teams that sought to understand other employees' job demands and processes, and support their work, such as by providing practical help or new tools. For example, a functional assistant described how she created learning materials to help others, including *"a homepage [with] all the latest materials [...] presentations that might also encompass FAQs, some of the webinar sessions we deliver [...] latest videos"* (E10). In sum, there were times when employees and the enterprise had limited understanding of the procedural dimensions of work *a priori*; however, this knowledge was collaboratively co-constructed with colleagues, and the enterprise delivered resources to support the practice of knowledge work.

For freelancers, the burden of knowing how work is done — and providing support for that work — is transferred largely from the client to the individual freelancer. Freelancers described situations where clients did not know how to get something done (described by 20/21 freelancers) and believed that 'passing the buck' to the freelancer would solve the problem. This invariably led to an impasse due to information asymmetries, freelancers being 'outsiders' to clients' organizations, and clients' limited awareness of freelancers' work. For example, F7 said:

"[...] the lack of knowledge is what makes it very difficult for me to do my job because some clients either think that there's a magic app on the phone that makes videos or that I will just pull an idea out of a hat and say, 'OK. Here you go. Let's work on this.'"

This perhaps illustrates mis-understandings of work process, tools and skill. Freelancers also characterized clients as underestimating requirements for other aspects of procedure, such as task complexity or time required to get the job done. F5 summed up the problem as follows: *"A lot of it is really educating the clients about what I need to give them what they need."*

In this way, freelancers described an asymmetry in which 'getting a task done' was perceived to be a collaborative effort for freelancers, but an 'overhead' for clients. Consequently, freelancers (20/21) described how the ease and efficiency of this 'collaborative effort' depended on their own capacity to educate the enterprise about their work and resource their own work process. This both transferred costs and overheads to freelancers, and stood in contrast to employees' experiences. Nevertheless, there were at least some freelancers who described the ways in which they sought to change their position by drawing on expertise from outside the enterprise, which we discuss later in the paper.

4.2.3 Utilizing workers' knowledge. Third, participants described the opportunities to utilize different types of knowledge in the workplace. Part of this discourse is about utilizing domain expertise from beyond formal work roles. The other component describes the value of different types of knowledge in the workplace. Whereas employees were supported to utilize broader competencies (e.g., strategic planning, improving process, building capabilities), freelancers were primarily valued for narrower and specific skills (e.g., copy writing, programming): freelancers had limited opportunities to utilize broader types of knowledge due to client demand and platform requirements for work to be 'taskified'.

Employees described the different types of knowledge that they bring to bear on work. First, participants (10/17) reported how a history in the organization enabled them to take advantage of a depth of expertise gained through previous experience in the role. For example, a scrum master described how his experience with the project's source code enabled him to assist project planning and troubleshooting: *"I have more experience with the project, I know the code itself [...] I can share to*

[the product owner] what I think will be wrong” (E7). Next, employees (7/17) described opportunities to put into use broader expertise, beyond the domain required by their formal job description. Participants distinguished between their jobs “on paper” and what they were “really doing 95% of the time” (E10). For example, a self-described technology ‘geek’ was made the IT ‘champion’ for his business unit, which later gained formal recognition through the accolade of world IT champion in his organization. He described how his “expert past experience” became a bottom-up stimulus that led him to “try to drive the people to use the tools we have” (E11). Thus, the enterprise was able to utilize a greater proportion of its workers’ knowledge by being responsive to their expertise and experience, and supporting flexibility in work.

In contrast, freelancers described primarily utilizing specific skills for work (21/21), with scarce opportunities for broader competencies. First, freelancers characterized Upwork as an advertising platform and a matching market between clients’ needs and workers’ skills, with client demand the primary organizer of work. This meant that freelancers spent a lot of time looking for the right kind of work. Second, because on-demand work is centered around tasks, freelancers reported limited opportunities for them to engage in complex, longer-term projects or managerial work. Finally, participants’ off-platform work experience was not readily supported by the platform. Although client reviews and ‘badges’ (e.g., ‘rising talent’, ‘top-rated’) were available on Upwork, these mechanisms did not take account of experience outside of the platform, nor could they be transferred to other platforms. This reflects a larger issue of interoperability that was described by participants (11/21).

As an example of these three issues, F9 describes how he spent many years employed as a program manager for a large enterprise before freelancing full-time. He characterized Upwork jobs as “task- and skill-oriented” rather than “project- and experience-oriented”. Thus, he characterized on-demand and traditional knowledge work as different in nature, with a knock-on impact on in-demand competencies:

“[clients look for] a task that needs to be done, or they’re looking for a bargain. And I’m a former program manager. I’ve handled large projects with large teams, and so, the type of work you’d hire me for, I’m not finding as much [...] It also seems like they are still trying to figure out exactly what type of work to hire somebody for through Upwork. Is it going to be just task- and skill-oriented or is it going to be more project- and experience-oriented?”

Moreover, as already outlined in our ‘knowing what needs to be done’ sub-section, opportunities for more management-oriented competencies - such as the organization and definition of work - were often informal and unpaid. Thus, the way that the platform structured ‘work’ restricted the scope for knowledge utilization. Our freelancers’ characterizations of limited applications for knowledge are consistent with prior research that has criticized the gig economy for ‘dumbing down’ work [30]. Similarly, the under-utilization of freelancers’ knowledge through tasks that do not utilize their full expertise could be argued to be a form of underemployment through over-qualification (see also [15]).

4.3 Knowledge Gaps: Integrating Knowledge

The second category that we generated is concerned with the ways in which workers understand their own skills and expertise as bound up with a broader organizational context. Employees described *multiple opportunities to create ties* between their own work and that of their team, other teams and the enterprise as a whole. In contrast, freelancers characterized their work as *decoupled* both from the enterprise, freelancer communities, and their own personal history of work. Nevertheless, freelancers were not completely powerless. They also described strategies

that they engaged in to ensure their work tied into their longer-term professional goals, including repeated hiring by clients and growing their own micro-business.

4.3.1 Knowing the enterprise. A key aspect of the relationship between workers and the enterprise was the workers' knowledge of the enterprise as an organizing structure for work.

Part of employees' (7/17) discourse described how they were able to apply prior knowledge gained in the enterprise to the task at hand. For instance, one analyst was able to accelerate her team's work because she had worked with a stakeholder in the past. Specifically, she described how a previous project led to an insight about a stakeholder's way of working, which she later drew upon in a separate project (involving the same stakeholder) to make recommendations for deriving a financial model. Similarly, employees described how they could apply broader knowledge about the enterprise — such as strategy, career trajectories, procedures and culture — to guide daily work practice and professional growth. There were various ways in which participants gained this broader knowledge, including by engaging with confidential webcasts, public press releases and one-to-one coaching. For example, one participant described an ambient awareness of the other projects happening in the enterprise, even if not personally involved with them: *"Typically, I'm not that much involved. I just know it's happening [...] I know there was something created."* (E11)

Thus, employees described various opportunities where they could gain knowledge from the enterprise and bring it to bear on their work; this knowledge included organizational history, strategy, stakeholders and relationships, policy and culture. Prior work has also noted the importance of knowing the enterprise, although it has tended to focus on organizational identification rather than work trajectories [78].

There was also a discourse that described employees' knowledge of their team and, specifically, how to facilitate collective productivity and effectiveness. Part of this (described by 8/17 employees) involved an effort to understand what team members were doing in order to plan and offer help, for example through daily stand-up meetings, agile methodology (e.g., iteration reviews, backlog grooming), and project planning tools (Jira, DevOps, PowerPoint timelines). In fact, our employee participants (6/17) described scenarios where they would sacrifice their own individual productivity and time to help team members and team success. However, rather than being an extraordinary activity, this was described as an essential and reciprocal element of collaborative work. Similarly, employees (12/17) described more general efforts to create visibility for their team's work to help the enterprise (although this was often associated with challenges such as 'knowing where to share' and the time it takes to 'make knowledge ready for sharing' e.g., due to the need to contextualize information, formalize thoughts and/or remove confidential information). For example one participant described sharing information that could help others on Confluence: *"When we improve something, we update Confluence or create a new page saying here is a new way to do it, or here is a help page to do this kind of stuff"* (E7). Thus, employees described work as a collective accomplishment, with success entailing collaborative workflow and shared concern.

In contrast, freelancers described a lack of knowledge about the client's organizational culture and the broader context of work. F9 stated: *"It's like... here's this one thing and I really don't know what's going on elsewhere"*. Freelancers, therefore, knew little about how a task they completed for a given client might fit into larger workflows or goals (described by 12/21 participants). Moreover, strict limitations were imposed by the platform as well as by clients on whether and how freelancers were able to talk about their previous work. Participants (15/21) reported that they were not allowed to share certain work details due to confidential intellectual property, with freelancers required to sign a non-disclosure agreement (NDA) before accepting the task. Signing the NDA meant that even when working for the same enterprise in future, participants often felt unable to talk about previous experiences or externalize this knowledge into their work. In this way, freelancers had

limited opportunity to re-use enterprise knowledge, which functioned to individuate their work, disconnect the output from the worker, and erect some barriers to cross-project knowledge flows.

4.3.2 *Knowing what you don't already know.* Second, we consider how workers are able to augment their work with new knowledge. Both types of worker described scenarios in which they were required to complete tasks beyond their immediate expertise. Participants outlined opportunities for learning new skills, new job roles and deepening existing expertise. They also described how they drew on others' knowledge to fill gaps in their own.

Employees outlined several courses of action that enabled them to apply new knowledge to complete their work. Participants described how if “*you don't know how to do*” something, they were encouraged to “*find a way to learn it*” by the organization (E10). Learning activities (discussed by 12/17 employees) included: taking time out of the day job to deep dive into a subject and understand the issue; asking a subject matter expert to demonstrate how to do something; or, if a task was sufficiently complex, employees could ask a specialist to do it for them. Participants engaged in different strategies to ensure they knew whom to turn to for help, such as asking a colleague for a contact (described by 8/17 employees), or proactively making efforts to build out professional networks (described by 6/12 employees) during events such as in-house training courses. Interestingly, employees not only described opportunities to harness others' knowledge, but they also characterized these activities as legitimate and supported by the enterprise. Nevertheless, the process of ‘knowing what you don't already know’ was not unproblematic: participants often struggled to find experts and relevant knowledge within the organization.

Freelancers also described a need to acquire new knowledge. However, what was distinct for freelancers was how an online marketplace for work introduced unique requirements for, and challenges to, success. Unlike employees, in the case of ‘not knowing’, freelancers were often unable to get help from others outside the enterprise (described by 12/21). First, tasks were contracted to individuals and ‘sub-contracting’ to others was prohibited by default. Similarly, NDAs restricted how freelancers could seek help from their own networks, as they were unable to share specific work details. Simultaneously, opportunities for in-house support were limited by the decoupled nature of the freelancers' work from the enterprise (described by 18/21 participants). In sum, freelancers described unique learning curves and costs when required to acquire new knowledge because they are functionally on their own, which is consistent with Blackler's [10] research that emphasizes how different organizing structures mediate and change the dynamics of knowing. Nevertheless, freelancers did describe times when they resorted to subcontracting part of a task to other freelancers, such as when they needed particular expertise (such as search engine optimization or copywriting) to get the job done, at the risk of platform penalties or expulsion. In this way, they circumvented contractual and platform restrictions to create their own support networks, and put new knowledge to use in their own work and the enterprise. Collaborating with other freelancers was not just about dividing workload but also filling skill gaps, producing superior deliverables, focusing on favoured aspects of work, and recreating the social dimensions of work, as illustrated by the quote below.

“I am just taking classes to improve my skills [...] With email marketing, I usually ask for help from my colleague [...] I am better at organising the projects and speaking directly to the client, managing it, whereas he is more experienced with technology [...] If we have a project, I will be in contact with him several times a day. But usually it's at least once a week even when we don't.” (F2)

4.3.3 *Knowing how to innovate.* Finally, we consider the practical application of knowledge to deliver value from work. Workers describe whether and how they are able to work in the context

of *organizational goals* and how different goals shape working practice. Whereas employees described opportunities to prioritize - and work collaboratively towards - enterprise goals, freelancers characterized on-demand work as a micro-business that generated its own goals.

For employees, 'knowing how to innovate' entailed understanding the enterprise's context and goals, and acting to drive the enterprise forward. Our participants (9/17) engaged in structured and *ad hoc* strategies to achieve these aims, and characterized top-down direction and transparency as key. For example, a software engineer described how he was able to utilize an objective setting framework similar to OKRs ('objectives and key results') to define and track work objectives and outcomes. He explained how this framework enabled his own work to be driven by a goal that was set by a Senior Vice President and how the system that supported this framework allowed him to see how their objectives aligned: "*We should always be planning our work to deliver against the company objectives, and our objectives, and that should all ladder up*" (E13). In this way, participants constructed notions of innovation and change in the context of the enterprise's goals, and described their task as aligning to these goals, which was made possible by transparency at the organizational level (however, there were also times when this transparency was not available through tools and participants needed to engage in one-on-one discussions instead). Although focused on supporting participation rather than organizational goals, prior work has also identified the importance of knowledge for employee innovation [78].

For freelancers, part of 'knowing how to innovate' was about self-innovation and growth. Freelancers needed to know how to find opportunities, advertise their skills and secure steady work. In this way, an enterprise's goals did not influence what the freelancer was trying to achieve in the longer term. Instead, freelancers described how they decided their own areas for development and growth (20/21), shaped by their perception of in-demand skills (15/21). Consequently, the platform became an organizing structure for professional growth. For example, one participant said:

"There's a huge need right now for content marketing and people who know how to write web-based content. When you are writing web-based content, you need to please the algorithm plus the reader plus the client." (F2)

At the same time, some of our participants (19/21) conceptualized freelancing as a 'micro-business' that they sought to grow. Part of this growth entailed repeat hiring from clients to facilitate financial stability and build long-term professional relationships. It also involved forming professional contacts whom freelancers could subcontract work to, and thereby expand their capacity and move to a managerial or teaching capacity. Thus, for certain freelancers, there was a complex set of organizational dynamics at play, which involved the clients, the platform *and* their own micro-business. Accordingly, freelancers needed to acquire or possess relevant knowledge to manage these dynamics, as demonstrated in the quote below:

"I actually teach other moms how to get started in freelance writing, and one of the things I teach them is how to use Upwork effectively. So, I teach other people how to do the same thing that I do." (F4)

5 DISCUSSION

Our results investigated how knowledge workers deploy organizational knowledge, work skillfully and mobilize resources to meet knowledge needs. We extend prior work describing the information asymmetries between freelancers and employees [36], by highlighting disparities in the ways that freelancers are able to access, share and apply knowledge for work. By examining freelancers we also extend prior research examining organizational knowledge, which focuses on employees (e.g., [3, 76, 78]). We demonstrate that for freelancers there are different types of organizational knowledge at play, which are collectively constructed and enacted dynamically through the process

Table 2. Knowledge gaps, types of knowing, and resources and practices described by workers

Knowledge Gaps	Description	Type of knowing	Different resources and practices		
			Freelancers	vs.	Employees
Shaping and defining knowledge work	How workers and the enterprise understand the meaning and value of work	Knowing what needs to be done	Single point-of-contact	vs.	Networks of expertise
		Procedural knowledge about the work	Educating the enterprise	vs.	Collaborative co-construction
		Utilizing workers' knowledge	Tight, top-down definition of work and role	vs.	Flexible and open work roles
Integrating knowledge	How workers create ties between their own work and the enterprise to create value	Knowing the enterprise	Stand-alone and decoupled work experiences	vs.	Joined-up work trajectory
		Knowing what you don't already know	Organizational restrictions on reaching out to others	vs.	Plugging into others' work is legitimized and supported
		Knowing how to innovate	Microbusiness shaped by diverse stakeholders and concerns	vs.	Work shaped by organizational goals

of work. In particular, we find that although both freelancers and employees utilize knowledge about the hiring organization (or enterprise client), these groups differ in the materials, networks and practices that they can mobilize to work knowledgeably. We also demonstrate how freelancers utilize a unique form of organizational knowledge - pertaining to the freelance platform as an organizing structure for work - to meet their needs and goals. In sum, we demonstrate how freelancers are able to deploy a unique knowledge of the freelance platform as an organizing structure for work, but also have to contend with relatively limited access to knowledge resources that would enable them to balance personal and client goals. In the following subsections, we begin by discussing these differences and the implications for on-demand knowledge work and the design of macro-task freelancing platforms. We complete our discussion by considering the limitations of our research and avenues for future work, before presenting our conclusion.

5.1 Implications of Knowledge Gaps for Work

We found that both freelancers and employees utilized organizational knowledge relating to the enterprise (i.e., client for freelancers) to work productively. In fact, freelancers and employees

described similar knowledge needs and challenges in this context, such as the need to learn new things, know what tasks comprise work, and understand tasks' procedural dimensions. Although not examining freelancers, many needs and challenges identified here have been examined in prior research (for review see [2]). Consequently, rather than a difference in organizational knowledge needs and challenges *per se*, we are interested in the differences between the resources and practices that freelancers and employees could mobilize to work well. Extending prior research, we found that compared to employees, freelancers were able to draw on a limited pool of materials, people and practices. This indicates that while freelancers may have been able to develop adequate levels of human capital (e.g., education, skills, experience) to work well, they potentially have limited social capital in the enterprise, which is the personal relationships, common context and structural networks that underpin success (e.g., [62]).

In particular, we found that freelancers' relationship with the enterprise (including its people, knowledge and other resources) was mediated by the individual client who created the task, which had an impact on knowledge work's collaborative, socially constructed and emergent dimensions (e.g., [10]). The mediated nature of the relationship between the enterprise and freelancer functioned as a form of gate-keeping, which created both *dependencies* and *overheads* for freelancers. Specifically, many freelancers performed unpaid labor through 'scope creep' or helping clients define the task. This finding extends recent research that demonstrates how the job of managing freelancers can create unexpected, and potentially counterproductive, overheads for clients [37, 64]. First, it demonstrates that a mediated relationship between freelancer and enterprise can impact freelancer productivity and fair pay, as freelancers' input increased while output remained the same. The additional workload can also result in longer working hours for the freelancers, reducing often desired temporal flexibility [61, 111]. Simultaneously, it demonstrates how traditional notions of collaboration are re-framed in freelance knowledge work: workers are in a position of lower power than their collaborative partner (i.e., individual client) and are unable to access broader forms of collective support (e.g., networks, professional service teams). In this way, and consistent with a network perspective of social capital and structural hole argument, the hiring manager can potentially be understood to function as a bridging or linking mechanism, which creates a connection between the freelancer and the enterprise (e.g., [34, 109]). These findings are similarly consonant with Blackler's [10] work, which demonstrates the socially constructed and situated nature of knowing as a contested and mediated process that emerges over time through practical collaboration: the relationship between freelancer and enterprise was both mediated and unequal, impacting the practical realities of knowing and knowledge work for the freelancer.

To address these challenges and meet the requirements of on-demand work, we found that freelancers uniquely deployed an organizational knowledge that related to the freelance platform as an organizing structure for work. Specifically, freelancers worked knowledgeably within and around the platform's structure to balance competing needs. This involved knowing how to navigate the platform - including its rules and clients - to *achieve both shorter-term and longer-term goals*. For example, knowing how and when to subvert platform rules by hiring subcontractors in order to grow a micro-business, or knowing which clients should be charged by the hour rather than the job to guard against scope creep. However, there were also times when short-term and longer-term goals could not be reconciled. Here freelancers needed to know when and how to *make trade-offs between immediate financial needs and the promise of longer-term rewards*, such as the freelancer who did not charge for extra work in the hope of maintaining a relationship with a repeat client. Likewise, freelancers needed to know how to *work in the context of platform demand*, for example by learning new skills, or accepting tasks that do not utilize their full expertise. Although much of this knowledge could be gained through experience with the platform, there was also an element of professional clout, which enabled freelancers to successfully push back against organizational

elements of the platform that were more restrictive. This aspect of the results is consistent with research outside of CSCW examining sustainability and precarity in on-demand work. In particular, we can begin to create a conceptualization of better on-demand knowledge work by framing these results in terms of Ohrvik-Stott and Miller's [26] notions of 'financial stability' (e.g., fair pay for labour), 'dignity and autonomy' (e.g., utilizing full expertise, sub-contracting), and 'planning for the future' (e.g., building a micro-business). However, our results also extend this work by demonstrating how organizational knowledge itself can be one form of safety net to guard against vulnerability in on-demand knowledge work.

In sum, our results demonstrate how different types of organizational knowledge can provide a basis for both productive and sustainable freelance knowledge work. However, rather than suggest these differences are 'caused by' - or inherent to - freelance work in and of itself, our results indicate that they are products of the different resources and practices that were available to our workers, which are in turn shaped by the design of the freelance platform, expectations and norms surrounding gig work, and the nature of the contract between the freelancer and client. Specifically, freelance knowledge workers were uniquely required to work within a set of restrictions set by the Upwork platform, and a further set of restraints that were required by the client. In the following subsection we consider design implications for freelance platforms that seek to support organizational knowledge as a basis for better on-demand knowledge work. Consistent with our own results, as well as social and practice-based perspectives on organizational knowledge (e.g., [2, 4, 10, 76, 78, 79]), our design considerations suggest ways to support the collaborative, negotiated and emergent ('dynamic') dimensions of organizational knowledge by helping freelancers develop social capital in hiring organizations.

5.2 Considerations for Reducing Knowledge Gaps

Existing macro-task platforms have made some attempts to improve the productivity and sustainability of on-demand knowledge work by supporting information flow and externalizing records of knowledge. For example, Fiverr [29] supports task definition by allowing clients to categorize jobs and tasks (e.g., as 'voice over' or 'logo design'), and then asking category-specific questions to distinguish client and freelancer contributions. Similarly, Toptal [100] allows freelancers to share blog-posts, which can support career goals by helping them build reputation. Nevertheless, we argue that these features fail to tackle the central issues identified here. It remains the case that freelancers are participating in an unequal freelancer-enterprise relationship, driven top-down by the enterprise and platform, and mediated through a single enterprise contact. Thus, they potentially struggle to develop social capital in the enterprise, and receive limited support for the active generation of new knowledge (e.g., [10, 62, 70]). Consequently, we advocate for designing knowledge mechanisms that facilitate a shift in the freelancer-enterprise relationship: opening it up to enable a more meaningful participation in on-demand knowledge work by freelancers and the enterprise alike. We proceed by considering three key phases of the freelancer-enterprise relationship: First, we consider how the freelance-enterprise relationship is established: specifically, how *co-defining work* through early inclusion of freelancers' knowledge of what needs to be done can guard against scope creep. Next, we discuss how we can improve the visibility of freelancers within the enterprise and expand the freelancer-enterprise relationship by *opening up knowledge networks* to freelancers. Finally, we consider how the freelancer-enterprise relationship can be maintained by enabling freelancers to *build a reputation in the enterprise and beyond* once a job has been completed.

5.2.1 Establishing the freelancer-enterprise relationship. Consistent with prior work demonstrating how knowing is situated, negotiated and emergent (e.g., [10, 76, 78]), our results demonstrate that

a top-down definition of work is limiting. Although this structure might support certain types of on-demand work (e.g., micro-tasks, delivery driving), providing a clear definition of knowledge work is more complex, manifest in issues such as scope creep and unpaid labor. Simultaneously, although freelancers are experts in knowing how their own work is done, this knowledge is not supported in the platform. Thus, we need to *find ways for freelancers and clients to co-define work* prior to the moment when a freelancer is currently assigned a task. One way that this could be achieved is by enabling engagement before a contract is signed, whereby freelancers and clients work collaboratively to specify the job. As part of this process, freelancers could help the client identify gaps in what is needed to do the work, how work should be done, and the resources (e.g., tools, background information, specialist support) that are needed to support work. In terms of resources, these could be provided by the enterprise, the individual freelancer, or sub-contracted out. Importantly, the platform should provide mechanisms to recognize and reward this consultancy work, both through review ratings and actual pay.

5.2.2 Opening up the freelancer-enterprise relationship. Consistent with research that demonstrates how social capital and communities of practice are bound-up with organizational knowledge (e.g., [34, 62, 70, 109]), our results also suggest that gate-keeping and the mediated-nature of the freelancer-enterprise relationship creates challenges for collaborative work. Although communicating with a single point-of-contact in the enterprise might facilitate confidentiality, it also creates overheads for clients and freelancers alike. Thus, we suggest it is important to *find ways to open up knowledge networks to freelancers* for the duration of work. On the one hand, this entails mutual visibility between freelancers and a broader pool of employees, which would enable freelancers to both become more visible in the enterprise and understand how their own contribution fits into the larger scheme of things. For example, open task tracking would enable freelancers and employees to share each other's roadmap and progress. Simultaneously, we need to consider how freelancers can access and benefit from enterprise expertise. In practice, this might mean enabling freelancers to find and access experts who can help their work. This process could be initiated by the enterprise, the individual client or the freelancer; such as if the platform enabled the enterprise to specify a pool of subject-matter experts whom the freelancer could reach out to when they needed help.

5.2.3 Maintaining the freelancer-enterprise relationships. Our results also demonstrate that freelancers are restricted in the ways they can build and maintain ongoing relationships with the enterprise, although repeated hiring is an important professional goal. Due to NDAs, freelancers described limitations on the ways they could re-use knowledge when working with the same enterprise and build reputation to attract new clients. Thus, we argue that we need to find ways to *improve how gig workers can build a reputation in the enterprise and beyond*, whilst maintaining freelancer-enterprise confidentiality. As part of *establishing the freelancer-enterprise relationship*, platforms could enable freelancers and enterprises to negotiate and agree on clauses that would allow them to more openly share prior knowledge, for example if the enterprise wanted to re-hire the freelancer at a later date.

5.3 Limitations and Future Work

Despite these contributions, there were also limitations to our work. First, we - as authors - must engage in the process of acknowledging how our own biases and subjectivity affected study design and our reading of the data. As we are a group of knowledge workers ourselves, who are present and former employees of large organizations, we need to acknowledge our outsider status compared to our core set of freelance participants. We are outsiders both in terms of specific membership of the Upwork platform, and broader membership of the freelance group. Similarly, we need to acknowledge aspects of privilege in comparison to freelance knowledge workers, for example in

terms of relative financial security and predictability of work. Although we cannot remove our subjectivity, or anticipate all of the ways it impacted our results, we have attempted to make our process clear through the process of reflexive thematic analysis outlined by Braun and Clarke [12, 14].

Second, we acknowledge that our study was limited by our sampling in two ways. To begin with, most people in our sample were men, so we cannot be sure of the extent to which our results generalize to gender groups that are under-represented, or not represented, in our sample. This is particularly relevant because prior research indicates that experiences in the gig economy are gendered (e.g., [18, 46]). Next, the geographical distribution of the sample was not balanced across the employee and freelancer groups: the freelancer group was dominated by participants based in the United States and all participants worked for an organization with US headquarters; in contrast, all but one employee participants were based in Europe, and all worked in organizations with European headquarters. Thus, it is unclear whether and how country-level differences may have influenced our results. Prior research provides mixed results on the ways in which country-level factors influence work in the gig economy, and work more generally (e.g., [46, 48, 57, 68, 77, 90, 98, 105, 107]). Thus, there may have been unanticipated country-level effects in our study.

We also compared the experiences of employees who were members of traditional teams and freelancers who had been hired for specific tasks. Thus, we were unable to examine close collaboration between worker types. Anecdotal evidence indicates that there are teams in which freelance and employed knowledge workers collaborate closely (e.g., [83]). However, HCI and CSCW communities still have a limited understanding of freelancers' experiences in these highly collaborative contexts, as well as how to support these efforts. Future research should examine how collaborative knowledge work happens in such hybrid teams, which are characterized by shared deliverables and interdependent workflow.

As an interview study we were only able to explore how participants spoke about knowledge, rather than observe real-world working practice. Similarly, as a qualitative piece of research, we were unable to test the consequences of these knowledge gaps on participants' work. Future research should test whether and how the knowledge gaps identified here affect work, for example by examining when they might inhibit productivity and how they might facilitate freelance work. Specifically, there might be scenarios in which knowing less is beneficial: in other domains, evidence indicates that 'information overload' can be problematic for productivity and collaboration [50].

Finally, it is worth emphasizing that as a cross-sectional and in-depth qualitative study, which only recruited a limited number of freelance participants from one platform, our account of knowledge gaps is not exhaustive. Similarly, we do not argue that all freelance knowledge workers will experience the knowledge gaps generated here. Rather, as a qualitative piece of work we seek to provide an in-depth account of the experiences that were salient to our specific set of research participants at a specific point in time. Nevertheless, the finding that freelance knowledge workers are at risk of being disadvantaged by inequalities in knowledge is more generalizable, as are our recommendations for designing freelance platforms to support productive and sustainable knowledge work. Consequently, future research should examine knowledge workers who provide services via other freelance platforms, for other enterprises, in other industries and in other countries. It could also test how such factors might function as antecedents of knowledge gaps. For instance, longitudinal and quantitative research could be carried out for a systematic examination of how freelancers' knowledge needs change over time and as a function of different work roles and different working contexts; such as differences between more or less experienced workers, differences for workers based in different countries and time zones, and differences based on occupational role.

5.4 Conclusion

We extend research examining organizational knowledge by analyzing how freelance knowledge workers are able to utilize knowledge for work, focusing on disparities between freelancers and employees. Rather than a single organizational knowledge, participants described different types of organizational knowledge that were integral to work, differences in the resources and practices they could mobilize to work knowledgeably, and different knowledge about the work's organizing structures. Our results emphasize the importance of supporting the collaborative, emergent and negotiated dimensions of knowledge work, particularly for freelancers who play an integral - but often unrecognized - role in shaping and defining the work. Likewise, our results are consistent with research that emphasizes the precarity of on-demand work, as our participants were vulnerable to unpaid labor, a simplification of work, and pressure to trade-off between their short-term and longer-term goals. By examining skilled knowledge workers, our research speaks to broader explorations of the future of on-demand work: we bring together research examining how freelancers negotiate the practicalities of task demands with calls to design safety nets for sustainable on-demand work. Specifically, we outline how freelancers can cultivate the knowledge essential for their craft and how platforms can provide mechanisms to support these efforts. Thus, our contributions provide insights for the CSCW community in a world of knowledge work that is increasingly task-based and 'gigified'.

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