

# I Beg to Differ: Soft Conflicts in Collaborative Design Using Design Fictions

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## ABSTRACT

The adoption of design fiction into design research has recently been expanding within the HCI community. Design fiction workshops have fruitfully facilitated users and researchers discussing and creating future technologies by exposing differing viewpoints. Yet, most scholarship focuses on the ostensibly successful outputs of these workshops. It remains unclear exactly what sort of interaction dynamics are instigated by design fiction in collaborative design. How might design fiction affect what we consider in design, and how is this reflected in the ensuing design? To fill this gap, our study examines design fictions across five workshops where diverse participants created futuristic autobiographies, a method to elicit values, and built diegetic prototypes both individually and collaboratively. We detail their design processes and unpack three kinds of soft conflicts that arose between participants and allowed them to bring up and discuss differing values regarding technology in society. Reflecting on our workshops, we discuss their implications on how one might employ design fiction in collaborative design.

## Author Keywords

Human-robot interaction; Qualitative methods; Design fiction; Value-sensitive design

## INTRODUCTION

In recent years, HCI and design researchers have paid increasing attention to the potential for design fiction to allow scholars to critically explore the materialization and consequences of new design ideas in HCI. Technological futures and imaginaries constructed around emerging technologies are commonly discussed and critiqued in science and technology studies (STS) [16, 61] but such approaches do not take as their main aim the development and materialization of new designs. Design fiction is increasingly being recognized as a valuable source of inspiration and a design research tool for HCI, with the potential to play various roles and take numerous forms depending on the research setting and stages. For example,

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design fiction used alongside critical design can be presented as a design artifact with the intention to provoke and raise new questions for audiences both during and outside of the design process [65, 31]. Design fiction can also be used to facilitate design thinking and discussions about the potential forms, functions, and applications of technology in the form of fictional prompts or what-if questions [24, 37]. Design fiction can, therefore, inform all stages of the design process, from initial conceptualizations to materialization, and the consideration of potential short- and long-term societal consequences of the design.

Design fiction is often utilized during design activities involving multiple participants in workshops or focus group settings where it serves to elicit diverse viewpoints from these participants [17, 57]. Although such use takes into account the potential for design fiction to allow participants to envision and share their thoughts on future technologies via discussion, writing, or the design of artifacts, current work on design fiction does not often consciously reflect on and seek to develop specific forms of interaction *between* participants during design activities. Therefore, these past workshops may limit our understanding of how design fiction can best inspire and explore collaboration among participants with diverse perspectives. Sharing individual outcomes in design fiction workshops and discussing them within the group arguably entails an initial step toward collaboration. Therefore, we seek to explore and develop collaboration within the context of design fiction workshops in the deeper sense of “*working together in order to achieve a creative result*” [41, p.413].

Design fiction is used and shown to be effective in group environments for leading discussion and collecting diverse ideas; however, its potential and use in explicitly collaborative forms of design in HCI—namely co-design and participatory design—are seldom addressed, with some notable exceptions [52, 50]. For example, existing co-design workshop studies using fictions (e.g., co-constructing stories [17], fictional inquiry [21], and group storytelling [37]) placed emphasis on how the design process mediates between participants and researchers. Dindler et al. [21] asked participating children to write replies to questions from Martians asking what school days on Earth look like. In this way, researchers enabled children to talk about their everyday lifestyle practices in an informal way, which researchers failed to do through direct interviews. However, in both of these cases, researchers did not explicitly foster or consider collaboration among participants.

Moreover, HCI studies involving design fiction workshops often focus on individual outcomes (e.g., a piece of fiction, design prototype) while glossing over the process through which these outcomes are attained, such as specific design activities or participant behaviors during the workshop. As such, we know relatively little about the pragmatics of these workshops; instead we are presented with a relatively unproblematic telling of design. In this paper, we highlight the intermediate challenges and achievements of the process of design in design fiction workshops. In short, in terms of practicing design fiction, we see two opportunities to explore more: (1) situating design fiction in collaborative design and (2) analyzing the process of creating collaborative design outcomes.

Given that previous literature has not investigated interaction among participants in design fiction workshops, this paper describes our exploration into the potential of design fiction to support collaborative design among participants from various backgrounds in a series of five workshops conducted at two university campuses over the course of a year. There is much to examine on how design fiction connects with and supports collaboration—how it could work in/through/for collaboration. Through this work, we answer Knutz & Lenskjold’s suggestion that design communities should examine how fiction could “increase multi-stakeholder collaboration” in participatory prototyping [39].

We explore the use of design fiction to not only *inspire and collect different viewpoints* from participants but also to leverage these perspectives in *collaborative design*. Here, collaborative design refers to a generalized form of design activities in which participants work together to achieve a creative result. It thus embraces co-design or participatory design in a broad sense rather than standing within specific design traditions. The workshops build on prior work by examining the pragmatic aspects of design fiction (e.g., [42]), collaborative design [41], and design workshop studies [36]. This paper is also a direct response to a recent NordiCHI workshop call for exploration into “how to utilize [design fiction] within the realms of participatory design and co-creation with users or stakeholders” [50].

To explore these issues, we build upon our futuristic autobiographies (FABs) method to expeditiously elicit participants’ perspectives and values in semi-structured interviews [20]. With respect to values, we follow JafariNaimi et al.’s definition that “values serve situations as hypotheses” [35, p.97]. Values in our study act as grounds for taking a certain stance (e.g., if it is a problem or not) and actions (e.g., what ways can tackle an issue) vis a vis design choices in posed situations. We are interested in how values *serve* a design situation. Sejer et al. [59] proposed a form of participatory design that considers values as “emerging in collaboration” rather than already fully-formed prior to a project. We also see values as something that emerges during design through a dialogical process [30] and consider how this process can be constructed in design fiction workshops to support collaborative design.

In this study, we reappropriate FABs as an elicitation tool that enables participants to learn each other’s perspectives using a design prompt that asks them to create a community robot

in a future setting. Our intention was that each participant, by first creating individual and then shared FABs, would have an opportunity to explore their own values and ideas about future community robots and then work to understand and incorporate others’ values into a final collaboratively created design. We wanted to see whether FABs successfully facilitated or hampered this collaborative goal—whose values and what perspectives end up being discussed and incorporated into the final design outcome, and how are the choices that lead to these final outcomes made during the design process?

We make three contributions in this paper. First, through analysis of a series of workshops, we show new ways of using design fiction as an approach for collaborative design—allowing participants to be aware of other’s values and assumptions about technologies as a step toward collaborative design. Second, we identify and present an analysis of different kinds of soft conflicts and negotiations that arise in collaborative design using design fiction. By *soft conflicts*, we mean conflicts that were muted, but important, disagreements over values and designs that did not take the form of heated or extended debates. We also detail how these soft conflicts were resolved or sometimes ignored. We suggest that the notion of “soft conflicts” can be extended to discussions about the process of collaborative design more broadly. Lastly, we reflect on our approach by comparing it to other well-established design research approaches and offer practical suggestions for scaffolding collaborative design in design fiction workshops. In this, we explore some challenges that design fiction must overcome to expand its roles as a constructive, collaborative, and value-sensitive design research tool.

## BACKGROUND

In recent years, design fictions have garnered increasing interest in HCI. Design fiction was shown to be a valuable resource for communicating design concepts [62] and inspiring design of future technologies, as is often aligned with speculative design [24]. Recognizing its potential for producing socio-technical agendas for future technologies, HCI venues such as NordiCHI and GROUP have initiated a separate track for design fiction. Moreover, scholars have examined systematic ways to develop and use design fictions as a research tool (e.g., [58]). There has also been some critique of design fictions in HCI. Reflecting on the growing number of design fiction publications in HCI during the past 10 years, Lindley and Coulton [43] argued that the flexibility and ambiguity of design fiction has hindered the approach from being established as a respectable research method in our communities.

Sterling most recently defined design fiction as “the deliberate use of diegetic prototypes to suspend disbelief about change” [13]; this has become design fiction’s most canonical definition [43]. Design fictions can be summarized by three components: a story world, prototypes reflecting the story world, and a discursive space resulting from both [24]. There have been numerous descriptions on the future of design provoked and inspired by the use of a story world [4, 8, 21, 49] and diegetic prototypes [7, 38, 48]. However, the pragmatics of how design fiction is—or should be—used remains ambiguous [42, 45]. The lack of discussion on the pragmatics of

design fiction results in a lack of consensus among researchers on how to best utilize design fiction's flexibility to achieve specific design outcomes despite agreement among scholars on its ability to enhance collaborative design.

### Attending to the Pragmatics of Design Fiction

To reduce these ambiguities and establish a common ground to discuss design fictions, scholars have made efforts to put design fiction into practice for research [12, 42, 54]. For instance, Lindley [42] developed a pragmatic framework for design fiction by drawing upon Frayling's categories in research through design: research into/through/for design fiction. Using this framework, Lindley hoped researchers could clearly articulate the contributions of their use of design fiction. This also is in line with a recent call from numerous scholars in the HCI community to clarify design fiction as a research method [29, 43, 44, 47, 51, 66]. Our work serves as a response to these calls by directly examining the pragmatics of using design fiction in collaborative settings. This is achieved by integrating design fiction into collaborative design workshops and examining their use by participants to inspire discussion of differing viewpoints and creation of shared design ideas.

There is a general consensus that the primary focus of design fiction is not to produce polished design products but to "open up a space for discussion" [24, p.51]. Accordingly, generating insights and inspiration for future technologies has been commonly understood as design fiction's main purpose in research. Design fiction is tasked with envisioning the future world by means of fictional writing [9], producing physical artifacts [32, 46], or producing speculative prototypes [10, 31, 55, 65]. Building upon the general consensus that design fiction is a way of generating discussion, we show one specific way of using design fiction in practice. Specifically, we examine how design fiction in collaborative design can influence design considerations among collaborators. To accomplish this, we appropriate futuristic autobiographies (FABs) [20], a method inspired by design fiction for value elicitation [36, 57].

### Design Fiction in Workshops

Initially, the motivation for design fiction in HCI was to explore alternative futures and to encourage discussion between researchers and designers. In these cases, design fictions were created by researchers. Outcomes relied on participants generating polished fictional writing or prototypes using their literary or design skills. With workshops, researchers began to practice design fiction as a way to involve diverse stakeholders [15]. Participants included design students [51], customers [37], children and parents [1], or the general public [40]. Design fiction in these workshops mainly functioned to engage participants with an alternative reality or a futuristic world. For example, design fiction prompts guided participants to create insights for a certain domain, such as sustainable ICTs (information and communication technologies), via writing fictions [53], prototyping design artifacts [27], role-playing [34], or enacting living in a speculative situation [25].

Design fiction was also often utilized to materialize the workshop participants' imagination by transforming conceptual

ideas into design artifacts [1, 10, 11, 27, 39, 64]. For example, a workshop by Blythe et al. [11] focused on this materialization of the participants' imagination. Participants first annotated design workbooks consisting of collages of illustrations and sketches of an imaginary world; then, each participant made their own workbooks by materializing their imagination in drawings. Our study also uses similar elements of materializing the participant's imagination by means of prototyping certain aspects of their design fiction.

Some workshops focused on literary practices by borrowing literary strategies (e.g., pastiche scenarios to imitate potential users) for eliciting participation [39], in-depth feedback [17], or as a part of design activities. For example, futuristic narratives were collaboratively iterated by participants to come up with possible socio-technical agendas [53]. Another example is the writing of "mini-scenarios" conducted in a workshop organized by Markussen & Kunzt [51] that considered a future civil war in Denmark. Participants placed themselves in the year 2331 and wrote a speculative scenario in response to a dystopian vision of Denmark in 2018. Pairs of participants then used their writings to develop "what-if" scenarios, explore one selected scenario, and develop an artifact prototype from the selected scenario. Our study draws from Markussen & Kunzt's workshop in their use of speculative writing and prototyping.

The contributions of these design fiction studies to HCI and design vary. Markussen & Kunzt [51] aimed to explore different poetic practices that design fiction could involve, focusing on analyzing final prototypes—the outcomes of workshops—that design students made out of their previous literary activities. Our study instead focuses more on the process of design enacted during the workshop, in particular, how each group compromises and negotiates in collaborative design activities, and how design fiction could be useful to better facilitate collaborative design engagement.

In sum, using design fictions in workshops has been valuable in articulating participants' perspectives on imaginary worlds, actively sharing participants' ideas with others, and increasing participants' engagement with an open-ended future. There has also been a shift from researcher-led design fictions [63] to participant-led ones (e.g., collectively creating design fictions via SNS [40]). Our work aims to provide insight into how design fiction is created and may be changed through interactions or group dynamics among participants. By placing design fiction in a collaborative design workshop, we extend these notions of participant-led design fiction and focus on group dynamics in workshop-settings.

### METHODS

Although past work examined futuristic autobiographies [20] as a value elicitation tool in research interviews, this study seeks to explore how FABs can be used in a collaborative setting among various stakeholders. We were particularly interested in whether the sharing of FABs would allow participants to better collaborate with each other and reflexively consider and incorporate differing values of all participants. To examine this, our study method focused on two main questions: 1) how each group developed their collaborative FABs

Workshop	# of Participants (participant background)
1	5 students (3 design, 2 engineering)
2	3 students (2 design, 1 informatics)
3	3 students (1 computer science, 2 humanities)
4	7 students (3 robotics novices, 4 experienced)
5	7 students (4 robotics notices, 3 experienced)
Total	25

**Table 1. Informants' casting experience (in months).**

together (e.g., how were disagreements created or resolved) and 2) how this collaborative design process may reflect on the design outcome (e.g., which values end up being incorporated into the final design).

### Workshop Recruitment and Participants

We wanted to create design settings where participants encounter others who may have differing viewpoints and collaborate with them, mimicking the differing values between users and designers echoed in robotics literature [19]. We decided to recruit participants from different backgrounds (engineering vs. design) and different levels of experience in robotics. This, we reasoned, would create an environment where opposing values would be shared via FABs, presenting non-trivial situations for collaborative design.

We invited between six and eight participants to each workshop. A total of 25 participants attended over the course of five workshops. Twelve participants were male and thirteen were female. The demographics of our participants' can be found in Table 1. We use pseudonyms for all participants mentioned in this paper to protect their anonymity.

### Workshop Procedures

The workshop procedure was developed to give each participant an opportunity to reflect on and express their values about a potential future with robotic technology through individual FABs, and then to allow these values to come in contact with one another through collaborative FABs. Each workshop lasted approximately 2.5 hours and was comprised of four phases with a short break in the middle:

**1) FAB Introduction:** Participants each created a short FAB as a warm-up exercise. The introductory FAB prompt asked about participants' general thoughts on future robotic pets; participants improvised their ideas and presented their short FABs to others in the workshop. This also allowed participants to establish rapport among themselves. All participants had time to ask clarifying questions about FABs.

**2) Individual FAB Session:** The individual FAB session consisted of writing a FAB under a given prompt and expressing one part of the FAB through Play-Doh and wires, thereby producing a diegetic prototype.

The prompt in the workshop asked participants to imagine themselves with a community-shared robot (see Figure 1) in the future. As FABs are a method inspired by design fiction, we asked participants to include basic components of a plot (characters, drama, and settings) and one specific dramatic moment in their response. After 10–15 minutes of individual writing, participants were asked to start prototyping one component of their FAB. We emphasized that the

#### Futuristic Autobiographies (FABs) Prompt

It has been a long time after you graduated [the name of university]. One day, on the way to your home from work, you came across a communal "shared robot" around your neighborhood. Usually you don't take notice of the robot, but today you decided to engage with it. Then, you ended up renting the robot for a while. To date, the robot has involved with several happenings of X, Y and Z, and a significant event Q, which made you feel little bit anxious. Before you signed the rent agreement, you made sure to look through policies and obligations regarding the uses of robots. (X, Y, Z and Q could be something that you can imagine)

**Figure 1. FAB prompts used in the workshop.**

prototypes should be low-fidelity and did not need precise details. Participants were allowed to add details to their FAB as they prototyped.

Afterwards, each participant presented their FAB and prototypes. The facilitators asked leading questions to encourage discussion, and participants were encouraged to voice their critiques and opinions.

**3) Collaborative FABs:** Students were paired in groups of two or three to produce a single FAB and prototype. Taking the participants' background survey into account, we strived to form groups with varying backgrounds in robotics or design. The FAB prompt remained the same as the individual FAB prompt since we hoped to see how the encounter with different ideas may tip the balance in different design decisions.

We encouraged the participants to discuss their individual FABs with each other and to start brainstorming a new FAB. We made sure that participants either created a new FAB together or creatively reused components—not the entirety—of their individual FABs. The groups then prototyped a component of their collaborative FAB. Afterwards, each group presented their FAB and prototype.

**4) Workshop Evaluation/Wrap-up:** At the end of the workshop, we asked the participants to individually fill out an evaluation form to elaborate on any thoughts they may not have shared during the workshop in the presence of other participants.

### Data Analysis

We video recorded each workshop (2.5 to 3 hours), placed audio recorders between each participant pair to capture all conversations and interactions, took pictures of the workshop activities and prototype artifacts, and stored files of the individual and collaborative FABs. All videos and audio files were transcribed and analyzed later using ATLAS.ti. Our analysis followed a grounded theory approach [18] employing open and axial coding. Our research team went through iterative rounds together of reviewing collected data and initial themes (e.g., conflicts, technical concerns) that emerged in the group discussions to unpack the relationships and dynamics of found themes. In the following sections, we report on the major themes we found.

### FINDINGS

We now describe how participants engaged with FABs as an example of design fiction in the context of collaborative design.

From these observations, we hope to elucidate the pragmatics of deploying design fiction/FABs. Foremost, despite our intention to construct the workshops to promote heated discussion and negotiation about the design of future robots, we saw that FABs both facilitated and deterred collaborative design.

As our focus was on understanding how participants expressed and negotiated values during the workshops, we observed that participants' values were particularly elicited during moments of *soft conflict*. We use the adjective "soft" to connote that these were not outright, lengthy or heated debates between participants; rather these were nuanced and convivial, but important, disagreements. Soft conflicts emerged when participants collaborated with each other and also when they interpreted the workshops' procedures.

We found three main sources of soft conflicts. These sources were differences in *conceptual understanding*, contrasting interpretations of *feasibility*, and challenges in forging *physical representations* of the FABs. Conceptual understanding refers to participants' interpretations of FAB prompts (e.g., the purpose of creating design fictions, details on future environments where robots are deployed). Feasibility is concerned with describing the type of future robots participants envision and how they work (e.g., implementation and roles of robots) through the FAB narrative. Physical representations refer to constructing diegetic prototypes (e.g., what robots should look like, how the imagination represented in the FAB is materialized). Each conflict pertains to different components of FABs, yet these conflicts are dependent on one another.

We also present different design strategies participants utilized to resolve soft conflicts in collaboration. By foregrounding soft conflicts, we hope to show the pragmatic challenges and realities of using design fictions in collaborative settings. We further offer insights into using design fictions in collaborative design—past scholarship involving design fictions in workshops did not have participants engage with them collaboratively. Depending on the desired design outcome, researchers and practitioners can determine which parts of design fiction might be most useful to leverage.

### **Conceptual Understanding: Soft Conflicts with the Design Fiction Prompt**

In our workshops, we noticed participants approached FABs differently depending on their understanding of FABs and their general interpretations of the future setting. In our study, *future setting* referred to how the participants' envisioned the future environment in terms of the time and the physical/social space where robots will be deployed. Their different interpretations of the prompt resulted in FABs that varied from our original expectation—short, futuristic, and autobiographical stories. Some participants ended up amending the given prompts to create their FABs as they wanted to narrative their FABs.

#### *Reorienting the Design Fiction Prompt*

The different interpretations of the future period were previously pointed out by Cheon and Su's [20] work on FABs. This study further shows how FABs inform collaborators' perspectives and design decisions. We observed participants reorient

attention from the intended near-future setting toward more exaggerated far future scenarios and establish personal contexts for their FABs.

Although we expected to see short autobiographies as responses to the individual FAB prompts, many variations of FABs were created. For example, some participants made sci-fi stories. Nathan (W4) below described a future where humans hunt rogue robots:

In the year 252525, sentient AI robots are prevalent. . . They were created by mankind's greatest minds to be the next step in our evolution as a species. . . After the first few robot uprisings and the Rusted Bolt Rebellion, the United Nations formed a new council. . . It began on a rainy night. I was in my office with the lights down low. . . But then, a ragged looking broad rushed in without so much as a hello. She sat down in a chair. . . She looked like the type of person to go running without so much as a fight. . . "You see, I'm a Private Investigator, a PI if you will. I specialize in finding rogue robots to bring them back in. I used to be a recall specialist for one of those rich behemoths of a mega corp." (W4, Nathan)

Nathan followed the autobiographical style we asked for but situated it far into the future ("year 252525") in which available technologies were disconnected from current capabilities.

The prompt (see Figure 1) provided a specific time, place, and rationale for the future scenario. We found that participants, however, often took creative liberty by improvising on top of the original setting, creating a new future setting in their FABs. Our participants were instructed to primarily describe the robot and what happened during their interactions with the robot. Participants did not entirely ignore the given prompt but preferred to add context so that the given future situations were more appealing to them.

Details of the future neighborhood in our FAB, for example, were added to at the beginning of some participants' FABs:

It's 2047, a sunny Friday afternoon in August, and I am starting my walk home, ready to begin my weekend by working on my latest project: cryo-freeze. I saw many faces across as I walked, but more than half of them were artificial. Robotic Police Officers stood against every corner, "Hello Ma'am," the robot greeted as I walked past. As I made the turn toward my house, I saw something that wasn't very unusual, but today... it really stood out to me. The communal "shared robot" was making laps around my corner of the city, and normally that would not be of interest to me, but then I considered. (W4, Rachel)

Instead of writing about the encounter with the community-shared robot in a straightforward manner, Rachel's FAB started with the weather and what her future self saw on her way home, establishing a narrative undertone for her eventual encounter with the robot. In these improvised future settings, participants wrote FABs that justified roles for the robot and how their future communities and selves acquired the shared robot.

#### *Rendering the Future Setting*

We observed participants re-purposing FABs to align with their personal goals. Some participants wrote FABs to entertain or to bring up concerns about living with future technologies, and others addressed social issues they imagined would worsen in a future with technologies. For example, Samuel's FAB surmised that depression would be compounded in the future:

It is said that the world is getting smaller and people are getting closer as days go by due to social media and fast, convenient modes of transfer.

Yet, I feel that in the future depression will be a big problem due to lack of human interaction. Even today, you do not see people walking around “in the neighbourhood” as they prefer to drive. Flying vehicles will just make things worse. Ironically, robots could fill the void caused by a gloomy environment due to lack of human interaction. (W4, Samuel)

In this excerpt, Samuel foresaw that robots would be the only potential solution for the depressed while any other technologies in the future, such as flying cars, would make it worse. In this sense, the future setting in his FAB was framed with the assumption that there would be a societal need for robots. Similarly, Tina (W1) worried about “*losing [conversation] topics*” among families in the background of her FAB and expected that robots “*can serve as a social butterfly when we have nothing to talk about, it can sharpen the conversation.*”

Overall, we observed participants reinterpreting and improvising prompts by augmenting the given future settings and re-purposing FABs in our workshops. This is, perhaps, an example of addressing the implicit conflicts between their understanding of what is important in situating technology in the future, in comparison to the researchers’ expectations.

### **Feasibility: Soft Conflicts among Human Participants**

Conflicting ideas emerged between workshop participants over whether the proposed FAB narratives were feasible. We refer to *feasibility* as whether the roles of robots outlined in FABs are realistically implementable in the future setting. Negotiations around the feasibility of narratives revealed how the future robots are conceptualized, helped participants explore design spaces and articulate them, and, most importantly, exposed what is or is not negotiable.

We describe how participants encountered these conflicts in collaborative design and how they were handled. We say *handle* instead of *resolve* to note that not every conflict was solved by the end of the workshop session. The resulting design prototypes reflect compromises, which were not always equitably representative of the different values and visions of all contributors. As a way to see how the conflicts played out in their collaborations, we specifically show how soft conflicts led to participants’ design decisions and final prototypes.

#### *Revealing Technological Expectations*

In collaborative FAB sections, participants often had opposing thoughts on what the robots would do and how they should be implemented. Whether their idea was feasible or not depended on the “future” timeline of their FABs. Sometimes, it needed to be far enough in the future that necessary technologies would be available or the type of robot they developed would be novel. In workshop 1, a robot that suggested appropriate clothing according to one’s schedule was rejected since “*they [already] have some apps for that.* (Katy, W1)”

By contemplating the feasibility in their FABs, participants positioned robots as advanced technologies. Participants often selectively applied futuristic components only to robots, leading to misalignment between the future and present—robots were advanced because they incorporated cutting-edge technologies while other components of the narrative remained at current technological levels. For example, Amy’s FAB showed that her photo-taking drone will adopt current email

and electronic file systems: “*When you are signing out the robot, it will ask for your email address so that you can receive all of the photos the robot takes in a zip file once you return the robot to the booth it came from.* (Amy, W2)”

By actively incorporating current technologies, future robots were described as assemblages of technologies. For example, while creating their collaborative FABs, one pair in workshop 1 brainstormed their domestic robots as a combination of the Roomba and Alexa, both current popular home technologies. In addition to functioning like Roomba and Alexa, Tina suggested that their robots should have additional functions such as flying to other floors: “*[Y]ou basically have a Roomba but it flies. It can go floor-to-floor. . . The only thing I can argue right now is reminders and stuff like that, Alexa already does like those and it’s a very common thing of that. The big [difference] is that it can move floor-to-floor, it can maneuver around and bring stuff that you might forget.* (Tina, W1)”

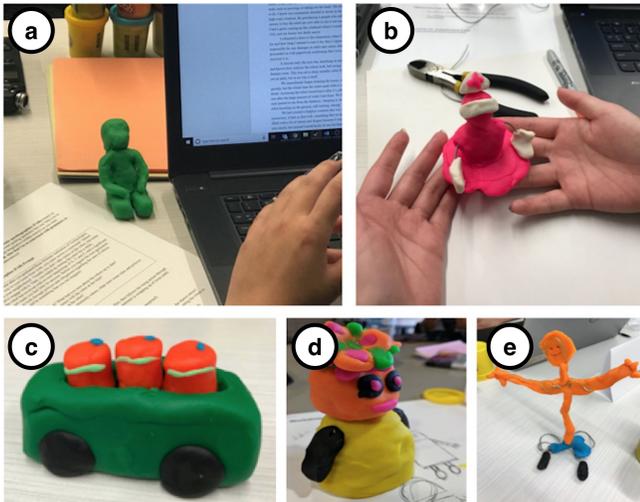
#### *Articulating their Design Spaces*

Overall, participants in our workshops neither strongly expressed their ideas nor were insistent on their views—they engaged in soft conflicts with each other. Through interrogation and validation, participants tried to see how other participants considered feasibility. Participants probed others for more details about their implementations. Alan in workshop 4 questioned why his partner made a charger for her robot, asking, “*Why did you think it was so important about the charging station that you actually made it?*” Jane elaborated her thought process by responding “*I mean you have to charge your phone or watch. . . I don’t want to charge my robot every single day, so I’m going to let it charge in the box every two weeks.*”

Soft conflicts over feasibility often led participants to explicitly discuss their ethical concerns on which roles the robot should take. One participant opposed the idea of a nanny robot over concerns with trust. She suggested alternative roles for the nanny robot by saying, “*Why can’t the robot take care of like the cats, you know some people want to travel long for a couple weeks, have the robot take care of your animals.* (Clara, W3)”

Most commonly, conflicting views on implementation and roles of future robots were smoothly negotiated or compromised, which was reflected in the final designs participants created. Participants were willing to embrace their collaborator’s suggestions on the appearances and roles of robots. For example, in workshop 5, Alice said, “*I really don’t like green*” when Regina picked the green Play-Doh. Regina, who used only green for her individual robot (Figure 2a), opted to choose the color that Alice preferred for their collaborated prototype (Figure 2b). Although this is a superficial decision, it demonstrated how willing participants were to compromise and negotiate differing values.

In terms of the roles and functions of robots, participants dealt with soft conflicts in one of two ways: subsuming one idea with another or finding a middle ground. For example, the following conversation in workshop 5 illustrates how the pair found middle ground regarding the role and implementation of their robot:



**Figure 2.** Pictures of prototypes made by participants.

Zack: Yeah. I'm thinking maybe like something that rolls around on wheels with appendages or something. If it's going to be in a central spot, it's going to move pretty quickly.

Kyle: Yeah, but I feel like it needs to have some way in traversing rougher terrain. Like, um, maybe it's stationed in a park or maybe it needs a way to climb stairs because you know it's in an apartment building. [Zack: Mhmm] It has to be able to get to one floor to another.

Zack: What if something like this is the main part but then it has like smaller robots that can carry or a bit of supplies? Like, they're slower, but they have, you know, legs or some sort of thing like that, like get into smaller spots. Like, one big transport instead a bunch of little...

Zack was thinking of implementing wheels in their robot while Kyle thought that wheels would not allow the robot to climb stairs. They compromised in a way that reflected both ideas in different parts of the robot: making a robot whose main body has wheels and has several mini robots with legs attached (Figure 2c).

Participants compromising did not mean they fully relinquished their views. In workshop 1, Aaron initially insisted on designing human-like robots since he believed the robot should have advanced functions: *"It could break things like that. Definitely, [it] has to imitate us humans. (Aaron, W1)"* In contrast, Rose stuck to her belief that robots should not look like a human but look like *"what people imagine when we talk about robots."* She explained further, *"So, if we design, so if we base on this shape, people won't get weird. (Rose, W1)"*

Aaron in workshop 1 spoke about how they compromised in designing their robot by making it, in his own terms, *"less human"*:

Aaron: Well, first—from the design standpoint—we had some contrasting ideas there because [I] wanted to [make] it look human and I don't want it to look... [mechanical] so then we found a middle ground, not completely human but not just a bot.

Rose: And also, the reason we designed this outlook is because we... don't want to shock our users. This shape is very familiar to most people, so we just want [users] to feel comfortable.

Rose mentioned how this middle ground (neither human-like nor non-human-like) satisfied her design philosophy that

robots should be designed differently based on target users. She was strongly against the universal design that Aaron suggested during their collaboration. As illustrated, once soft conflicts around feasibility were negotiated in collaboration, the negotiation manifested in the participants' prototypes (as presented in the Figure 2d) that have a body with two arms and fingers for doing house chores but a flower on its head and a colorful appearance to appear less human.

#### *Exposing What is Non-negotiable or Not*

When collaborating, participants found it difficult to compromise when discussion shifted from design feasibility to design values. For example, one participant in workshop 3 suggested building a road for their grocery robots. Their collaborator was not as enthusiastic in his support: *"If you could convince people to make huge infrastructure changes than I guess that would be cool. (Jess, W3)"*

As another example, the following vignette presents a big chasm between pairs regarding what roles robots should bear, which also implied different ethical standards for robots:

Oscar: I guess one could say that at the end day it's not like think it is a robot and if you need to vent your frustration and you don't want to do it in front of people around people without getting any sort of legal action against you... Just go and beat robots. I don't know why you would do that but...

Alex: Yeah but that's what a punching bag is for. Not a robot.

Oscar: This is... kind of alive, man... It's got to have emotion. It's going to be scared. People might enjoy that. <laughs>. I do not know.

Alex: That got dark fast.

Oscar: I don't know. Yeah, I don't understand that, but domestic-wise you'd rather beat up a robot than a real person man [Bruce, the third collaborator nods in agreement]. (W5)

The group in this vignette ceased to talk about whether violence toward robots was tolerable. These issues were perhaps more relevant to the usage of robots, and the pair might have thought it was not necessary to resolve the issue immediately for the purposes of completing their collaborative prototype in the workshop.

The consideration of these value-laden agendas was commonly observed in our workshops. For example, one group in workshop 3 deliberated whether grocery robots should be used for certain citizens (e.g., people in urban areas, people with physical impairments) or for everyone. This deliberation led to a discussion about whether their robot design would include sidewalks or roads for grocery robot-specific use. Jess who argued for not discriminating against certain users said, *"You must take the sidewalks because not everybody lives close to a local grocery store."* The group ended the discussion of this issue when her collaborator replied, *"It doesn't have to be. (Mike, W3)"*

Like many other discussions we observed throughout our workshops, this group did not push to resolve their difference of opinions with regards to design and values. At the end, the conflicts grounded in individuals' ethical and moral stances were not incorporated into the resulting design of their prototypes.

### Physicality: Soft Conflicts with Workshop Materials

In this section, we focus on soft conflicts around the FAB prototypes, specifically on how limitations of the provided design materials played out in collaborative design.

Conflicts relating to physicality often emerged as tensions between materials and individual participants rather than as disagreements between participants. For example, the lack of given materials often constrained the look and feel of their designs (e.g., shape and size). Aron (W1) mentioned this struggle: “When I was making the concrete prototype, I had to [think like] ‘Okay, maybe it needs a wing or something like that,’ so [in this way] I felt so restricted to make the similar concept.” The vignette that follows shows how the workshop materials caused soft conflicts during the collaboration by forcing participants to decide the ways in which they distributed clay appropriately to express what they envisioned:

Bryce: It’s a skinny body.

Shiraj: We need to use a minimum so we don’t run out of Play-Doh. I’m trying to make it light.

Bryce: The other one you used too much on the bottom! (W5)

Participants had to discuss what they could do with the given materials, such as whether the material was solid enough to express what they planned to make. One group had trouble using the wires with the Play-Doh to make a structurally-sound prototype (see Figure 2e).

One way to resolve these conflicts around the physicality was to leave them out of design decisions. Bryce and Shiraj discussed what specific jobs their gym robot would do for people. When Shiraj threw out his idea of the robot supporting weight training, Bryce was against it:

Shiraj: Resistance training? Weight lifting?

Bryce: No. Like, you get hurt a lot, so I imagine with this you would be hurt more.

Shiraj: Oh, because it’s made of metal.

Bryce: Yeah, and you said it will push you too hard. (W5)

Here, they treated Play-Doh and wires as if they were the actual materials for the robot (rather than representations of other materials). Bryce did not want their gym robot to be used for resistance training because people might get hurt from its metal composition.

### Roles of Materiality

One of the challenges we faced in using design fiction as a value elicitation tool was the expansiveness of design fiction—anything can happen in a fictional world. Although this flexibility enabled design fiction to have a variety of media and forms, we found that flexibility could also keep participants from taking the exercise seriously or not engage with the future world deeply enough. For example, one participant told us how writing design fiction gave her too much freedom to talk about future robots so that she did not have to pay attention to anything specifically: “When I’m writing, I feel everything is not a concrete for example. Like when I was imagining robots that can fly, it isn’t necessary for me to think how it would fly [or] the way it flies. (Kate, W1)”

We noticed that the clay prototyping portion of the workshop led participants to attend to specific concerns in their fictional worlds. Kate elaborated on how prototyping helped shape up her imagination. Concurring with this, Andy also mentioned that prototyping actually required him to think twice, and he could not just explore his imagination as he wanted: “You’re free to imagine whatever you want, and it’s totally up to your imagination, but translating that into something physical like a prototype, you just can’t. Of course, you can always improvise, include some new thoughts, but it’s far easier to imagine than to translate that to the world. (Andy, W1)”

In line with the soft conflict they had with the prototyping materials, we found that FABs written by our participants rarely described how the future robots might look in terms of their shape, color, or size. Although Play-Doh prototyping did express one part of the participant’s FAB, participants mostly focused on their robot’s appearance, which was rarely described in the written FABs. In this regard, we see that physical prototyping enabled participants not only to specify their imagination but also to materialize and collaboratively discuss aspects of their imagination that otherwise might not be revealed through other means.

## DISCUSSION

### Minimal Departure with Design Fictions

Within HCI, design fiction research tends to focus on the “future.” Because the nature of the HCI field is generally future-facing, researchers may be more inclined to reinforce this view of design fiction as creating the “future.” Our workshops were similarly aligned with this orientation by specifically probing our participants to imagine not-yet-existing technologies like community-shared robots. It is important to note, however, that a focus on the future may exclude or narrow the range of alternative technologies and contemporary concerns we engage with.

Literary scholar Marie-Laure Ryan’s principle of *minimal departure* [56] highlights that people tend to imagine worlds “as being the closest possible to the reality we know.” This parallels previous studies (e.g., [10, 20]) and our findings in this paper. Although the robots portrayed in our participants’ individual and collaborative FABs were somewhat futuristic and in some cases deliberately placed by participants in a far off time, other technologies (e.g., phones, card transactions systems) or social issues (e.g., social isolation) in their FABs were rooted in current life and society. Even though the FAB prompt indicated how far the future will be, some participants instead prioritized common needs with their collaborators (e.g., don’t have time to clean the house), and incorporated these needs into the functionality of future robots (e.g., cleaning all floors/stairs). Similarly, Blythe et al. [10] found imaginary technologies created by older adults addressed current issues, such as building accessibility. One participant in the workshop imagined a future movement where activists on scooters would mark the accessibility of buildings, toilets, and bathrooms—this “future” is, in fact, mostly grounded in current concerns.

The minimal departure exhibited by participants does have some benefits—it has allowed researchers to better identify

the matter of concerns users hold [23]. However, this is not the main reason why researchers use design fiction. What researchers intend to gain from employing design fiction is exploring alternatives and pursuing radical ideas that could inform design ideas and future design directions [46]. There is, therefore, a mismatch between what scholars expect out of design fictions and how users respond to design fiction prompts. A future direction for research, therefore, could be exploring how to inspire participants to venture more directly into future possibilities and concerns.

### From Futures to Alternatives

Design fiction should not limit itself to neither the future nor other specific time settings. One way to translate Sterling's definition of design fiction as "the deliberate use of diegetic prototypes to suspend disbelief about change" [60] is to see design fiction as contributing to more than just the future—namely, producing *alternatives*. Alternative scenarios imagined in design fiction do not necessarily have to be set in some future time. Scenarios could also draw from a past that participants have not personally experienced (e.g., the 1980s Soviet Union state [11]) to develop what Auger called an "alternative present" [2]. If our participants had been told to describe an alternative present, they may have, for example, imagined different robot assemblages with current technologies such as an Amazon Echo with wings. The diverse temporal scopes our participants chose to incorporate into their design fictions suggest that alternatives may be one way to reach deeper re-imaginings or re-appropriations of contemporary technologies as well as future ones. Our findings about participants' discussions about and process of developing FABs suggests that considering design fictions as referring not only to the "future world" but also to contemporary "alternative worlds," we could widen the scope of the application and context in which design fiction can be utilized.

### Design Fiction Collaboration with Soft Conflicts

Outwardly, half of the prototypes collaboratively created by participants in our workshop did not seem to result from careful consideration of the values and perspectives represented by the individual prototypes and FABs. Instead, final prototypes fell into one of three cases: 1) entirely new (six teams out of 10), 2) a creative blend of each other's individual prototypes (three teams), or 3) simply putting individual prototypes together (one team).

Despite this, based on our analyses of participants' conversations and design collaborations, we observed that participants did actively exchange ideas and negotiate for their final design. In fact, we argue that the collaborative prototype is not a good indicator of whether collaboration was successful or not; we should focus on the *process of collaboration*, not just the final product of collaboration. In the first case above, conflicts and negotiations happened around feasibility since participants had to create prototypes from scratch. Instead of utilizing individual prototypes, the second and third cases involved rich discussions on a variety of agendas (e.g., how should our city infrastructure deal with the needs of robots?). In this sense, looking at the process—the dialogue, soft conflicts, and negotiations of design—is vital; the final prototype is a means to

an end, and undue focus on them may limit our understanding of the collaborative processes in design. This is particularly important to remember because design fictions do not regularly take the prototype itself as the main outcome but rather seek to elicit critical and reflective thought on possible relationships between technology and related social experiences, organizations, and actions.

We highlight this because research incorporating design fictions in group settings [51, 10] often focuses on the outcomes of workshops (i.e., the resulting designs). We also initially focused on outputs—the ensuing FABs and prototypes. Instead, it might be more meaningful to track how designs evolved in our workshop process through design documentation approaches, such as annotated portfolios [14, 28], to understand more conceptual results of the collaborative design process.

### Reorienting Agonistic Spaces for Design Fiction

Initially, we expected our workshops to be vibrant sites for sharing and debating values revealed through FABs and prototypes. We also saw this as a way to create design fictions collaboratively, with all parties reflecting on and considering each other's values. To achieve this, we invited participants with diverse backgrounds and allowed them to comment on each other's prototypes.

We focused on designs that are collaboratively reached; so, we wish to draw parallels to similar motivations behind participatory design (PD). With the aim of promoting democratic values, scholars [5, 6, 22] have sought PD spaces that are *agonistic*—spaces that feature "a polyphony of voices and mutually vigorous but tolerant disputes among groups united by passionate engagement" [5, p.48]. According to Björgvinsson, collaboration is "a good opportunity to create [an] agonistic space" where diverse perspectives could be unpacked.

Even though we carefully designed our workshops in a way that participants could encounter different viewpoints during their collaborative design, our workshops do not resemble agonistic spaces. We noticed only a few open disagreements—certainly not heated debates—during the workshops. Indeed, identifying explicit conflicts between participants in our workshops was not easy. Regarding this, both Disalvo [22] and Eriksen et al. [26] also noted this difficulty based on their experiences with community design research. According to them, it was hard to *see* conflicting ideas among different communities that seem to have a different stake (e.g., entrepreneurs vs the unemployed); participants often expressed homogeneous views.

As scholars found agonistic spaces valuable for PD settings to reestablish democratic values, we also believe that seeing agonistic spaces in these different perspectives could advance design fiction. In particular, we can still reach the goal of agonistic spaces as we intended, but, instead, we need to review collaborative design in terms of identifying and understanding soft conflicts. Disalvo suggests that so-called conflicts in agonistic space are revealed in subtle ways [22]; we must find its signal. For example, in DiSalvo's work, low attendance rates of the PD meetings over time was a signal that there was discontent among participants. In our case, soft conflicts

enabled us to analyze different views of participants more critically—for example, we paid attention to what was negotiable or not and how negotiated elements were incorporated into participants’ design prototypes. In our workshops, participants could mediate their differing opinions about designing certain aspects of the robot, specifically, its appearance and functionality. These aspects are components that could influence their Play-Doh prototypes. They could also reframe the design fictions by building on the context and time period in which they were set. In contrast, value-laden concerns (e.g., Is violence to robots acceptable? Should we consider the needs of robots?) around robots were not resolved during collaboration and, unsurprisingly, these were not considered in the design of final prototypes. What this suggests, ultimately, is that participants in design workshops which do not aim to produce a final product that will be used in a specific context may express their ideas regarding complex, value-laden issues with soft conflicts, leading to neither resolution nor any final design that represents serious consideration of differences in values.

Simply sharing values is not enough for reconciliation of values to be achieved. Yet, we imagine our three sources of soft conflicts could signal to researchers when these value-laden concerns might arise in collaborative design workshops, leading to pro-active measures and making sure these soft conflicts are fully negotiated and not tabled. We suggest that soft conflicts may be a “strong concept” [33] that can be appropriated by researchers and designers to generate new solutions for a particular design problem. Future work may investigate how researchers and other stakeholders can create an environment where value conflicts are actively addressed.

### **Agonistic Spaces for Soft Conflicts and Alternatives**

Our thinking about our workshop goals has evolved since its initial inception. Pragmatically, we believe design fictions, and FABs in particular, may best be seen as bringing out soft conflicts over alternatives (i.e., alternative scenarios) in an agonistic space. Given this new goal, we now turn to how future scholars might iterate and improve their own workshops from our own rethinking of FABs in collaborative design.

FABs, and design fictions in general, are an activity that demands deep and personal engagement from participants as seen from the variety of FABs produced by our participants. As such, we suggest design fiction workshops to focus on one of three sources of soft conflicts—conceptual understanding, feasibility, or physicality. This would allow a finer-grain approach to examining how participants engage with design fiction and how certain types of conflict comes into play in a collaborative setting. For example, focusing on conceptual understanding, participants could be asked to only write about the future setting and environment rather than to engage in all elements of a plot (e.g., by omitting a dramatic plot point or certain characters). Researchers could then focus on the participant’s perception of where and when the future setting is and the technologies placed in that setting. This could be examined by carefully considering the “perceptual bridge” [3] that makes their fictions more plausible to the audience. For example, instead of focusing the examination of what partici-

pants think of a given design fiction, researchers could, prior to the workshop, ask participants to develop fictional backgrounds and histories of technologies that are credible and feasible.

We also suggest researchers take into consideration the type of materials provided for prototyping. Although Play-Doh and wires allowed participants to prototype their ideas, they did have difficulty when it came to making prototypes with bipedal features or large overhangs (e.g., helicopter-like blades) as well as the amount of time required to prototype with these materials. In workshop 5, one participant decided to sketch their prototype on paper. To better allow participants to prototype their FABs, the materials provided for prototyping need to be considered in conjunction with the prompt.

Finally, we suggest researchers explore different methods for participants to more actively engage with the workshop. This can be done by targeting a different demographic. Although we have highlighted the usefulness of soft conflicts, we do believe that the inherent “make whatever you want” quality of the FABs may have discouraged any critique or discussion—one might have been reluctant to critique another’s imagination. Targeting other demographics with more immediate stakes in the design process (e.g., robotic start-up companies, industry engineers or designers, graduate students or researchers, potential users of robots) may result in different engagement from the participants with design fiction. Also, further work could be done to compare workshops such as ours with those that do not use design fictions (e.g., future co-design workshop) to examine how they may produce different design ideas.

### **CONCLUSION**

Design fiction has gained increased attention from scholars in HCI and design communities. Despite its growing use, there has been little research focusing on inter-participant interaction when using design fictions in workshops or focus group settings. By appropriating futuristic autobiographies (FABs) as a value elicitation tool, this paper examines how design fiction operates in and supports collaborative design. Utilizing FABs in workshops, we identified three types of soft conflicts when participants engaged with FABs and with other participants. Overall, our efforts show that our workshops can be considered agonistic spaces but of a different nature—ones that features more subtle conflicts over values and about imaging alternative worlds. We hope that the concept of soft conflicts contributes to the design community as intermediate-level knowledge [33], constructed between particular instances and a theory, generating a new approach to facilitate design fiction workshops. We call for scholars to reconsider ways to recognize and capitalize on soft conflicts with design fictions such that the goal of collaborative designs that deeply considers heterogeneous values can be realized.

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