

Critically Engaging with Embedded Values through Constrained Technology Design

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ABSTRACT

The rise of gig economy platforms has highlighted the impact platform and algorithm design can have upon workers' experiences. This paper reports on an extended series of collaborative design engagements with a private company and an international non-government organisation during the production of an Interactive Voice Response component for a gig economy platform. We present the findings of a design ethnography undertaken during this process, and discuss how design decisions reflect how each party's values, motivations and assumptions are embedded within the final technology. There exists a need for simple methods to assist practitioners to surface and critically engage with the disparate values, priorities and assumptions held by the system's stakeholders. We demonstrate that this can be done during the production of real-world systems through the application of constrained design as a values lever, and discuss how constraint-based values levers can support critical reflection, even in resource-constrained commercial development contexts.

CCS CONCEPTS

• **Human-centered computing** → **HCI design and evaluation methods**; **User centered design**.

KEYWORDS

values in design, design ethnography, values levers, digital civics

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1 INTRODUCTION

It is essential that designers and engineers have awareness of how their assumptions and priorities are embedded into technology platforms, as such design decisions have the potential to both benefit and hinder a system's stakeholders [52]. The HCI community has introduced and utilised a wide variety of frameworks and methods to surface and critically engage with the values of a system's stakeholders (including its designers), however these are primarily intended for use by HCI researchers: requiring significant time commitments, an understanding of empirical research methods, and sometimes even reviews of philosophical literature [3, 17, 18, 44]. As such, these methods are unlikely to be adopted by small-medium production-focused organisations who often lack dedicated UX designers and research staff [4, 43]. While certain informal practices (dubbed 'values levers') have been shown to serve as effective entry points for value discussions within production-focused settings [43–45], little actionable guidance has so far been provided as to how they can be purposefully and effectively deployed within industry.

This paper works within this space to highlight the particular importance of producing value-centred technologies within the 'gig economy': the use of online platforms to connect customers to workers, an industry which has seen a worldwide explosion in popularity in recent years [27, 49, 53]. The technologies that power the gig economy need to account for and balance the disparate needs of two primary stakeholder groups: their customers (and, in turn, company profit), and their workers (whose requirements may vary, based on context and field of work [10]). The pace at which the gig economy has grown and 'disrupted' markets has presented its own issues and employment law has struggled to keep up [36], resulting in fears of worker exploitation due to a lack of necessary protections and safety nets [6]. While waiting for official legislation and regulation of the gig economy to be introduced, there have been calls for non-state actors—such as unions and NGOs—to negotiate

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formal agreements with gig economy companies, providing short-term benefits to workers and highlighting current issues [36].

This paper directly engages within this context, and presents findings from an extended series of collaborative design engagements with an international advocacy group (pseudonym: ‘NGO’) and a start-up company (‘GigCo’), which runs a gig economy platform for disadvantaged domestic workers in Dhaka, Bangladesh. The product of these engagements is an Interactive Voice Response (IVR) system, designed to connect the predominantly offline domestic workers to GigCo’s digital infrastructure in order to distribute and manage jobs. Using this system as a lens, this paper contributes: (i) the findings of a design ethnography, documenting how the creators’ values, motivations and assumptions are embedded within the system; (ii) a demonstration of how the constraints of a technology medium can act as a values lever for critical reflection; (iii) discussion for how constraint-based values levers can support critical reflection in resource-constrained commercial development contexts.

2 RELATED WORK

2.1 Surfacing Values in Technology Design

The critical analysis of stakeholders’ human values to inform technology design and use has become an increasingly popular research subject within HCI [44], with contexts spanning from social media [12], to education [41] and games [17]. Traditionally, algorithms, platforms and databases have been discussed as if they are ethically neutral, and as a result values-based inquiry has been left outside of the scope of developers’ design practice [43]. As the designs of systems and infrastructures can have implicit or explicit political qualities embedded within them [52], the ethnographic study of such infrastructures can provide insights into designers’ decision-making processes [47]. One of the most influential frameworks for approaching value-conscious design is Value Sensitive Design (VSD): an adaptable, tripartite methodology that uses theoretical, empirical, and technical approaches in combination with a guiding list of suggested values to scaffold philosophical analyses of systems or design spaces [18]. VSD has been previously reconfigured to focus on empirical techniques, such as photo elicitation and defamiliarization, which can assist in the discovery of non-prescribed values [29]. Such probes have been used to aid in the discovery of stakeholders’ goals, priorities, preferences and expectations [17, 50], or to support explicit and implicit discussions of participant values [3]. Other approaches, such as socio-technical integration, utilise research methods such as semi-structured interviews with designers to promote ethical reflection upon design decisions [16].

However, such values-oriented processes are not commonly deployed by small and medium-sized software development teams in commercial settings, given their reliance on specialist research techniques and a common perception of them being slow or unnecessary [43]. Within these environments, designers often act as advocates pushing for human-centred design, often espousing values in tension with their organization’s own interests [11]. Shilton argues that having a ‘values advocate’ within an organisation can be a viable approach, but acknowledges arguments that having a single advocate risks the marginalization of other voices, and that the need for such roles can be difficult to justify to leadership

[8, 32, 44]. While such approaches are effective ways of critically engaging with stakeholders’ values [12], the required time investment and knowledge of literature and methodology (e.g. designing probes, conducting interviews) effectively requires the presence of a researcher—an unreasonable expectation of smaller companies, who are often unlikely to even have dedicated UX designers due to the typical prioritisation of functionality over form, usability, and even ethics [4, 43].

Shilton recommends the use of ‘values levers’: informal practices that call attention to designed infrastructure, serving as effective entry points for value discussions during the process of technology development [43, 44]. Whereas VSD provides grounded reasoning through theoretical, empirical and technical investigations for values-based design decisions, values levers instead act as provocations: prompting moments of reflection and (sometimes emotional) reaction rather than evidence-based reasoning with scientific rigour. While resulting arguments for design rationale may not hold up to academic scrutiny, this is likely to be a non-issue for many within commercial contexts, and is arguably counter-balanced by values levers requiring significantly less work. Examples of such levers include: designers and engineers self-testing their creations and encountering discomfort at how their data is used [43]; designers explaining their decision-making across disciplinary barriers, requiring re-framing and re-examination of practices [44]; and online communities of mobile app developers reflecting upon why technical constraints are put in place by mobile platform holders [45]. Such examples suggest that values levers can be introduced as effective prompts for reflection within a commercial development environment, without the need for interventions by specialist researchers. However, Shilton argues that in order for values levers to exist, they have to be deployed by practices and agents [43]. Outside of the examples given, little research has explored what practices could be used to purposefully deploy values levers within a commercial context to promote the discussion of values and practitioner reflection.

2.2 The Gig Economy & South Asia

To lower costs and support scalability, gig economy platforms typically use algorithmic approaches to automate the allocation of the ‘most suitable’ workers to jobs [53]. In theory, this allows gig work platforms to offer high levels of flexibility and autonomy, as workers can ostensibly have control over when and where they work [6, 10, 53]. The success of ride-sharing and delivery services such as Uber has led to the ‘gig’ model being explored in many other service industries [6]. However, the recent popularity of gig work has prompted both caution and criticism: the industry’s focus on quantified worker ratings and algorithmic assignment has been shown to result in low pay, social isolation, and overwork [53]. Questions have also been raised around whether current employment laws are capable of addressing workers’ needs, such as sickness protection, when applied outside of traditional employment models: adding to fears of exploitation through a ‘race to the bottom’ of cheap pricing and low-cost labour [6, 49].

Nevertheless, gig work has remained popular, particularly in South Asia: India and Bangladesh are amongst the fastest growing

freelancer markets in the world [39]. Ride sharing services are increasingly popular within Bangladesh [27] and their unregulated growth has encouraged tens of thousands of rural and suburban youths to migrate to metropolitan areas, prompting calls for regulatory action [14]. Ahmed argues that those in Bangladesh without access to digital technologies cannot access these new employment opportunities [1], further deepening an existing digital divide and highlighting concerns around workers being underpaid, overworked, and constantly monitored [24]. Minter argues that, while there is a need for governments to introduce enforceable labour standards, this will take time: suggesting that while government solutions are being negotiated, non-state actors should work with gig economy companies on formal agreements to support workers' fair treatment and identify current issues [36].

2.3 HCI & the Gig Economy

The HCI research community's involvement in the gig economy can be traced back to its undiluted form, 'crowdworking', where online workers are given microtasks and paid per acceptable completion. Such platforms have been previously used as cheap and easily accessible sources of research participants (e.g. [34, 35, 38]). While early academic discourse frequently focused on improving such platforms' efficiencies, comparatively little investigation was taken into the workers themselves: their socio-economic status and the impact of the platforms' designs on them [24, 28].

Recent years have seen more critical, values-based analyses: Martin et al. note the dehumanising rhetoric surrounding crowd workers (e.g. '*artificial artificial intelligence*', and '*cogs in the machine*'), and how such terminology makes them easier to regard as 'troublesome components' to be controlled, rather than real human stakeholders worthy of design considerations [33]. A common frustration relating to gig economy platforms is a lack of transparency: the deeper functioning of such systems (e.g. the specifics of work assignment algorithms) is often opaque to the worker, leading to worker frustration and a balance of power in favour of clients and platform holders [33]. Furthermore, gig economy platforms are generally not designed to support communications between workers, which has been identified as one factor limiting gig worker collective bargaining [20]. This weak bargaining power leads to the pace of work being determined by direct demands from clients, heightened by a lack of job security and a frequent over-supply of labour [53]. Lee et al. argue that increased transparency in the assignment process could elicit greater cooperation with work assignments, especially undesirable ones: because the current supply-demand control algorithms do not account for human factors (such as workers' capability and motivations), their use in motivating and controlling human behaviors created distrust of the system in workers [30]. Lee also noted that the practical opacity of a platform's algorithm can lead to workers resorting to speculation and sensemaking through external channels, such as with other workers on social media platforms [30]. Raval & Dourish note that gig platforms' monetisation models frequently erase the distinction of work and 'related work' (such as care labour), and that platforms place workers' own bodies and possessions as the sites of engagement between clients and corporations: placing additional focus

on workers' emotional performance, bodily presence and timeliness [40]. This combination of opaque, quantified evaluation and an apparent accountability for every interaction creates a hyper-awareness of clients' ratings and the potential for psychological stress [30].

Introducing technology interventions without care runs the risk of amplifying existing inequalities amongst workers, or even creating new power dynamics within a given platform's economy [33]. In response to these issues, Alvarez et al. call for a greater worker-centred perspective in the design of gig economy platforms, focusing on transparency, professional development, networking and an avoidance of power asymmetry [10]. Designing the algorithms used by gig economy platforms to manage and assign workers in a human-centred approach will require practical methods of identifying the values and requirements of all stakeholders, including those of the designers and engineers [30].

3 CONTEXT

During this project we (members of an HCI research group based in Australia) entered into a three-way partnership with the Bangladeshi branch of an international NGO (anonymised as 'NGO') and *GigCo* (anonymised), a gig economy startup based in Dhaka, Bangladesh. Full ethical approval was received from our institutional review board before work commenced.

NGO was one of a number of organisations involved in a multi-million dollar international project ('OCP', anonymised) aiming to improve the safety and well-being of Bangladeshi female domestic workers. Domestic workers are typically hired to cook, clean, do laundry or even care for the children of a household. Estimates range between there being 2 million [13] and 4 million [5] domestic workers in Bangladesh, with around 80% being women or girls [5]. Despite their prevalence, domestic work in Bangladesh was only recognised as an informal profession in 2015, with the introduction of the Domestic Workers Protection and Welfare Policy (DWPWP) [26]. Prior to this, domestic workers were not entitled to time off, were not legally assured 'fair' wages (85% live under the poverty line [22]), and there were few legal protections from abuse and harassment within their places of work [23]. However, adherence to these new policies has been inconsistent [25], with a perceived lack of regulatory enforcement and reports of abuse still frequent [51]. Within this context, the OCP project aims to provide female domestic workers with skills training for formal job opportunities, to increase their awareness of their rights, and to support the Bangladesh government's capacity to enforce and monitor the implementation of the DWPWP.

In line with the policies promoting technologically-mediated social interventions in Bangladesh (e.g. [15, 21]), NGO chose to partner with a gig economy company *GigCo* as a part of the OCP project. As discussed, gig economy platforms are increasingly common in Bangladesh [1]. Aiming to be 'the Uber of domestic workers', *GigCo* runs an app-based service through which customers can request a domestic worker through a smartphone app. Whereas other organisations within the OCP project recruited and provided training to domestic workers, *GigCo* provided work for them: configuring their business towards the promotion of the DWPWP by highlighting the workers' rights and implementing platform policies to improve

the women's working conditions. On *GigCo*'s app, the 'About Us' page notes that they '*dream to build an ecosystem where every family employs trained, skilled and verified domestic helpers*' and that they aim to provide a '*secure workplace for millions of domestic helpers through our platform and establish "domestic work" as a dignified profession*'. Taken at face value, *GigCo*'s priorities are to create a platform which would enable them to: i) achieve their commercial goals, and ii) empower domestic workers.

Like many women in Bangladesh, *GigCo*'s domestic workers are subject to a digital divide for which gender and socio-economic status are defining characteristics [19]. Most lack access to a smartphone, typically only having a 'feature phone' which can place calls and send/receive SMS (although low literacy levels render SMS of limited value). As a result, the majority of *GigCo*'s workforce are unable to directly interact with the digital infrastructure to respond to client requests. Because of this, *GigCo* initially utilised 'local guides'—another tier of gig economy workers—whose function was to connect clients to workers by taking orders through the *GigCo* app and forwarding their details to domestic workers using phone calls. However, after several months *GigCo* reflected that local guides would often select workers based primarily on personal preferences, leaving the process open to favouritism.

In late 2020, *GigCo* and *NGO* decided to explore alternative, automated solutions to bridge the domestic workers with the digital infrastructure. They decided to create an Interactive Voice Response (IVR) system: an automated telephone-based system with which callers could interact using phone button presses. An automated IVR system was deemed to be more efficient and objective, as it provided a simple way to assign workers to clients through a consistent, automated decision-making process that would address previous concerns relating to the local guides. As a research team with experience of designing IVR systems and a pre-existing relationship with *NGO*, we offered consultation and advice during the design process of this new system, whilst simultaneously carrying out a design ethnography of the process to reflect on how the values of the three parties (*NGO*, *GigCo* and the research team) were reflected in the design of the IVR system.

4 METHODOLOGY

The primary aim of this study was to understand how the values and motivations of the three partner groups directly influencing the design—*NGO*, *GigCo*, and the research team—were reflected in the design of the IVR system, and shaped by the constraints and possibilities that it offered. To address this aim, the authors undertook a design ethnography: a research approach that provides a critical and reflexive lens to a design process, providing insight into how the entanglement of actors, artefacts and processes within a context shapes design decisions and outcomes [2, 46]. Baskerville and Myers argue that design ethnography builds upon both 'ethnography for design' and 'ethnography to study design': that design ethnographers produce data to inform designs and gain insights into designers and their practices, taking a more active approach which can be both generative as well as descriptive [7]. This approach allowed us to provide consultation and feedback on the design to the other partners, providing them value to their involvement in the research. That said, our goal of gaining an understanding of *GigCo*

and *NGO*'s values and motivations limited the extent to which we could influence the process. For example, when it became clear that *GigCo* and *NGO* would not involve domestic workers in the development of the system, we didn't suggest otherwise: doing so would have significantly affected the rest of the design process beyond being a representation of the two stakeholder groups' values.

Design workshops with *GigCo* and *NGO* were carried out over 11 months (November 2020 - September 2021). These engagements were held online, as *GigCo* and *NGO* were situated in Dhaka, Bangladesh, whilst the researchers were situated in Melbourne, Australia. Travel between these two locations was not possible due to travel restrictions imposed by the Australian government in response to the COVID-19 global pandemic. Research activities involved 12 one-hour online video conferencing design workshops, with at least one researcher and one representative of *GigCo*. An *NGO* representative was present at 8 of these online workshops.

The workshops were carried out over three design phases:

- (1) *Exploratory discussions*, which aimed to understand the various partners and their priorities in this process. In these workshops, each stakeholder shared their specific interest in the process, their motivations for participating, and their intended outcomes. During this stage *GigCo* shared further details about their services, business model, structure and challenges and their underlying motivations for the design and use of this IVR system; whilst *NGO* provided details of the plight of domestic workers they have been supporting through their advocacy work, and their ideas of how the platform could improve the workers' livelihoods (e.g. through financial security and personal safety).
- (2) *Iterative design*, which aimed to develop an initial iteration of the IVR flow that reflected the needs and priorities of *GigCo* and *NGO*. *GigCo* led this phase, producing several iterations of the IVR system design in Microsoft PowerPoint detailing the 'IVR flow': the menus, information and options available to the domestic workers as they interact with the system over the phone (Figure 1). During each workshop *GigCo* shared their screen to walk through the updated designs for discussion and feedback. These visual illustrations prompted more nuanced discussions of the values and motivations underpinning the IVR flow: raising questions around what information should be included (and excluded) by the system, and how included information should then be prioritised. The limited decision-making capacity of the IVR required that any divergent views on content and prioritisation be negotiated, meaning that each party's divergent values and perspectives were surfaced and negotiated during these discussions.
- (3) *An operational prototype*, which aimed to actualise and test the IVR process. In-lieu of a fully automated IVR system, *GigCo* used human call operators who followed the algorithmic recommendations and the designed IVR script to contact and interact with the domestic workers. Dubbed the 'Human IVR', this stage reproduced a 'Wizard of Oz'-style prototype, supplanting all local guides who had previously been employed by the company. Workshop discussions during this stage focused on this prototype's implementation, how

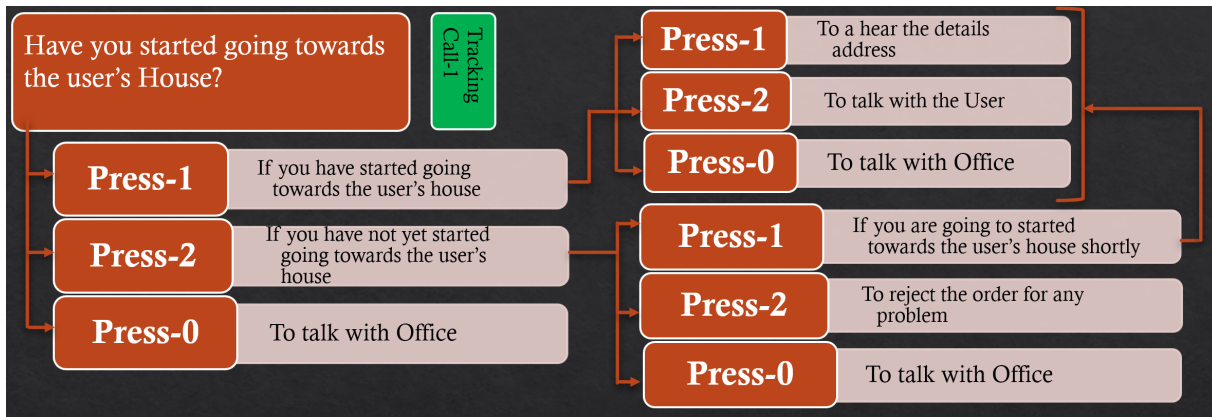


Figure 1: The final design of one of the IVR menus, created by GigCo in Microsoft Powerpoint.

it was performing, and what feedback *GigCo* had received about it from the domestic workers.

A design ethnographer on the research team introduced an additional reflexive lens to these workshops to explore how the priorities and values of each stakeholder were reflected in discussions, and how priorities were negotiated and reflected in design decisions. This research was carried out through observations of the workshops (or workshop recordings), and semi-structured interview discussions both during or after the workshops.

4.1 Data collection and analysis

In order to portray how the values and motivations of the design partners impacted the IVR's design, this paper uses the produced artefact as a lens through which we go on to discuss how the values and priorities of each design partner were negotiated and represented, and how such findings had practical consequences in the final design. As such, our analysis particularly focused on the decisions and negotiations surrounding the system's key features. Data used in the analysis included: (i) recordings of workshop discussions and interviews that were transcribed; (ii) notes taken by researchers during workshops; and (iii) visual diagrams of the iterations of the IVR flow (e.g. Figure 1).

Data analysis involved three iterative stages: (i) the final IVR flow design was analysed to identify the specific points in a job cycle that domestic workers interacted directly with the IVR system; (ii) workshop transcriptions and meeting notes were then read multiple times to identify dialogue that directly or indirectly informed how and why workers would interact with the IVR system at each point; and (iii) dialogue between each stakeholder was screened for values and motivators that were surfaced and subsequently negotiated through this iterative process.

4.2 Researcher Positionality and Influence

The study's two lead researchers are not Bangladeshi or women of colour. In an attempt to mitigate the impact of cultural biases and contextual misunderstandings, this paper's three Bangladeshi authors often participated in discussions with the design partners and were frequently consulted by the other members of the research

team. To avoid an overbearing influence upon the design and resulting ethnographic data, the researchers' design suggestions were usually presented to the design partners as valid alternatives, rather than being definitively better options. The exceptions to this were when the existing design had the potential to cause harm or endanger the domestic workers (such as the system giving the workers' phone numbers to clients, see Section 5.2). All changes to the design in each iteration were made by *GigCo* after having received feedback from NGO and the research team.

5 FINDINGS

The following findings are presented in relation to the final *GigCo* system design, looking specifically at ways domestic workers are likely to directly engage with the IVR component of the system during a single 'job cycle', from giving notice of availability to the final sign-off after a job is complete (illustrated in Figure 2). We outline the purpose and quality of the interactions between the domestic workers and the IVR system as they are designed, drawing on recordings and notes from discussions held between the research team, *GigCo*, and NGO.

5.1 Daily Check of Availability

Each domestic worker registered to *GigCo* receives an automated call from the IVR each morning to determine whether they are available to work that day, and if so are they are available to work in the morning or afternoon. This process was devised by *GigCo* and NGO to give all domestic workers registered to the platform an equal opportunity to work within their local area during a time that suited them. Workers' responses to the IVR are logged onto the *GigCo* system, informing an automated worker selection algorithm of which workers are available throughout the day.

5.2 Being Offered a Job

During their nominated working time, workers will then receive another automated phone call through the IVR system, saying:

You have a work request of [X] hours from [area name] and it will pay you [Y] taka. The user's name is [name]. You [have/haven't] worked there previously. Press 1 to

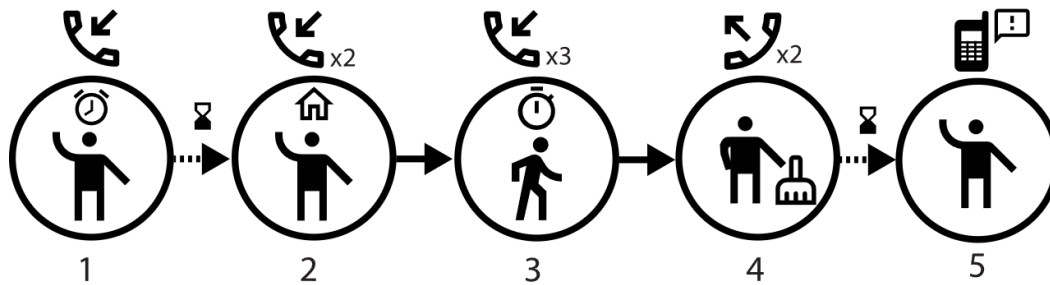


Figure 2: The GigCo IVR system, as encountered by a domestic worker. (1) The system calls the worker in the morning to ascertain if they want to work, and if so when. (2) The client requests a worker through the smartphone app. GigCo’s algorithm chooses a suitable worker and rings them to see if they will take the order. If so, the worker is asked to wait while GigCo check if the order is genuine. The worker receives a second confirmation call from the system, and, if the job is genuine, is then asked to give an ETA and leave towards the client’s house. (3) During the journey, the worker is called up three times to get an updated ETA. (4) At the client’s house, the worker calls the system to log when the work is started and finished. (5) After finishing, the worker waits at the client’s house until an automated SMS arrives confirming that the client has paid. At any time, the worker can call the system to get information about a current job or their wages, get help from the GigCo office or emergency services, or to contact the client.

accept the order. Press 2 to reject the order. Press 3 to hear the order again.

If they accept, they are played an audio recording detailing the exact location of the client’s home, and asked to either reject the job or re-confirm it by giving an estimated time of arrival (ETA), with the options of 30 minutes, 60 minutes, or longer than 60 minutes. There is no option to delay or negotiate an alternative time. If the worker rejects the order or if they hang up, the system will call the next worker prioritised by the algorithm.

5.2.1 Prioritising Workers for a Job. The group’s discussions around this IVR menu prompted queries about how the platform’s algorithm should select workers. GigCo and NGO negotiated three factors that were aligned with their priorities:

- **Proximity of the Worker’s Home to the Client:** the algorithm prioritises workers within a 1km radius of the client’s home, and then gradually extends out to 2km depending on availability. This reduces the travel time and cost to the worker, whilst also increasing worker reliability as they are more likely to arrive at their estimated time.
- **Work History:** workers who have previously worked for a client will get priority with them, unless they received a poor rating from the client. This was to promote stability for both workers and clients.
- **Ratings of the Worker:** workers are given two quantified scores, reflecting i) the frequency in which they accept or reject offers of work and ii) their average rating given by past clients (out of 6).

However, these three factors present in the final design are not inclusive of all concerns brought up during these discussions. For example, NGO’s representative suggested that the algorithm should take workers’ ratings of clients into account—a feature absent from the ‘Human IVR’ implementation:

“One rating will be from the employer’s side: if she gets five [stars] she’ll be called again. We are also taking ratings from the employee level—how she feels working there. Are you going to consider this? Because it might be that she might not be comfortable with working there: it might be that I’m a bad person, and give her five stars to get her again, but she’s not comfortable with me.”

Further discussions centred around the fact that the worker was given little access to information regarding both the client and the job when choosing whether or not to accept. For example, the IVR menu design did not give the worker information regarding the nature of the work (i.e. what they would be doing), the client’s rating by other workers, or who will be present in the household during the work. In contrast, clients were given access to the worker’s past ratings, a profile photo, the amount of training they had received, and their phone number. Some of these omissions could be explained by the limitations of IVR, the need for timeliness, and that logistical information about the job took priority. However, GigCo were also concerned that the inclusion of additional information such as client ratings could ‘confuse’ the workers—when we suggested that workers be provided with clients’ ratings prior to accepting a job, GigCo responded by saying:

“The domestic worker might not understand the rating system to be able to assess the client. So I think we need to do the screening from the back end.”

When we raised the potential safety and privacy issues regarding giving clients access to female workers’ phone numbers [42], GigCo claimed that it hadn’t been an issue. However, as removing access to phone numbers could potentially lower the worker ‘bounce rate’ (when clients use the workers’ details to hire them directly, outside of the GigCo platform) they became interested in routing the calls

through the IVR as an intermediary. At the time of writing, the *GigCo* app still gives clients access to the workers' phone numbers.

5.3 Confirming the Job

After the worker accepts the job request, they are asked to wait while a *GigCo* customer support agent manually calls the client directly to confirm that the job is legitimate: *GigCo* explained that clients often place test orders to see how the system works, and so they call to confirm every order. When we queried why the domestic workers were called prior to confirming with the client that the job is legitimate, *GigCo* expressed that this process meant they could avoid cancelling on a client in an instance where they couldn't find a suitable worker:

"We do not want to call the user without first confirming that we have a domestic worker in place to serve him. It will make him dissatisfied."

If the client confirms the job, the worker then receives a second automated call saying that the job is legitimate, and reminding the worker of a number of safety procedures:

Your order has been confirmed. Please set out for [name]'s house at [area]. Please only enter the user's house if you see a woman in the house, wear a mask, and immediately report any safeguard issue by calling us. Call us back at [phone] whenever you need any support. To hear the user's detailed address, press 1. To talk to the user, press 2. To talk to the office, press 0. Otherwise, please hang up now and set off for the user's house.

The *NGO* representative noted that the safety checks included here were part of a broader strategy devised by *NGO* to explicate the importance of safety, and aimed to exclude particularly 'risky' client groups from the service:

"We do not provide the service to any single male households—bachelors. We normally provide the service to the family. [It is] compulsory that there is one female member present during the work day."

5.4 Travelling to the Job

Once a job is confirmed, the IVR system calls the worker as they travel to the client's home up to three times to 'track' their progress and get an updated ETA. The first call is made 15 minutes after the confirmation call, and asks if the worker has left their home yet; the second call is made after two thirds of the given ETA has expired, and asks for an updated ETA; and the final call is made 10 minutes after the ETA if the worker has not yet logged the start of work. These calls offer workers the option to connect to the client for a single call per job, to support workers asking for more specific directions without irritating the client.

When we queried about why workers were being called on three occasions over a short period of time and suggested that it might be intrusive, *GigCo* expressed that they had doubts about worker reliability and professionalism, expecting this number of calls to be necessary:

"We have to maintain a certain time—on the user's side we have already committed them at the start of the order that it will take 30 minutes, based on the

estimation of the domestic worker [...] so we keep pushing them. [...] When we test the system we might find that we need more tracking calls, maybe we don't need this many, even."

GigCo received negative feedback from their workers about the tracking calls during the 'Human IVR' prototype. Despite finding that they were unnecessary during the prototype, they expected the calls would still be needed in the final automated version:

"Maybe they're on their way, on the bus—they really don't want to receive a lot of calls. [...] We don't need to call that much: without calling the domestic workers, after half of the time almost all of them went to the customer's house. [...] But I'm worried that in the case of the IVR, it will be lower: it may be that we need at least one tracking call at the start [of the journey]."

5.5 Safety Measures & Starting the Job

Once the worker arrives at the client's home, they call into the IVR system to log the start of work. Prior to doing so, they are required to check that the client has met the safety conditions of the platform: ensuring there is at least one woman in the home, and that the worker feels comfortable and safe. If these safety requirements aren't met, *GigCo* explained that the workers are advised to leave the house immediately and call the IVR to log a safety breach:

"Our domestic workers are instructed to check if there is a female member or not. What happens if they see the house doesn't have a female member? They come back. We have a status called 'maid return'. It happens, maybe every day two or three times."

Should these safety measures not be sufficient, workers can call into the IVR system and are given options to connect with emergency services and an independent women's helpline. After feedback from the research team, *GigCo* moved these options to be read at the beginning of the IVR menu, ahead of more frequently used options relating to starting and finishing a job or checking on earnings.

GigCo and *NGO* emphasised that prior to the IVR system, logging the start and end of a job used to be in the control of the client through the smartphone app, but that they would sometimes deliberately log inaccurate times to reduce the cost of work:

"Sometimes the customers are very tricky—he will not say anything [about the time being over] because she is busy doing something."

5.6 Completing the Job & Payment

Once the worker completes a job, they are required to call into the IVR system and log the end of work from the client's home. The client then makes an online payment via the *GigCo* app. Once the payment is complete, the worker is then sent an SMS stating:

The client has paid the bill. You can leave the house. Your payment will arrive in your account shortly.

However, when we queried if the often illiterate workers are able to understand the message, *GigCo* responded:

"No, not really. Sometimes they can use it as an indication—there is a sound."

In our discussions, *GigCo* emphasised that workers are permitted to leave the client's home only after they have received this confirmation message. *GigCo* explained that cash payments were no longer permitted, as online payments enabled them to regulate payments more transparently:

“If the workers are paid in cash like in their other jobs, they can sometimes not get paid or get paid less”.

5.7 Leaving Feedback about the Client

After leaving the client's home, the workers have the option to leave feedback about their experience with that client by calling the IVR system, which gives the option to rate their client out of six stars or give additional feedback by leaving a recorded message. These messages are later listened to by a *GigCo* staff member and logged onto the system. If a worker reports a negative experience with a client, *GigCo* addresses this by calling a worker directly and clarifying the issue, and—if deemed necessary—will call the client to inform them of a breach of conduct and potentially block them from using the service for a period of time.

6 DISCUSSION

This IVR system enables domestic workers to participate in the gig economy: without requiring smartphones, internet access or any significant level of literacy. However, despite the project's primary goal being the empowerment of the domestic workers, there are a number of design decisions evident which would be detrimental to the workers' experiences when using the system. The design highlights that the IVR medium's inherent constraints required decisions to be made, resulting in some motives and values being prioritised over others throughout the workers' job cycle. We argue that when examined, these decision points act as values levers: revealing how the diverse and sometimes conflicting values of *GigCo* and *NGO* were prioritised and ultimately included (or excluded) from the final system design, often at the expense of the workers. In this discussion we reflect on how these values were surfaced and negotiated through the design, and discuss the broader implications of how constrained design can be used in commercial contexts as values levers.

6.1 Highlighting Embedded Values through Design Decisions as Values Levers

Contrary to *GigCo* and *NGO*'s belief that the IVR system would offer more objectivity than the 'local guides', such infrastructures feature embedded biases informed by the values and priorities of those involved in the design process [52]. In turn, analysing and querying the design of technological systems can give insights into the designer's priorities, attitudes and assumptions [47]. As such, querying the choices required during the design of the IVR component re-framed them as values levers: acting as entry points for reflection and values discussions [43]. In this way, we have been able to gain insights into how the stakeholders' values were embedded within the final system design, through the inclusion, prioritisation, and omission of pieces of information and functionality accessible to workers:

GigCo's low expectations of the workers There are multiple elements within the system's design which suggest that *GigCo* had low expectations of the workers. For example, the 'tracking calls' were perceived by *GigCo* to be a necessary inclusion to prompt workers to arrive at clients' houses on time: even after a high success rate during the 'Human IVR' deployment (where the calls had been removed due to complaints from the workers), *GigCo* was concerned that workers would not leave on time if the calls were not coming from a human operator. As in crowdsourcing platforms, this intrusive use of technology for monitoring frames workers as 'troublesome components' to be controlled, rather than human stakeholders to be designed for [24, 33]. *GigCo* also believed that the women would be confused if given the ratings of clients when offered work, and that such decisions should be made algorithmically '*from the back-end*'. Furthermore, while clients had access to workers' phone numbers, workers were only able to directly connect to clients once by routing through the IVR system. These low expectations and the unequal provision of information and control contribute towards a final design where the worker has little power: as seen in analyses of other gig-economy systems [10, 20, 30, 33], a lack of information flow and opaque, algorithmic control often results in a system where the worker has less power than other parties.

Prioritising clients over workers As noted, *GigCo* are principally a for-profit company, and the system's design reflects their prioritisation of clients' interests over those of the workers. This is evident through design decisions both benign (e.g. the worker is called to accept a job before the client is called to confirm it is legitimate; that workers receive automated calls, while customers are called by human operators) and those that have serious potential consequences (e.g. that workers' ratings of clients were not provided during IVR calls offering jobs, nor being considered by the algorithm during 'Human IVR' deployment; that *GigCo* had few concerns related to safety when sharing workers' phone numbers with clients). As Lee argues, supply-demand orientated algorithmic controls frequently do not account for human factors [30]: such issues are further evident in this system, where workers are pushed through repeated phone calls during travel, prioritising keeping clients' waiting time to a minimum. Similarly, the requirement that workers stay in the client's house until *GigCo* has received payment again suggests that little thought had been given to the workers' experiences of the system, and serves as an example of the workers themselves being the site of engagement between the client and a corporate entity: placing additional focus and pressure upon the worker's physical presence and emotional performance [40]. Finally, that *GigCo's* platform is built around technology that the client has access to but the worker does not—with the IVR component's existence being an attempt to navigate this core inequality—highlights that the system's human-centred design focus is on the clients, not the workers.

Loss of focus on workers While *NGO* made fewer contributions to the design, they were consistent in evidencing their

stated goal of improving the well-being of women domestic workers: suggestions such as the algorithm accounting for workers' ratings of clients and the inclusion of safety reminders had a clear focus on improving the workers' safety and agency. However, within the final design the focus on women's empowerment was lost, and the women were no longer the priority. As the party with the platform and task of creating the implementation, *GigCo* had the most control over the system's final design. Despite producing some concrete improvements towards the upholding of the standards set out in the DWPWP, as a for-profit company *GigCo*'s priority was understandably to make money, and so the focus of the project naturally shifted from the women being the cause to being the product: no longer the priority, but a commodity in a capitalist process.

We present these insights as evidence of how values levers can be applied by designers as a simple tool to reveal and reflect upon what values are embedded and prioritised within their designs and processes. As Martin et al. argue, technology interventions introduced without care into gig-economy ecosystems have the potential to reify existing inequalities or create new ones [33]. Before attempting to introduce what we think are worker-centred interventions [10], we as designers and engineers need to reflect on our own interests, and how they compare and contrast with those who will be affected by the systems we create. While actually engaging with the workers in consultation or even a full co-design process would naturally be a more effective way to ensure a more suitable human-centred final design [31], these practices are frequently overlooked within commercial settings [4, 43]. We argue that in such cases, *some* level of critical values reflection is better than none, and that values levers are a useful and simple tool for engaging in this space without requiring additional investment or expertise.

6.2 Using Constraints to Introduce Values Levers in Design Practice

Many of the values levers discussed above were resultant from decisions that *GigCo* and *NGO* were forced to make due to the limitations of working within the IVR medium. Within an IVR system, menus and messages are usually prescribed, linear, largely static and should be limited in length to support cognition [48]. Such limitations require judgements to be made not only on the inclusion of information, but in what order it is presented. Furthermore, most traditional IVR systems act as blunt instruments: the end-user is given little ability to work outside of the confines of the design space set out by its system designer. Due to these limitations, the choices of what information and functionality is excluded and how included elements are ordered are strong indications of the designers' priorities and assumptions about the end user.

Within this study, the constraints of IVR required *GigCo* and *NGO* to negotiate the prioritisation particular information (e.g. logistical information for getting to a job), and the exclusion of that deemed too complicated or not worth the additional menu space (e.g. details of what the job would actually entail, or how the client has been rated by other workers). These choices often involved balancing the empowerment of domestic workers against the designers' other

interests. We argue that by forcing these decisions to take place, the process of encountering the constraints and limitations of the technology became a values lever.

As a technology medium, IVR is particularly well-suited to this due to its inherent limitations that require designers to go through a process of explicit prioritisation. However, we also posit that such constraints are often naturally encountered during the practice of technology development. Choices in other mediums might include: which items should be surfaced in the top level of a GUI; the minimum requirements for a user's hardware or version of operating system; the granularity of users' control over collection of their data; or reliance on the user having reliable internet access. In this regard, any design materials which feature constraints can serve as an effective way of surfacing stakeholders' values by forcing them to make decisions.

These decisions could also act as a useful way of communicating and highlighting the practical effects of designing towards a given agenda, supporting the inclusion of less technical stakeholders in the decision-making process. Some functionality, such as the design of system infrastructure or algorithms, can be so complex to lead to practical opacity, often impeding productive critical analysis and inviting users to speculate and sense-make through channels external to the platform [30]. In cases where complexity impedes open discussion, major design decisions could be clarified and represented through abstraction: previous work has shown the benefits of using mediums such as Lego as design tools for collaboration and the communication of complex ideas [9]. Such use of artefacts as design tools (e.g. [3, 50]) is widely valued by UX designers and researchers as a method of prompting critical and creative discussions between stakeholders. However, this study is an example of how traditional reflective processes are often neglected within pragmatic, production-focused development environments [43], where design is often based on tacit knowledge and '*watching trends and chasing after innovations*' without first laying a human-centred groundwork for design [37]. Such was explicit for *GigCo*, who aspired to be '*the Uber for domestic workers*' and frequently changed operational model. In small- to medium-sized development environments, it can be harder to justify allocating resources to practices beyond those perceived to be core to the development of technology. Constraints-based values levers are likely to be more appealing mechanisms for including and prompting reflection on stakeholder values, as they can be more tightly integrated into the practical stages of development.

We also propose that engaging with decision-based values levers can be of value even beyond the production more appropriate designs: keeping records of design decisions—and the explicit values-based reasoning behind them—would be useful for the purposes of accountability and evidencing deliverables. For example, in this project *NGO* and *GigCo* could have been able to show a paper-trail of design decisions, highlighting to the funding bodies of the OCP project how the system promoted the values and enforcement of the DWPWP. Such practical benefits offer further grounds for the integration of reflection through values levers into software design and development, in ways that 'pragmatic' practitioners may find more palatable.

However, this study also showed that the introduction of values levers is not a guarantee of worker-centred design: despite extensive dialogue between the parties, our findings showed the final design to still more closely reflect the values of *GigCo* over *NGO* or the research team. Examples of issues discussed within design sessions but (as-yet) unimplemented include our concerns relating to the application giving clients the workers' phone numbers, and *NGO*'s suggestion that a client's rating by workers should be accounted for by the worker selection algorithm. While these topics were raised through the IVR design process as points for critical discussion, we argue that the fact that these issues and suggested improvements were not acted upon is a separate issue: likely resulting from *GigCo* having significantly greater control over the design and implementation than *NGO* or ourselves. In this case, the constraints acted as tools to reveal what the different stakeholder values were and how they were being prioritised and represented within the design: an opportunity to surface the implicit positions of the designers, even if not all that was surfaced was acted upon.

7 LIMITATIONS AND FUTURE WORK

The intended users of the system, the domestic workers, were not included in the design process. However, as noted, the practices of co-design and stakeholder consultation are often foregone in commercial development settings [4, 43]. We advocate for the inclusion of all stakeholders within participatory design practices—especially those who are most marginalised—but understand that this is rarely the case in practice.

This research project did not set out to evaluate constrained design through the lens of values levers: the constraints and the resulting discussions were identified as values levers after the study's conclusion. As such, the values levers we have identified in this paper were not explicitly engaged with as a tool for reflection by the stakeholders themselves within a formalised process. We aim to continue this research by exploring how constrained design can be utilised to incorporate values-based reflection into ongoing development processes, and how such processes can be designed to support accountability and transparency in contexts where stakeholders hold unequal levels of control and power.

8 CONCLUSION

This paper has reported on the findings of a design ethnography, undertaken with an international *NGO* and a for-profit gig-economy company in Bangladesh during the design of an IVR component for use with a disadvantaged workforce of domestic workers. We argue that the limited nature of the IVR format acted as a 'values lever': that it introduced a number of constraints which required the stakeholders to make design decisions which prioritised particular qualities within the system, and that discussing these decisions surfaced their values in relation to the project and their assumptions about the workers. We posit that such constraint-based design decisions are present in other technology mediums, and that as values levers they offer opportunities for engagement in critical, values-focused reflection: even in resource constrained development contexts. We argue that such reflection is particularly valuable in projects where parties may have different—even conflicting—agendas (such as between for-profit gig economy companies and their employees),

and that constraints should be considered as values levers during the production of any platforms looking to develop a worker- or user-centred perspective.

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