

The Troubling Cups

Making Trouble at Work about Inequalities in Pay

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The Troubling Cups: Making Trouble at Work about Inequalities in Pay.

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As technology permeates people's everyday lives, opportunities arise for HCI to design, develop and research technologies that focus on broader societal challenges such as sustainability, race, gender, and power. Toward this end, we present the Troubling Cups, a provocative design that makes trouble about unequal pay in a work environment. The design was produced through a series of workshops in which women discussed, identified and provotyped trouble in their work environments. Through a small, two-day field study, we explored if and how the provotype made trouble about unequal pay in real-world settings, and how the participants stayed with the trouble of unequal pay. We contribute to our research field with the provotype itself, our qualitative findings, and with our reflections and lessons learned on making trouble and staying with the trouble through provotyping.

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

Additional Key Words and Phrases: Gender, unequal pay, making trouble, staying with the trouble, provocation, provotype.

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1 INTRODUCTION

With the emergence of third-wave HCI [Bødker 2006], our research field has moved beyond simply dealing with the effectiveness and efficiency of interactive systems, and HCI researchers started to investigate in depth the broader impact of technology in our everyday lives, focusing more on larger societal and political challenges. This led to the adoption and creation of theories and frameworks that were more suitable for these areas of concern and go beyond usability/UX aspects of interaction. Examples include feminist HCI (e.g. [Bardzell and Bardzell 2011]), frameworks of power (e.g. [Schneider et al. 2018]), post-colonial computing (e.g. [Irani et al. 2010]), social practice theory (e.g. [Shove et al. 2012]), etc.

Inspired by personal experiences and the fact that, unfortunately, issues of gender inequality still do exist (for example see [Stamarski and Son Hing 2015]), in this research work we decided to focus on work environments, and more specifically on the trouble of inequality in pay. As researchers and designers, we first wondered "*who speaks for women?*" [Muller 2011], and through *making trouble* and *staying with the trouble* [Haraway 2016; Søndergaard 2018], we opted to produce a design that would make trouble about gender issues at work. Our design process was based on

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participation [Bardzell 2010], and through a series of workshops with women, we co-defined as an important trouble that of unequal pay, and we then collectively produced a *provotype* [Jensen et al. 2022; Morgensen 1991] titled *Troubling Cups*. During this process, we listened to women's work experiences, gave them the voice and power to co-shape the design itself through discussions and sketches, and we then refined the final design by utilising aesthetic, functional, and conceptual provocation [Bardzell et al. 2012].

The design was studied utilising a Research through Design (RtD) approach [Zimmerman et al. 2007], with the purpose to understand if and how our provotype makes trouble about unequal pay at the workplace. Thus, the purpose of this study is not to provide a solution for the trouble of unequal pay, but instead to understand how a design can make trouble about unequal pay, and how participants can stay with this trouble. For this, the Troubling Cups were deployed for two days in the IT department of a large company in Denmark, and data were collected through interviews and observations. Our contributions to HCI is the provotype itself, along with our findings on how to make trouble through design, and how to help people stay with that trouble in a work environment.

Our paper is structured as follows. First, we present prior work on making trouble and staying with the trouble, and on provotypes and provocation. Then, we present how we stayed with trouble through a series of workshops with women and how this process led to our final provotype, the Troubling Cups. We then thoroughly present our design, methodological details of our study, as well as the emerged findings. We conclude with reflections and lessons learned on staying with the trouble in a work environment and on making trouble through design.

2 RELATED WORK

It is fair to say that trouble exists and permeates every society and culture at different extends and levels. As trouble, we loosely define problems that must be addressed from every society which they cannot/should not look away from them. Work within HCI has engaged with such troubles, for example on how race, gender and class influence design choices by engaging black students in the ideation process [Rankin and Henderson 2021], by exploring gender biases in esports [Madden et al. 2021], or by understanding how HCI can facilitate openness and visions for the futures of sustainable communities [Chopra 2019]. Particularly, for gender issues, HCI has turned into a range of cultural theories, grouped under the term feminist HCI [Bardzell and Bardzell 2011], which are closely linked to feminist theory, empathy for participants, and the goal to decrease/remove one-sided views from social life. Related research in the area of feminist HCI is focusing on improving women's health conditions, as well as understanding the importance of designing specifically for women's health. The work within this area ranges from technologies supporting women finding public breastfeeding places [Balaam et al. 2015], to improving motherhood by critically tackling the breast pump [D'Ignazio et al. 2016], and understanding the experience of women's health to encourage HCI to work within this area [Almeida et al. 2016a; Balaam et al. 2017]. The social and political conflicts women experience in today's society (e.g. inequalities, stereotyping, and gendered assumptions) is an under-explored area in feminist HCI, as argued by Bardzell: "*Feminism's variously critique images of women in media, policies and laws pertaining to women, gendered institutional practices, scientific discourses on/about women, and other places where/mechanisms through which woman is constituted in and by knowledge. By exposing how women become enmeshed in these discourses, feminists introduce opportunities for social action.*" [Bardzell 2009].

Within this area of concern and inspired by Haraway [2016], we believe HCI can benefit from adopting a specific research attitude towards a trouble, where instead of looking for solutions that address the trouble in the future, we continuously engage with the trouble, understand it by being truly present [Haraway 2016], and thus become more capable of responding to it [Søndergaard 2018]. Within HCI, many studies utilised staying with trouble as a

research approach. Specifically for gender issues, HCI has already visited trouble through multiple studies (e.g., queer HCI [Carrasco and Kerne 2018], living with HIV [Maestre et al. 2020], empowerment of LGBT+ communities [Pereira and Baranauskas 2018]). And for this approach to work, it requires researchers to take up the challenge and ask questions about the "naturalness" and embedded assumptions we have about our everyday life [Breslin and Wadhwa 2014]. For example, Warner et. al challenges the design of sex-social applications for HIV status disclosure through qualitative research that helps HIV positive and negative men manage their HIV status [Warner et al. 2019]. Designing and researching for marginalised groups have also been of high priority for the HCI community, thus allowing individuals to self-identify as freely as possible [Carrasco and Kerne 2018]. Carrasco and Kerne explored how social media affects LGBT+ user experience of managing self presentation, thus developed implications for design to support and encourage the community to define their gender and sexual identities freely rather than through predetermined definitions [Carrasco and Kerne 2018]. Furthermore, many studies stayed with the trouble of women's health and the intimate female body [Almeida et al. 2016b; D'Ignazio et al. 2016; Svenningsen and Almeida 2020; Søndergaard and Hansen 2016] or advocated for Haraway's argumentation of staying with the trouble [Land et al. 2020]. As an example, Søndergaard and Hansen [2018] have stayed with the trouble of digital personal assistants (DPA) through design fiction by troubling our collective imaginings and gender roles of DPA's.

Not only does the research approach of staying with the trouble require us to learn to be truly present, the aspect of trouble also expresses an anti-solutionism approach, in which we might reconfigure our way of imagining the future, and instead focus on the present and how we are implicated [Haraway 2016]. In this case, it is worth exploring the technological outcomes of such design processes, and here we see a strong connection between provocation and staying with the trouble. Provotyping [Jensen et al. 2022; Morgensen 1991] (contrary to prototyping), is a design approach where the focus is not to produce a design that will serve somebody's needs, but to produce a design that will challenge assumptions, beliefs and practices through provocation. Within HCI, many studies have utilised provocation with the above mentioned aims (e.g. for challenging energy consumption practices [Raptis et al. 2017], bathing practices [Kuijter et al. 2013], etc.) and the outcome of such processes typically is a provocative design that can be characterised (among others) as critical [Bardzell et al. 2018, 2012; Dunne and Raby 2002], speculative [Dunne and Raby 2013], discursive [Tharp and Tharp 2018], or reflective [Sengers et al. 2005], based on its characteristics and its theoretical anchoring.

Provocative designs aim is disrupting needs rather than serving them [Bardzell et al. 2012], and demand from designers a critical sensibility which "*at its most basic, is simply about not taking things for granted, to question and look beneath the surface*" [Bardzell and Bardzell 2013]. HCI approach to troubling gender issues has produced studies that incorporate provotypes that trouble. For example, Bardzell et al. [2012] focus on gendered spaces and study how design could help understand such places, and how design can guide individuals to make decisions in relation to gender roles. They do that by challenging the "handyman" role in order to transgress instead of reinforce social norms [Bardzell et al. 2012]. The challenging aspect of provoking and transgressing cultural assumptions lies deep in the roots of provocative designs. Especially, the need for staging dilemmas, that challenges not only designers but consumers to envision a more challenging view of human experiences [Bardzell and Bardzell 2013]. The challenging aspect has many shapes in HCI studies, by creating provotypes that challenges social norms [Bardzell et al. 2012], by provoking conversations on complex topics (e.g. gender equality, social dilemmas, [Roussou et al. 2019; Welsh et al. 2018]), or by advocating and creating awareness of marginalised communities [Clarke and Schoonmaker 2019]. Towards this end, Roussou et al. [2019] investigate how interactions with a chatbox can evoke emotional engagement in ways that can challenge our assumptions and trigger conversations on complex topics, such as gender equality, wealth distribution, and privacy.

Thus we see a strong connection between provotyping and staying with the trouble as research approaches, since the latter also demands that we stir up debates and disturb thought processes, in order to change the story [Haraway 2016]. For the rest of the paper we will refer to the process of staying the trouble and provotyping for it as *provotyping trouble* (designer's point of view), while the design produced through this process (provotype) we hope it *makes trouble* (about the trouble - objects' point of view).

3 PROVOTYPING TROUBLE WITHIN WORK ENVIRONMENTS

In this study, we focused on gender trouble within work environments and in order to do so, we got engaged in a two-step design process which we will unfold in the following sub-sections. Both parts of the process were theoretically anchored in feminist standpoint theory [Bardzell 2010; Bardzell and Bardzell 2011] and feminist interaction design qualities [Bardzell 2010]. Feminist standpoint theory advocates in favour of women's viewpoints and experiences, requiring that women's knowledge should be recognised and utilised as a resource, instead of being marginalised [Bardzell 2010]. Throughout the process of provotyping trouble we tried to practice strong objectivity [Bardzell and Bardzell 2011] through the feminist interaction design qualities of pluralism, participation, and advocacy [Bardzell 2010]. As such, two workshops were conducted where women first identified trouble and then provotyped trouble. Details about the workshops are presented in the following sections.

3.1 Workshop A: Understanding and Making trouble

Nine self-identified female participants took part in Workshop A, which lasted approximately 3 hours. Their ages ranged from 23 to 31 years old, they represented a variety of nationalities and they were either students with student jobs or full-time employees (Table 1). In order to make trouble at work, it is important to identify what are the trouble(s) that exist in work environments. Therefore, we initially engaged our workshop participants through storytelling, a practice that is very important since *telling stories is not the same as finding or simply coming up with stories. Stories are always told by someone and not by no one, from somewhere and not from nowhere, in some time and not in no time* [Søndergaard 2018]. Thus the days before the first workshop, we asked our participants to watch a video that addresses inequality in today's societies [Harvard Business Review 2019], and then produce anonymous personal stories that would be shared among the participants. The two authors that hosted the workshops also shared their own stories in order to disclose their own experiences and create empathy with the participants. This process allowed us to gain insights into our participants' own experiences and take their views into consideration without imposing our values on them. In total, we received 33 anonymous stories from the participants.

When the workshop started, the participants shared their stories, read some of them aloud, and discussed them in depth. In close collaboration with the two authors, three major categories of trouble were initially co-identified: troubles in the workplace, troubles in study environments, and troubles in everyday life. By moving on and focusing on troubles at the workplace, 12 stories were selected as representative, and from those 12 stories, three troubles were defined by the participants as more pressing/important: Resource Inequality, Degradation, and Stereotyping. For Resource Inequality, inequality in pay and inequality of access to resources were emphasised. As an example, P3 mentioned that "[her] male colleague is getting paid 10-15.000dkk more than me every month, even though we are of the same value for the company". Furthermore, an example of Degradation was presented by P1: "Situations occur at my workplace, where I feel non-empowered. For example, I am the one to show new employees around the company and introduce them to everything. When they meet me for the first time, I get introduced as the CEO's wife. Every time this happens, I feel dis-empowered because I need to work harder to prove my worth". Stories were also shared in relation to Stereotyping. For example, one

ID	Position	Age
P1	Product communication lead	31 years old
P2	Master student	23 years old
P3	Automation engineer	27 years old
P4	Master student	24 years old
P5	Master student	26 years old
P6	Communication and sustainability	27 years old
P7	Master student	25 years old
P8	Master student	23 years old
P9	Master student	22 years old

Table 1. Overview of participants from workshop A.

woman expressed feelings of frustration as she had *“experienced it in everyday small talk between colleagues, where they joked about me being their team manager. They said: “you can not be a leader for me when you are a woman and younger”.*

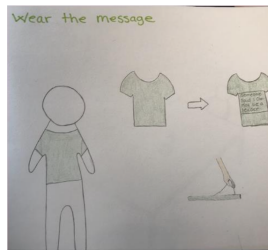


Fig. 1. Wear the message. A shirt that depicts experiences women have had during their work.

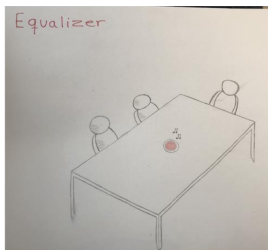


Fig. 2. Equalizer. A "buzzer" that makes a loud noise and says, if a woman gets interrupted during a meeting.

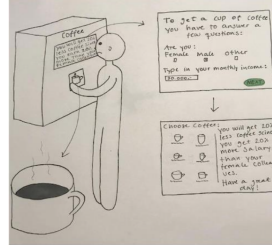


Fig. 3. The judging coffee. A coffee machine that provides less coffee if someone has a higher salary due to their gender.

As a next step in the process, each participant was asked to sketch a design that would make trouble (provotype). Thus, we did not instruct our participants to provide a solution to the trouble (even though some participants chose to do so), but instead we asked them to focus on ways of making their trouble visible/known. Nine provotypes were produced, and each of them was then discussed. In the end, three provotypes were prioritised by the participants as the best candidates for making trouble at the workplace (see Figure 1, Figure 2, Figure 3).

3.2 Workshop B: Reflecting on the provotypes

Four women (different from Workshop A) with an interest in gender equality were recruited through our university's social network and volunteered to participate in our second workshop. They were in the age group of 24-30 years (Table 2, the workshop was carried out online (Google Meet) and lasted approximately two hours. The purpose of the workshop was to reflect upon the three provotypes that emerged from Workshop A (Figure 1, Figure 2, Figure 3) with a focus on three questions: Do they make enough trouble? Can they make other employees that experience them stay with the trouble too? What can go wrong?

ID	Position	Age
P2.1	Junior UX researcher	29 years old
P2.2	Master student	25 years old
P2.3	Researcher	27 years old
P2.4	Master student	24 years old

Table 2. Overview of participants from workshop B.

The three questions resulted in long discussions which were transcribed and analysed using a procedure called 'explication de texte' or close reading, which originates in the humanities [Aldridge et al. 1963; Fowler and Fowler 1986] and has been already used in studies within HCI (e.g. [Biggs et al. 2021a,b]). During this process two of the authors first built literacy with the text by working/reading alone, and then through dialogue they extracted positive and negative critique points about the three design ideas.

The design that appealed to participants more was the "Judging Coffee" (Figure 3) where participants highlighted that using something already present at the workplace can create visibility around the trouble. Furthermore, even though all participants liked the idea, they pointed out that providing coffee based on salary would not be possible to do in real world settings (e.g. GDBR), that it could be perceived as too provocative in the long run, or that it could be simply circumvented by the employees by using the machine multiple times. Additionally and in short, the majority of

the participants were critical towards the remaining two designs mostly because "Wear the message" (Figure 1) could attract the wrong kind of attention, and because "Equalizer" (Figure 2) would get too much in the way of work.

The final stage of the analysis process was an abstraction exercises where all three authors summarised the identified critique points into a set of design considerations that could be useful in anchoring and reflecting on the re-design process (see next section). The identified design considerations were:

C1: Don't bring too much attention. Do not make a provotype that puts too much attention towards a gender. It could put some at the center of attention, and thus make them feel victimised.

C2: Don't promote "us against them". A provotype must not facilitate an "us against them" state, but instead encompass everybody at a workplace.

C3: Utilise passive-aggressiveness and humour. A provotype could be passive-aggressive and balance between punishment and reward utilising humour.

C4: Don't point to a specific person. A provotype should not point out to a specific person.

C5: Utilise what is already there. A provotype can incorporate materials that already exist at a workplace in order to make trouble more effectively. Examples of such materials include artefacts (e.g. coffee machines), rooms, furniture, etc.

C6: Don't mess with work. A provotype should not affect anyone's job, or make them less productive.

C7: Keep an eye on who gets empowered. Reflect if a provotype unintentionally empowers other stakeholders than the intended ones.

4 THE TROUBLING CUPS

With the seven considerations in mind, along with the concerns expressed by the participants of workshop B, we redesigned the "Judging Coffee" provotype. It was transformed into the *The Troubling Cups*, a provotype that aims to be held by employees at a work environment, and makes trouble through its conceptual, aesthetic, and functional provocation. [Bardzell et al. 2012; Raptis et al. 2017].

4.1 Conceptual provocation

Conceptual provocation is about defining the concept(s)/idea(s) that will be provoked through a design [Bardzell et al. 2012; Raptis et al. 2017]. Through the design of the Troubling Cups, we challenged and provoked the trouble of inequality in pay due to: a) being identified as really important by the workshop participants, and b) being one of the most troubling causes in societies, with statistics from European Commission showing that women earn on average 14.1 per cent less than men [European Commission 2019]. The inequalities we face in society (e.g. pay, equal rights, gender-segregated labour market etc.) creates a divided society with a Utopian standpoint stating equal pay for the same value. However, with this Utopian view on equality in the labour market, we unfortunately still face inequalities with statistics showing that when a man and a woman hold the same job, men earn more than women in 90 percent of the cases [Terp 2020]. Through our design, we do not aim to go down the road of investigating the causes of inequality, but to stay in the present of the wrong [Søndergaard 2018], and provoke it. The Troubling Cups put the trouble of unequal pay in the foreground by acting as a 'Ticket to talk' [Welsh et al. 2018], a way to encourage individuals to engage in conversations around inequalities in pay through statements displayed on the centre of the cups and through their aesthetic qualities.

4.2 Aesthetic provocation

Aesthetic provocation relates to a design's overall style, and how far it deviates from the norm [Bardzell et al. 2012; Raptis et al. 2017]. The Troubling Cups consist of 4 cups that live next to a coffee machine in a work environment. Their style deviates from a typical coffee mug, due to their size and their shapes that range from spiky to curvy (Figure 4). The provotype allows the cup-holders to decide on how they engage with the trouble of unequal pay by selecting one of the four cups.

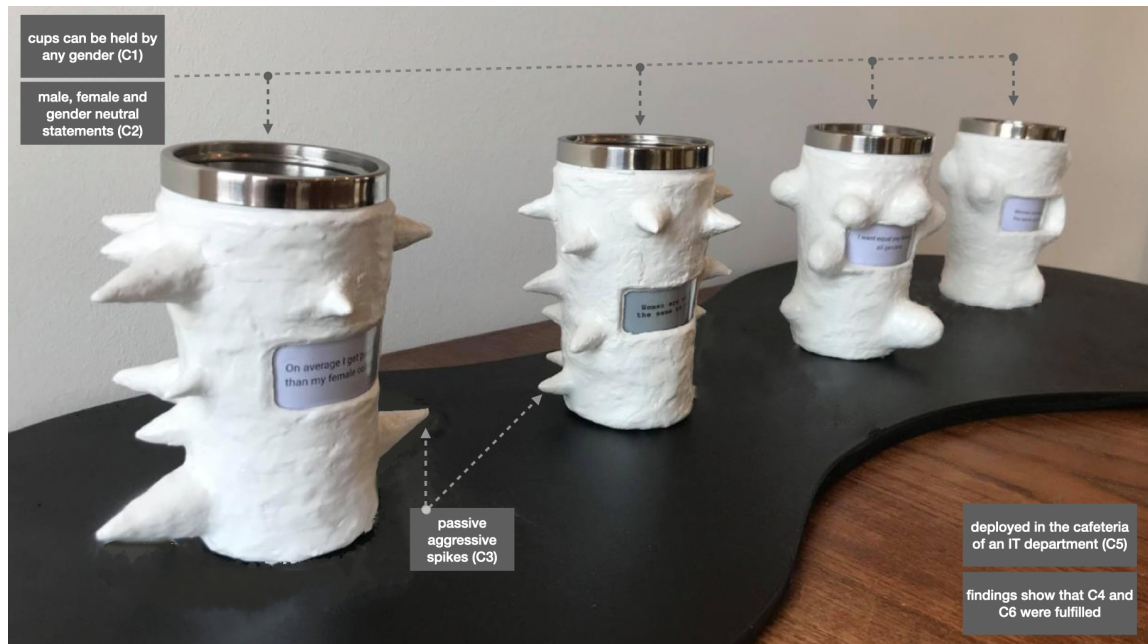


Fig. 4. The Troubling Cups along with the implemented design considerations.

4.3 Functional provocation

Functional provocation deals with how how far from the norm a design operates [Bardzell et al. 2012; Raptis et al. 2017]. In terms of functionality, the Troubling Cups operate differently from a typical coffee cup. First, they provoke the cup holder through their shape, as they are a bit uncomfortable to hold, thus reminding them about the trouble they are making. Second, they provoke other employees through a screen in the centre of the cup, that extends the typical cup functionality. As a side note, the shape of the cups ensures that when held the screen will be always facing other employees. The cup-holders interact with the cups by selecting three out of 16 predefined statements, which are then loaded into the cups through a very simple mobile application. These selected three statements are then projected on a screen (Figure 5), running in a loop, and act as conversation starter towards the trouble of unequal pay (along with the provotype itself).

The 16 statements were created by two authors and are based on interesting quotes we collected during the workshops. They categorised them into *general* (e.g. "I deserve the same salary as my male colleagues"), *provocative* (e.g. "I'm more valuable than my female colleagues"), and *motivational* (e.g. "I want equal pay between all genders"), and were written



Fig. 5. A display at the centre of each cup projects statements about unequal pay.

from a female, male and gender neutral points of view. The provotype allows the cup-holders to decide on how they engage with the trouble of unequal pay by selecting three of them.

4.4 Constructing the Troubling Cups

The Troubling Cups were created from off-the-shelf hard plastic cups. These cups had a sealed bottom with a separate container which was used to fit the electronics (Figure 6, Figure 7). The four different shapes were first formed in paper and attached to the cups using gauze. Finally, in order to achieve a more ceramic look, we also attached clay, and painted the cups with white spray paint to be easier to clean. In terms of hardware, we used a flexible e-paper display, an e-paper driver hat, an Arduino Nano, and a battery. The flexible e-paper display was then attached to the e-paper driver hat and to the Arduino Nano board through an SPI interface (Figure 7). In terms of software, we programmed in C, by relying heavily upon open source code [ZinggJM [n.d.]].



Fig. 6. Inside the Troubling Cups.

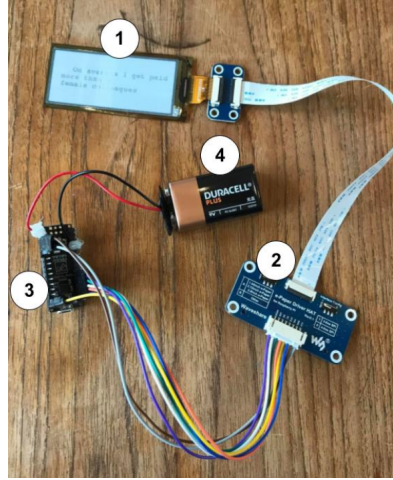


Fig. 7. Troubling Cups' hardware: (1) e-paper display, (2) e-paper driver hat, (3) Arduino Nano, (4) battery.

5 OUR STUDY

We consider The Troubling Cups as a provotype, a design that does not provide a solution to the trouble of unequal pay, but it acts as means to make trouble in a work environment, and as a research strategy to provide us with knowledge about the trouble. Thus, The Troubling Cups acted as our artefact in a Research through Design (RtD) approach [Zimmerman et al. 2007]. More specifically, we wanted to understand if and how the provotype made trouble about unequal pay, and what was the experience of staying with the trouble of unequal pay for the participants.

5.1 Location

Our research was conducted in the cafeteria of the IT department of a large (more than 15.000 employees) company in Denmark over two days. The cafeteria serves approximately 500 employees per day. The reason for selecting this company was because it already had several internal groups for dealing with diversity and inclusiveness. Among those groups, in the IT department a "WOMEN in IT" group existed with the mission to empower the female employees of the company. After contacting the group, they were enthusiastic about our study, they made sure we could get the necessary permissions to deploy in real-world settings, and they heavily assisted with the deployment (e.g. selected the deployment location to maximise visibility, commented on our interview guide, and facilitated the process in general).

5.2 Procedure

The four Troubling Cups were placed next to the coffee machine of the IT department's cafeteria. Each of them projected on its screen a randomly selected statement in relation to the trouble of unequal pay. Since the Troubling Cups were deployed in a real-world work environment, we could not run the risk of bothering people from doing their job. Therefore, only the employees that showed an interest in the provotypes were approached and were asked to participate.

Initially, we briefly explained to each interested employee the idea behind the design (phase A), and then upon agreeing to act as participants, they selected one of the four cups and three (out of 16) statements the cup would project (phase B). Finally, participants were instructed to use the cup for as long as they wanted, in any way they wanted, and

that they had to just bring the cups back to us later that day (phase C). By following this approach, we also argue that we recruited participants who were generally interested in making and staying with the trouble of unequal pay.

5.3 Participants

Overall, five employees volunteered to participate in our study and carry the Empowering Cups around the company. All of them were self-identified as female or male. In detail, The Empowering Cups were held by a female senior consultant (P1), by a female UX consultant (P2), by a female software developer (P3), by a male UX consultant (P4) and by a male product owner (P5). All participants had different nationalities. Additionally, we also had five employees who showed some interest in the cups, but refused to participate (mainly because they considered them too provocative or too weird, or for reasons that were not disclosed to us).

5.4 Data collection

In order to collect data, we opted for a qualitative approach. For each participant, two interviews were carried out, both on location. In the first interview, we asked questions related to their first impression of the Troubling cups and their general views on unequal pay (during phase A). In the second interview (during phase C), we asked questions about their experiences while using the cups (e.g., how their colleagues received them, how they felt carrying them around, what they discussed with their colleagues, etc.). We prepared an interview guide for both interviews, and all interviews were audio-recorded. On average, the interviews lasted 20 minutes.

In addition, one of the researchers remained on location and they observed and took notes on how the cups were received/perceived by random employees coming to get some coffee, and also tried to initiate small conversations with them. The researcher also took notes on the main points for each conversation.

5.5 Data analysis

All data (transcriptions from the interviews and observation notes) were analysed by following the same analysis process as the workshops' data [Aldridge et al. 1963]. This time though the purpose was focused on understanding the participants' experiences on making trouble and staying with the trouble of unequal pay.

6 FINDINGS

On average the participants held the cups for approximately 2 hours, where the minimum amount of time spent using the cup was 20 minutes, and the maximum amount was 4 hours and 45 minutes. The cups were mainly used at the participants' workstations, in meeting rooms, and in the cafeteria itself while taking a break.

Contrary to our expectations, four out of five of the participants' selected the most aesthetically provocative cup (Figure 4, left side). The main reason for this was that the participants were eager to stay with the trouble and engage in conversations around it. Thus, the more edgy the cup, the more attention it attracted and the bigger the chances to initialise conversations with their colleagues. Contrary to selecting the most aesthetically provocative cup, the majority of participants chose the more general purpose statements and ignored the very provocative ones (only two selected one provocative statement). The reasons behind this choice were not revealed to us.

6.1 Making trouble about unequal pay

Our intentions behind prototyping the Troubling Cups was to make trouble about unequal pay in work environments. We have noticed from our observations that many employees were surprised on why these items were placed inside

their cafeteria, and many of them showed a playful curiosity about them. During phase A of the deployment and before explaining to them the cups' purpose, we asked the five participants to express what they believed the cups were about. All of them stated it had something to do with differences at the work environment, but only one of them understood that it was about unequal pay (P2), since it was the only participant who immediately noticed the statements on the cups.

"It is not the first thing [unequal pay] I think of when I see the cups. I think it is a question of attracting attention. I think the shape attracts attention", P4.

"The inequality we face today with different wages", P2.

When all participants read the statements, we asked about whether the provotype made trouble about unequal pay. All five participants chose to differentiate between the physical design of the provotype and its statements in their answers.

"It is the shapes that provoke me [...] it creates like interest and curiosity, and also some playfulness with it almost", P1.

Overall, the shapes were successful in making the participants to look inwards and reflect on the trouble of unequal pay. And P2 went a step further by highlighting that the trouble of unequal pay cannot be associated with comfort:

"The spiky one seems very aggressive, and like it is not comfortable to touch [...] It's unforgettable [...] Aggressive.", P2

Looking outwards, participants also reflected on how engaging and effective the provotype would be in making their colleagues relate to the trouble of unequal pay.

"I think the cups invite conversation because the design is quite bold and outlandish looking", P1.

This strangeness of the design was viewed as an asset, as it would allow them to point to the statements and invite their colleagues to participate in discussing the trouble of unequal pay. In relation to the statements as carriers of the trouble of unequal pay, all participants viewed them as appropriate in delivering information:

"Yes, I actually think they [the statements] deliver the message at the overall level. They do not go into detail, but I really think they deliver the message", P5.

But some went beyond the information presented by the statements and focused only at their role as conversation starters:

"I think they are good to start a little discussion. The discussion is more important than the statement", P4.

Similarly to the shapes, some participants looked inwards on how they would feel as deliverers of the statements to their colleagues. P4 discussed the difference between the statement being perceived as his own opinion instead on an objective fact, and informed us (after selecting a statement) that:

And then I hope that people don't put the statement on me", P4.

Similarly to P4s considerations, P1 a female participant reflected on the way the statements were formulated (male, female, neutral) by stating:

"I think it may be easier for women to carry the female statements than it is for men to carry the male statements [...] The female statements are really empowering and provoking, but for the male statements you kind of have to take some ownership and blame", P1.

6.2 Staying with the trouble of unequal pay

As staying with the trouble through design suggests, design artefacts can facilitate conversation and bring forth discussions about the trouble [Søndergaard 2018]. Thus, a design can both provoke, inspire and problematise an audience, and make people wonder how they experience the trouble themselves, and what their role is in relation to the trouble.

After taking the cups with them, participants informed us that their colleagues had similar reactions as them when they saw the cups for the first time in the cafeteria.

"I walked with the cup and people I knew commented on them. "Wow, what is it?", P5.

And similarly to their own experience, they explained to their colleagues the idea behind the cups, mostly because the statements were not that visible.

"I do not think people discovered the different statements on the cups. I had to explain and show them what the individual statements were", P4.

This difficulty in seeing the statements, and the failure from the provotype to sometimes instantly declare its troubling purpose led also to one situation of the participant not feeling empowered:

"I would have felt empowered if someone would have asked me about the statements. But when me and [P2] talked about the statements we had, that felt good", P3.

When audiences realised that the cups were about the trouble of unequal pay in a work environment, we had contradicting situations. In very few occasions, participants started having long conversations about the trouble, because they knew their colleague very well, and/or because they passionately wanted to stay with the trouble of unequal pay:

"We are very close friends, and we know how much we make, and we get the same salary. We are both consultants, so we get the same salary. He said, "look at us, why is this a problem?" For him it was more like, I don't think it is a problem. He doesn't think this exists [at the company]", P2.

Another reason we identified as leading to long conversations for the trouble of unequal pay, was two participants meeting each other while holding a cup. In this case, the cups themselves were used as means to understand each others views on unequal pay.

"I had a conversation with [P4][...] I think that I started that conversation because I asked him about his cup and what he chose", P1.



Fig. 8. Two participants talking while holding the Troubling Cups.

We hoped that the Troubling Cups would make our participants as well as the audiences to stay with the trouble of unequal pay and disturb the order of things [Søndergaard 2018]. But besides the few cases we mentioned above, staying with the trouble of unequal pay was difficult for our participants. mainly for three reasons.

The first reason was that often the participants did not have enough knowledge about the trouble of unequal pay to keep the conversation going. This led to many shallow conversations:

"I didn't have much knowledge to back up the conversation. I couldn't really argue with the folks, and one of them was like "Is this really an issue? This is unfair if that's the case", P2.

This awkwardness became more palpable when the audience too had no knowledge or interest on the trouble:

"It got a little awkward in the end when we stood two men. I did not know how to take the conversation further from there", P4.

The second reason was related to how the audiences perceived the trouble of unequal pay. Often our participants intentionally toned down the discussions when they realised that some of their colleagues considered the topic as too private (similarly to [Søndergaard 2018]):

"You do not know what to say or do. I think everyone knows how to deal with it, but not how to talk about it", P4.

The same toning down also took place when some of the audience members perceived that the Troubling cups were aimed personally at them and that they were responsible for the trouble of unequal pay. As stated by P2 and P1:

"They felt a bit attacked. I wanted to see how they would react", P2.

"I kind of expected the reactions I got. I was kind of expecting that some people, men, would be a bit more defensive towards that. Because I have seen it when it comes to equality they [men] take it the wrong way. They take it as if women want to push them down, and treat them badly", P1.

Lastly, the third reason for the difficulty of staying with the trouble of unequal pay, were the power relations that exist in a work environment. In particular P1, informed us that when she tried to share some personal stories as a way to make trouble (similarly to [Haraway 2016; Søndergaard 2018], their colleagues were reluctant to talk due to her position:

"I would really like to have the same kind of conversation with someone who is not reporting to me. With my boss, who is the one I report to, I think it would be really fun to have this and bring the cup", P1.

There were also a few cases where the trouble was perceived as non-existent. The more relevant one occurred in the cafeteria where one employee approached one of the researchers to inquire about the Troubling Cups. When the researcher explained to him their purpose he put his hands up in the air, said *"it's none of my business"*, and kept walking away. What was interesting though was that he then transformed the trouble into his own version, came back and said *"I get it now! The inside is the same, but the outside is different!"*. He then explained situations where he experienced unequal pay between him and other male colleagues and felt injustice. We then observed that he proceed with explaining his trouble to several of his colleagues that were taking coffee.

Overall, despite the challenges, trouble around unequal pay was made. Participants had conversations about the trouble with people known and unknown to them, and the statements and the overall design facilitated these discussions and reflections:

"So for both of them, the perspective was why is there inequality? Why should I get paid more if I do the same job? What is the difference? It created some conversations", P5.

7 DISCUSSION

This research work was inspired by Bardzell [2009] call for action by critiquing women's imaginings in different discourses. We know for a fact, that women experience trouble both through the data collected through our workshops, and, more importantly, through existing research towards a feminist methodology [Bardzell and Bardzell 2011]. With inspiration from Donna Haraway's staying with the trouble, in combination with a provotyping approach [Jensen et al. 2022; Morgensen 1991], we decided to stay with the trouble within work environments. Through a participatory approach instantiated in two workshops with women and by utilizing storytelling we have co-identified the troubles of resource inequality, degradation, and stereotyping. We argue that having this approach to entangle with and understanding trouble, not only provides us as researchers but also under-representative groups the opportunities to properly understand, speak up, and respond to trouble.

In this research work, we extend related troubling work [Almeida et al. 2016a; Balaam et al. 2015, 2017; D'Ignazio et al. 2016; Søndergaard and Hansen 2016], by focusing on the trouble of unequal pay in work environments. In the following subsections we reflect on how our provotype made trouble about unequal pay, and how our participants stayed with that trouble.

7.1 Making trouble through design: Reflections and lessons learned

The Troubling Cups were successful to a certain extent in making trouble about unequal pay in a work environment by prompting discussions and reflections (similarly to [Roussou et al. 2019; Welsh et al. 2018]). The provotype itself (form, shape and functionality) was successful in steering up discussions about unequal pay and gender issues in general, made employees curious and definitely caught their attention as the coffee cups travelled inside the working spaces, or as they were waiting to be used on their stand. We learned that even during awkward moments of silence, people were reflecting on the trouble, how it affects them, and perhaps what they can do about it. For reaching this point, of extreme usefulness to us was: a) the distinction among conceptual, functional, and aesthetic provocation [Bardzell et al. 2012], b) the fact that we designed together with the people that experience the trouble, and c) the fact that we distilled our own understandings and our participants understandings of the trouble into seven design considerations.

We do not claim that our study differentiates from numerous studies that focused on important societal problems (e.g. raising concerns about network technologies [Pierce and DiSalvo 2018], sustainability issues [Jensen et al. 2018], smart homes and gender issues [Yolande and Kennedy 2020], or race issues [Benjamin 2019]). Nor that we contribute to HCI field's theoretical understanding on how to do so (see for example [Bardzell and Bardzell 2013; Bardzell et al. 2014; Ferri et al. 2014; Khovanskaya et al. 2015; Pierce et al. 2015]). Our first small contribution is that we have evidence that this approach (staying with the trouble + provotyping + a participatory process) can work; it can lead to a provotype such as the Troubling Cups, which can make trouble. Thus we clearly align ourselves with other research efforts (e.g. [Bowen 2009, 2010; Thinyane et al. 2018]) that opted for participation and pluralism in their design processes (e.g. [Bardzell 2010; Bødker 1996; Spinuzzi 2005; Steen 2013]). In terms of the provotype itself, our second contribution is related to our reflections on how to produce one. Here we point out that co-distilling design considerations about other troubles, can act as evaluation mechanisms and discussion anchors for improving/reflecting upon the provotypes. This process is not only useful for looking on the provotypes, but can also act as reminders for future researchers and practitioners on true their understandings are to the spirit of the people that experience the trouble. Of course, we do not treat these

seven considerations as generalised and suitable for any similar design process, as further research would be necessary to be able to make such claims. We simply point to the fact that such an abstraction exercise can be also useful for future researchers, designers and trouble makers.

7.2 Staying with the trouble through design: Reflections and lessons learned

Through our study we asked employees to volunteer and stay with the trouble of unequal pay in real world settings. Thus, we asked them to disturb the order of things [Søndergaard 2018] by carrying around the Troubling Cups.

The provotype did allow them to stay with the trouble of unequal pay both by looking inwards and outwards. In relation to looking inwards, the design itself and the fact that it was deviating from the design of typical cups, thus making them more difficult to hold, made the participants aware of the trouble. Furthermore, what was also interesting was the fact that not only females, but also males chose to engage and act as troublemakers for unequal pay (2 participants). In relation to looking outwards, the Troubling Cups did steer discussions and problematised about unequal pay, but our findings show that this effect can be enhanced even more by a) *taking into consideration existing power structures*, b) *by providing more information about the trouble*, and c) *by utilising humour*.

Firstly, our provotype entangled with the power structures that exist inside any work environment and we identified a few situations where it was difficult for our participants to overcome these power structures and engage with the audiences (either because they were in power themselves and the audience did not want to engage, or vice versa). For future researchers and designers that want to produce provotypes that problematise similar troubles, we highlight that *who* takes ownership of the trouble (similarly to [Muller 2011]) is an area that deserves to be researched more. Perhaps we would have made more impact if the ones in power where the ones staying with the trouble through our design; or perhaps a bigger impact if the ones without power stayed with a trouble and highlighted the issue of unequal pay in a bottom up approach. In any case, there is a need for more understandings that shed light on who stays with the trouble through design and their relationship to power, and power relations should be definitely considered by future troublemakers.

Secondly, we also identified a few situations where people wanted to engage with the trouble, but they did not have enough knowledge/information about it. In our case, many of the participants knew that the trouble of unequal pay exists in work environments in general, but they did not know if and how much the trouble existed at their own work environment. And this situation led to insecurities in engaging with the trouble. We thus recommend that any future provotype should be anchored to context specific data, that will assist the participants to stay with the trouble.

Thirdly, our design approached the trouble of unequal pay from a rather serious point of view when it came to the statements. We believe that our results could have been different if humour was used to point to the trouble of unequal pay. We admit that we should have included more humour in our provotype, especially if we consider that it did emerge as a design consideration (C3) and that there is evidence that humour and awkward experiences can be effective in breaking taboos, make people empathise with each other, and encourage conversation [Almeida et al. 2016b; Søndergaard 2018]. We must, however, be aware that there is a fine line when using humour to address sensitive and tabooed topics, since using too much humour can easily constitute the trouble as unimportant [Søndergaard 2018].

Finally, we would like to reflect on the trouble of unequal pay itself. For many of the audience members the trouble of unequal pay either became their own responsibility, or non-existing. Both situations have been identified in literature before, since often individuals that are exposed to something wrong feel vulnerable and responsible for it [Søndergaard 2018], and often people that are already in a privileged situation refuse to hear the people that are not [Harding 1998]. Looking back into our design process and outcome, we believe the design strategies for social justice as presented by

Dombrowski et al. [2016] may act as a useful reflection tool, and in particular the strategies for designing *recognition*, *transformation* and *accountability*. Our focus with the Troubling Cups was to design for *for recognition* by identifying the trouble of unequal pay through the understanding the individuals who are most affected by that trouble. Our hope was that our design would lead to *transformation* through discussions and knowledge-sharing among the trouble makers and the audiences that could lead to change in the future [Dombrowski et al. 2016]. And even though our findings show that such discussions did took place and the trouble was recognised, the Troubling Cups were sometimes perceived as being designed for *accountability*, shifting the responsibility to the audience members. Since we strongly believe that researchers and practitioners who make trouble through design in the future will face a similar challenge, we strongly advice they should take it into consideration from the early stages of the design process and that often "*conflict in discussions – either anticipated or direct – should be understood not as a problem, but as a healthy sign that the project is tackling questions worth discussing*" [Dombrowski et al. 2016].

8 CONCLUSION

In this paper, we chose to focus on issues of gender inequality within work environments and through a series of workshops women shared their stories, discussed their troubles and provotyped ideas that could make trouble. The end result of this process was a provotype titled Troubling Cups that made trouble [Haraway 2016; Søndergaard 2018] about unequal pay, and guided its users to stay with this trouble [Haraway 2016; Søndergaard 2018].

Our qualitative findings demonstrate that through participation [Bardzell 2010] and provocation [Bardzell et al. 2012] a provotype can be successful in making trouble in a work environment. Towards this end, our contribution to research is that we have evidence that this approach (staying with the trouble + provotyping + a participatory process) can work. Furthermore, producing design considerations about other troubles, can help future designers and practitioners both in evaluating their provotypes as well upon checking how well themselves understand the trouble.

Furthermore, in terms of helping participants to stay with the trouble through design, we identified that it is important to a) *take into consideration existing power structures*, b) *provide more information about the trouble itself*, and c) to *utilise humour*. All three points were present in our findings as challenges which to a certain extent deferred people from staying with the trouble, and all three should be taken into consideration and explored more in future research studies. The same is the case with the fact that some audience members might choose to ignore the trouble either because they view it as their own responsibility (and thus too much of a burden to carry) or because they believe the trouble does not exist.

In relation to the Troubling Cups, we hope they will act as inspiration for future troublemakers, while the design process we followed will be useful in their efforts. Finally, we would like to conclude by stating that this research work was conducted within a western European context and within an IT environment and this limits its generalizability. Furthermore, another limitation of our study was its short deployment period, due to COVID19 restrictions, which did not allow for trouble to be properly diffused, and us having more thorough understandings. Thus, we strongly suggest to future researchers to aim for (way) longer deployments.

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