Evaluating Design Fiction: The Right Tool for the Job

Eric P. S. Baumer
Comp Sci & Engr, Lehigh U
Bethlehem, PA USA
ericpsb@lehigh.edu

Mark Blythe
School of Design, Northumbria U
Newcastle-upon-Tyne, UK
mark.blythe@northumbria.ac.uk

Theresa Jean Tanenbaum
Informatics Dept, U of CA Irvine
Irvine, CA USA
ttanen@uci.edu

ABSTRACT
Design fiction has become so widely adopted that it regularly appears in contexts ranging from CEO speeches to dedicated tracks at academic conferences. However, evaluating this kind of work is difficult; it is not clear what good or bad design fiction is or what the judgment criteria should be. In this paper we assert that design fiction is a heterogeneous set of methods, and practices, able to produce a diversity of scholarly and design contributions. We argue locating these diverse practices under the single header of "design fiction" has resulted in epistemological confusion over the appropriate method of evaluation. We identify different traditions within the HCI literature—critical design; narratology and literary theory; studio-based design "crits"; user studies; scenarios and persona development; and thought experiments—to articulate a typology of evaluative frames. There is often a mismatch between the standards to which design fiction is held and the knowledge that speculative methods seek to produce. We argue that evaluating a given instance of design fiction requires us to properly select the right epistemological tool for the job.

Author Keywords
Design fiction; evaluation; epistemology.

CSS Concepts
• Human-centered computing~HCI design and evaluation methods

INTRODUCTION
In 2019 the richest human on the planet was Jeff Bezos. In May of that year, he delivered an address as founder of Blue Origin, laying out plans to benefit the Earth by going to space [9]. He began by pointing out that human energy demands are far outstripping the planet's finite resources with catastrophic results. As he outlined a vision of humanity expanding into space, he showed brief animations of O'Neill Space Stations: gigantic rotating structures containing millions of people in artificial worlds. Bezos is almost lyrical as he suggests the possibilities of such environments:

"They don't all have to have the same gravity, you could have a recreational one that keeps zero g.s so you could go flying with your own wings. Some would be national parks. These would be really pleasant places to live. Some of these O Neill colonies might choose to replicate earth cities - they might pick historical cities and mimic them in some way. There'd be whole new kinds of architecture. These are ideal climates, these are short-sleeve environments. This is Maui on its best day all year long - no rain, no storms, no earthquakes." [9]

The optimism is irresistible in the context of impending disaster on earth. Bezos focuses on new design possibilities:

"What does architecture even look like when it no longer has its primary purpose of shelter? We'll find out. But these are beautiful. People are going to want to live here. And they can be close to earth so that you can return […] They'll also be really easy to go between. The amount of energy required to go between these O'Neill colonies from one to another (to visit friends, to visit family, to visit one that's a recreational area) very, very low energy needs. And quickly. It's a day trip." (Ibid)

This is Design Fiction by any definition and it is very seductive. O'Neill space stations also feature in the movie *Elysium* but this fiction concentrates on those left behind. Elysium depicts the rich and powerful living with miraculous medical care in an O'Neill type artificial world while the residents of earth live in abject poverty without medical care.

Bezos and *Elysium* present the same design concept – O'Neill space station rotating to create artificial gravity in a structure so large it feels like its own world. But the design fictions serve different purposes. Design fictions which are presented to win over investors or funding are likely to be positive. Design fictions which premise Hollywood movies are likely to be more nuanced, if not totally dystopian. Similarly, in HCI studies design fiction can be used to map out a space of possibilities but it can also function to critique. How then do we make sense of them?

Good and Bad Future Scenarios
The novelist Jonathan Franzen was recently pilloried for an article he wrote for *The New Yorker* on the psychology of climate change denial. He suggested that our reluctance to face imminent environmental catastrophe is akin to our inability to think about death. Franzen was excoriated not only for his pessimism but also the means by which he

arrived at his conclusions. He describes his method as follows:

> "As a non-scientist, I do my own kind of modeling. I run various future scenarios through my brain, apply the constraints of human psychology and political reality, take note of the relentless rise in global energy consumption (thus far, the carbon savings provided by renewable energy have been more than offset by consumer demand), and count the scenarios in which collective action averts catastrophe." [41]

Franzen claims he can "run ten thousand scenarios through my model" and all of them result in apocalypse because human nature is not going to change any time soon.

Blogs and journalists around the world gleefully reported the "online pile on" mocking his "made up" model [40]. For many of these critics Franzen was guilty not only of paralyzing pessimism but also not being scientific enough. Part of the problem with Franzen's scenarios is that we do not get to see them, we just have to accept his claim that he can run tens of thousands and most if not all of them turn out out badly.

It is easy to mock this approach, but scenarios and thought experiments are often used in science. Many of the greatest discoveries in Physics began as thought experiments [19][21]. The makers of self-driving cars have been confronted with a very old thought experiment from moral philosophy called The Trolley Problem where throwing a switch on a track will kill one person but save three [4][20]. Within HCI and Design more broadly, scenarios and personas have a long history in the process of development (e.g., [27][29]). More recently, design fiction has become so widespread it is almost standard practice e.g., [14][15][16][17][18][49][53][54][55][74][75][77][78].

Sci-fi author, Bruce Sterling, predicted in 2013 that design fiction was going to become very popular because it is cheap and relatively easy to do [77]. Although design fiction may be cheap, it is not necessarily easy to do well. Indeed, Sterling recently argued that most design fiction is very bad [28]. What then makes for good design fiction? How do we know if it is good or bad? By what criteria are we supposed to judge it? Lindley and Coulton recently complained that their work was sometimes derided by reviewers because they took a different approach to the practice than the reviewers did [54]. So how do we evaluate design fiction?

Issues around evaluation have emerged repeatedly in the evolution of interaction design and HCI more broadly. The field is disciplinarily heterogeneous [30] and moves almost as rapidly as the technology it addresses. As this field's scope has grown to encompass more aspects of sociotechnical activity, its methods and epistemological strategies have diversified [66]. These diverse methods – controlled laboratory experiments, ethnographic field studies, analyses of usage log data, research through design – each work to create their own types of knowledges. Each method has their

own criteria for what qualifies as "good" (i.e., high-quality, valid, publishable) work, and it would be inappropriate to apply assessment criteria from one method to work conducted using another.

This paper argues that design fiction should similarly be evaluated based on its epistemic function, i.e., the kinds of knowledge it seeks to create. This paper suggests a number of different evaluative frames, each with their own orientation and set of criteria, that might be taken when evaluating design fiction. We illustrate this diversity of criteria for evaluation through a series of fictional reviews for a paper that does not exist. These reviews demonstrate how the same work might be evaluated from a wide range of different perspectives. We also show how each of those perspectives might be more or less appropriate, based on the epistemic work a paper seeks to do. This is not then a relativistic, "anything goes" claim. Indeed, we agree that "conventions must be established to facilitate the creation, review, and publication of fictional research papers" [55] and other speculative forms. However, the heterogeneity of design fiction means that such conventions cannot prescribe a single, definitive set of evaluative criteria. Instead, we must develop conventions that honor this heterogeneity.

PLURALITY AND EVALUATION IN HCI

Evaluation in interactive systems design is already diverse, drawing on an increasingly wide range of disciplinary traditions including the Humanities. Sengers and Gaver argued that multiple and competing interpretations of design could fruitfully co-exist [72]. Blythe et al. termed their evaluation of an interactive drama as "interdisciplinary criticism" as it focused not only on the usability of the system but also on literary, critical and narrative theory to evaluate the piece [14]. Gaver argued for the use of "non native" voices in HCI such as documentary film makers to evaluate prototypes. He described such evaluation strategies as "polyphonic" drawing on multiple voices and insists that conflicting responses can be valuable.

However, the involvement of the Humanities does not make evaluation any easier or more consistent. The work of Constable was described by Ruskin as "blundering"; Degas' paintings of ballet dancers were described by a contemporary as "disgusting and offensive"; Eric Gill said Jacob Epstein's sculpture Rima looked as though the artist had "gnawed it with his teeth" [35]. What engages and enchants one person might repel and irritate another. These problems are familiar in domains such as literary theory, film and media studies, and critical theory, which have also been applied to evaluation in HCI [7]. How might such developments help inform the evaluation of design fiction?

Defining and Evaluating Design Fiction

It is unlikely that a single, canonical definition of design fiction will provide definitive evaluation criteria. The origin of design fiction is often attributed either to Bruce Sterling, who uses the phrase in his 2005 book *Shaping Things* [74], or to Julian Bleecker, who develops the concept in his 2009

Short Essay on Design Fiction [11]. But the term first appears in print in a piece by Alex Milton in 2003 discussing the work of Noam Toran [61]. Toran was then a student on the Master course taught by Anthony Dunne and Fiona Raby, and Milton discusses the work in terms that are recognizable as design fiction. For Milton, Noam Toran's work has "…begun to explore the realms of design fiction through the medium of props and pseudo documentaries" (ibid).

Over time, there have been several competing formal definitions of what design fiction is, e.g., Sterling [76], Lindley and Coulton [53], Tanenbaum [82], Blythe and Encinas [18]. Most of these definitions are descriptive and lack formal or specific evaluation criteria. Sometimes, though, the categorizations are proscriptive. While such proscriptive definitions could provide evaluation criteria, there is disagreement. For example, Sterling argues that there is long and honorable tradition of parody and satire in design but declares that parodies, jokes, and whimsy such as chindogu are "akin" to design fiction but lighter in spirit and played for laughs.

> "These funny, high spirited things are not Design Fiction. There is nothing wrong or bad about them, but they're not a form of design, they're a form of comedy." [76]

However, Blythe and Monk used chindogu to illustrate design spaces [8]. Kristina Andersen's magic machines have been used in a number of studies precisely because of the lightness of tone and silliness. Kirman and colleagues also note the importance of humour in opening up design spaces [49].

In such research contexts, the goal is not to entertain but to create knowledge. Thus, the evaluation criteria for research uses of design fiction pertain not to subjective judgments (e.g., do you like the fiction?) but rather to epistemic judgments (e.g., what knowledge is being claimed here?). Design fiction is an emerging form which is applied in many different ways and to different ends. Thus, categorizing different types of design fiction, rather than articulating a single definition, may be a more useful way to provide guidance for evaluation.

THE PEER REVIEW PROCESS

In this paper we employ a series of fictional reviews, modeled after the Peer Review Process used by many ACM Conferences. This review process is typically facilitated by Subcommittee Chairs (SCs) and Associate Chairs (ACs). ACs recruit three reviewers, then write meta reviews stating where there is agreement and disagreement. The review process is anonymous, meaning neither the authors nor the reviewers can identify one another. ACM papers are scored between 1 for definite reject and 5 for definite accept. Acceptance and rejection decisions are ultimately decided based on discussion at the PC meeting.

FICTIONAL REVIEWS AND EVALUATIVE FRAMES

The Polish science fiction author Stanislav Lem frequently wrote reviews of books yet to be written and conferences yet to take place [57][58]. Following in this tradition we offer fictional reviews of an imaginary conference paper submissions. Following the reviews, we unpack the various kinds of evaluative frames invoked across them.

The reviews were written in a dialogic fashion. Prior to composing these reviews, the authors had discussed among themselves the various evaluative frames to be invoked, but not specific plans about how to do so. The authors each contributed to different reviews, following an improvisational "yes, and" tactic, also sometimes called the rule of agreement [45].

In previous commentary on peer review of design fiction, Lindley and Coulton suggest that, rather than quote from various anonymous reviews that one of their papers received, they "could have simply 'made up' the reviews in this paper [54]. Broad engagement with the content and tenor of the peer review process may certainly be valuable. However, quoting from actual reviews of only one or a few papers risks a paper that becomes an extended rebuttal. Thus, rather than using real reviews, this paper presents strategic caricatures. They take certain attributes seen in actual reviews and amplify them, both to make them more noticeable and to highlight differences. For each review, we then describe the evaluative frame that it draws upon, to better situate the review within the different epistemological and analytical traditions that are commonly applied to speculative work. Each of these frames holds design fiction to a particular intellectual standard, or "burden-of-proof." While a speculative work might seek to make multiple kinds of contributions to knowledge, across a range of these perspectives, we find it valuable to isolate each position as a unique frame in order to better surface the underlying assumptions and commitments that it entails. To preserve the context of the ACM conference reviewing process, we first provide the "1AC Meta Review," which summarizes the other reviews. The fictional reviews are also typeset in *Italic Arial* to preserve the aesthetic and to visually delineate the fictional portion of the paper.

AC1 Meta Review
Comments to the Committee

> *It was very difficult to find reviewers for this paper. As the review deadline drew nearer, I panicked a bit and asked about five extra people and ended up with too many reviews. It might not be too much of a problem because opinion was so divided. Also, all reviewers rated themselves as Expert, so there's no obvious way to resolve the differences.*

Meta Review

> *This paper involves a combination of ethnography, design fiction, systems engineering, and critical reflection. It received mixed scores, with R1 scoring*

and R4 scoring a low both recommending rejection. But R3 and R5 score it highly with 4 both recommending acceptance, R2 rates it as borderline Both R1 and R4 find the design fictions wanting, R1 because the authors do not situate their ideas critically, R4 because they do. R3 and R5 like some of the ideas but also identify weakness in the paper. R3 remains on the fence.

Reviewer 4 (R4)
Recommendation: Definite Reject

The paper begins with what the authors are pleased to call an ethnography. Insights from this study are then used to generate several "design fictions." These consist of ideas which are either preposterous or half baked. The preposterous ones are described as "provocations" and the half baked ones are claimed as "opening up" a "space". The authors conclude this "work" with a discussion largely consisting of impressive sounding quotes from continental philosophers.

This paper should not be published by this or any other conference. The so-called ethnography is nothing but cultural snacking. A few interviews doth not an ethnography make. Like many researchers in HCI the authors have identified a worthy cause. They presume that there will be a halo effect on their work –the users are marginalized therefore our study about them is good. Except it's not. If a difficult topic is taken on then it should be taken seriously.

offer a number of sketches and concepts which they claim "opens up" the space but offer no evidence to support this claim. They seem to be suggesting that coming up with a very bad idea will eventually enable someone else to have a good one. I do not see how this follows and they cite no precedent. They simply make the claim without evidence or argument to back it up.

Given the serious nature of the problem they claim to address I find some of the "design fictions" offensive, especially number 8. The authors claim that this particular fiction is "provocative" It's not clear who it's supposed to provoke. Engineers might by incensed I suppose but I don't imagine that they would pay any attention to something like this in the first place. Do these authors imagine that there are respectable computer scientists in their audience listening to their nonsense? Someone should point out to them that the computer scientists and engineers attending this conference will be in sessions where they might actually learn something useful.

The people who like this kind of thing will already be aware of the issues raised and very likely agree with the authors' position. We have had something like twenty years of critical design and design fiction now.

Lots of questioning, challenging and provoking and to what avail? The net result is a list of publications and a few books read by nobody but feckless undergraduates on low value degrees. This kind of work will at best comfort and amuse likeminded people. It is not obvious to me why this conference should provide a venue for that. A self-help group would be far more appropriate. These authors are not nearly as clever as they think they are.

The tone of this review is of course offensive, and this is the kind of review where a good AC would ask the person that wrote it to moderate their tone. Aside from being rather rude, the reviewer is also at odds not only with the paper but with a whole body of work: critical and speculative design which we briefly outline below.

Primary Evaluative Frame: Critical, Adversarial, and Speculative Design
Many design fictions reflect critically on social or technological trends. This has a long history beginning in the 1950s in Italy. Italian Design was synonymous with chic in cars, clothes and furniture [73]. But in the 1960s many young designers became disillusioned with the consumer culture their industry was building. As the counter culture developed several groups of designers began to make artefacts that were critical and questioning of the dominant society (ibdi). Archizoom for example produced grainy black and white images of the "No Stop City" an urban sprawl where there was no distinction between home, office and supermarket [22]. These designs for a city as factory functioned like a critical essay or political pamphlet.

In the late nineteen nineties Anthony Dunne and Fiona Raby applied this kind of approach to the design of electronic and interactive devices [36]. Dunne and Raby led a ground breaking Masters at the Royal College of Art which insisted that design need not be simply a tool to develop solutions for well constrained problems; provocative concept designs, might also be a lens through which to examine the changing social and cultural landscape. Over the next fifteen years their students and followers around the world produced a range of critical designs: for example, a cabinet in which a user can lock themselves to avoid the electromagnetic rays that surround us; a table top filled with twitching compasses alerting us to the magnetic fields given off by our devices [36][37][38]. The purpose of such work was to encourage viewers to ask questions and debate the taken for granted.

Ironically, or maybe not ironically, critical design is much criticized. The work is usually shown in seminar rooms or art galleries and often it is dismissed as preaching to the converted. This kind of response is perhaps most eloquently expressed by the despairing cultural critic Mark Fisher:

"The Subject Supposed Not To Know is a figure of populist fantasies - more than that: the duped subject awaiting factual enlightenment is the presupposition on which progressive populism rests, if the most

crucial political task is to enlighten the masses about the venality of the ruling class, then the preferred mode of discourse will be denunciation. Yet, this repeats rather than challenges the logic of the liberal order." [39]

Fisher here expresses a profound disillusion with the value of any critical work, including presumably, his own. It is possible to see the audience for critical design as primarily those who already share its concerns. Rather than challenge anyone it might rather console and comfort.

Such critiques can be applied not only to the general enterprise of critical design, but also to specific instances of it. The tone of "critical design" can also seem didactic and it is perhaps for this reason that alternative terms such as DiSalvo's adversarial design [31] or Auger's speculative design [5] are gaining in popularity. The above hostile review is based on deep skepticism about these kinds of methods. The next reviewer is not hostile to the entire enterprise and sees value in the approach, but they feel this example is wanting.

Reviewer 1 (R1)
Recommendation: Possibly Reject

The paper addresses an important and timely topic. It is well written and well structured, describing a series of design fictions informed by an ethnographic study. The authors critically reflect on the fictions and reference the discussion with relevant literature. Although the authors raise a number of interesting issues, I cannot recommend acceptance due to the following problems.

As the fictions are in part text based, it is important to reflect upon them as literary artefacts. Any scholar of literary studies is well aware that representation is a political act. Up until the 1960s, students of literature were taught that there was a canon of great and minor writers, and it was their job to learn which was which without wondering why so many of them were white, middle class, middle aged, cis-gendered men. Following the development of postmodern critical theory, this model of appreciation was overturned and textual analysis focused on the politics of representation: who was representing what to whom and with what purpose. At stake in any cultural artefact then, is power, although these fictions are interesting there is little to no consideration of race, gender sexuality, or class.

The authors claim that the design fictions here explore the spaces opened up by the ethnographic study. I would argue that, in failing to include some of the basic elements of storytelling – characters, plot events, dramatic tension, denouement, and an invocation of a larger fictional world – that the authors

haven't really created design fictions at all. Instead, these scenarios are float free from any considerations of the broader social and cultural issues that might be invoked with a narrative. There is also little to no consideration of the authors' own power positions as designers. To what extent are they actually articulating their own anxieties about technological futures in which their own privileged position is challenged? In recent years, there has been much work which has considered critical design as an expression of first world problems and fears of dystopias that many people around the world are already living in. Although this work is seemingly critical, there are deeper discourses of post colonialism at play here. Yet the authors fail to engage with any of these issues.

While some of the design ideas are interesting and innovative, the work is insufficiently grounded in critical theory. The discussion should include a much wider engagement with debates around critical design, speculative design, adversarial design, and design fiction. The authors should also declare their positions in terms of -- gender, ethnicity, sexual orientation, etc. -- so that reviewers can take proper consideration of such vitally important points in assessing the work. Again, any scholar of cultural and critical theory is well aware that the same utterance may have radically different meanings depending on the positionality of the speaker.

Most of the references are to white male writers. There are almost no references to women or writers of color. For this reason alone the paper should be rejected.

This review synthesizes multiple different perspectives and evaluative criteria. This multiplicity can be seen in how the review brings to bear numerous ideas from the development and evolution of literary theory and criticism over the course of several decades. Within that tradition, this reviewer takes a very particular and highly debatable ideological position to argue for reject. However, literary and critical theory contains a wide range of perspectives that treat "texts" in many different ways. The following section provides a brief overview of hermeneutics – broadly the disciplines of interpretation.

Primary Evaluative Frame: Narratology and Literary Theory
Some design fictions place put the fiction first. One of the most effective examples of this technique is *Ambition* [6], a short film commissioned by the European Space Agency and aired shortly before the completion of their *Rosetta* mission[1]. *Ambition* is set far in the future, at a point when humans appear to have transcended into almost omnipotent beings, capable of crafting whole planets. A teacher and student reflect on the power of human ambition, and the teacher

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[1]

illustrates his point by telling a story about the importance that the *Rosetta* mission had on placing humanity upon a path to this future. Unlike other speculative works, such as those commissioned to promote new emerging technologies and materials, *Ambition* puts the human story first. It focuses on specific people, doing specific things, in a specific fictional world. Contrast this against a more corporate design fiction, such as Corning's *A Day Made of Glass* [31], which conjures a future through vignettes of generic people in generic situations and the distinction between design fictions with *stories* in them becomes clearer. A hermeneutic critique of these two examples would consider how each one conceptualizes the imagined future, what the underlying values and commitments are and how the piece articulates that vision through the use of narrative and drama.

These kinds of design fictions are best evaluated using the analytical tools developed for evaluating other forms of narrative media. In particular, the constellation of critical, rhetorical, humanistic methods [67] that includes hermeneutics and close reading [10][47][84][87] are best suited to evaluate these kinds of contributions. It is important to note that, unlike scholarship in a post-positivist tradition, these kinds of works should not be held to standards such as whether they are "True" or "plausible" or even "realistic." The goal of a design fiction written in this mode isn't to demonstrate any kind of generalizable claims, or predictive power. Instead, these works seek to direct our attention towards questions, challenges, and assumptions about a speculative design that might otherwise remain uninterrogated. Thus, the standard which one would apply to this work is not necessarily about judging the fiction as "good" vs. "bad," "interesting" vs. "boring," or "plausible" vs. "implausible." Furthermore, an assessment of such design fiction should not hinge on trying to determine what the author(s) intended [86]. Instead, it is more appropriate to ask questions such as, "What assumptions about the speculative technology does this fiction reveal?" or "Does the fiction thoroughly explore the consequences of this speculative design?"

Jerome Bruner's work lays out a case for narrative as a sense making strategy that people use to structure and relate our understandings of the world [23][24]. From this perspective stories must be internally consistent, they must follow a structure of cause and effect, and they must portray a social and cultural reality populated with characters who behave in ways that we perceive as believable. In this way, narrative can be seen as a kind of data structure, one that imposes constraints grounded in theories of digital narratology [32][68][69], and narrative cognition [23][24][61]. Thus, positioning a speculative design within a story requires a designer to rigorously constrain their speculation. Design fictions written within this frame seek to use the logics of fiction to explore new possible techno-social worlds: often the role of the fictional technology in these design fictions is to provoke speculation about the human consequences of an emerging or imagined technology. The act of trying to

envision a coherent fictional narrative that occurs in a fictional world around a speculative design can entail the designer in more careful consideration of the values, biases, and ethical commitments that might be hidden within that design. This second hostile review (R1) draws on this perspective but also on European critical theory and questionable identity politics. The next review comes from a very different orientation, both theoretically and practically.

Reviewer 2 (R2)
Recommendation: Neutral

> The paper reports findings from an ethnographic study which resulted in the generation of a number of design fictions. The implications of these fictions are then considered in a lengthy discussion. The paper is at times rather badly written and there are typos and grammatical errors throughout.

> The authors of this paper clearly mean well. They strike me as very young and idealistic. There is an energy and optimism in the designs that I would hate to discourage. But for me, some of the ideas work much better than others. The paper is very uneven and it is looks as if different authors worked on different sections of the paper with no very clear idea of what the others were doing. The voice and tone are all over the place.

> For me the strongest design fictions are the ones that are the most plausible – number 3 and number 4 in particular had real potential and could almost be described as design proposals rather than design fictions. Unfortunately they remain fairly high level concepts. Why not push them harder? Either make some prototypes and test them or at least take them back to the users and ask them what they think?

> So I am being rather unhelpfully netural. It's OK, the topic is important and some of the design fictions are almost proposals, they have the potential to actually be useful. Is that enough? I'm not sure. I would really like to see these authors take themselves out of their comfort zones.

> Sometimes the tone of the early design fictions is a bit flippant especially number 2 and number 7. Of course there's nothing wrong with humor but design fiction should be something more than the lowest form of whimsy. I would like to see much more of the moments when the authors are practical.

> That said, it's not a bad piece of work and I think, on balance, I would rather see something like this at the conference than another paper about Fitts law. But I would say to the authors: work! Be more self disciplined, If you work it will lead to something. Get outside of your comfort zones.

> The paper could be much improved with a more nuanced discussion section. The authors miss a

number of relevant papers that should be cited e.g., Baumer, Blythe, and Tanenbaum 2020).

This review criticizes individual design concepts proposed and also the kind of enterprise in which the paper engages in general. At the same time, the review is broadly supportive. The reviewer seems interested in dismantling the work primarily for the purpose of helping the authors reconstruct something better. The reviewer also helpfully directs the authors to their own previous work, in a way that is not necessarily ethical but also not uncommon. However, the tone is overall helpful, constructive, and reminiscent of the studio based "crit" outlined below.

Primary Evaluative Frame: Studio Based Design Criticism
Kristina Andersen cites ten rules from the Art Department at the Immaculate Heart College which capture the spirit of such institutions:

> "Rule 1: find a place you trust and then try trusting it once in a while;
>
> Rule 2: general duties of a student: pull everything out of your teacher pull everything out of your fellow students;
>
> Rule 3: general duties of a teacher: pull everything out of your students;" *[3]*

Evaluation of the work such students produce would involve "crits" in the studio. Here a student would show work to a lecturer or a group of peers and they would review it in a session lasting anywhere between five and fifty minutes. The method originates in apprenticeships during the nineteenth century in schools of architecture, it was developed by the Bauhaus where it became an open review amongst peers rather than a closed session. This kind of evaluation is essentially pedagogical, its aim is not to grade a piece of work but rather to help a student to situate their practice in a wider context (so as to avoid repetition or cliché) and also to challenge them to reach further. The art school crit, and indeed the art school itself, are under threat as university courses are compelled to justify their existence in terms of immediate employability.

The neutral review (R2) draws on this kind of tradition. On the one hand, it levies numerous critiques, both of the specific design concepts proposed and of the kind of enterprise in which the paper engages in general. At the same time, the review is broadly supportive. The reviewer seems interested in dismantling the work primarily for the purpose of helping the authors reconstruct it into something better. The next reviewer also sees value in the work, this time coming from an epistemological position closer to orthodox HCI.

Review 5 (R5)
Recommendation: Possibly Accept

> *This paper demonstrates the use of design fiction as a means of engaging with, and eliciting narratives from, a particular group. The ethnographic pieces aren't terribly novel, and the findings are pretty incremental but the fictions demonstrate how the findings might be related to questions of design.*
>
> *The paper's strongest contribution is in its novel methods innovations. Too often, design fiction looks or feels like writing short fiction (and bad short fiction at that!). We don't really care about what a designer or researcher thinks might happen in the future. We want to know what *users* think is going to happen, or could happen, or should happen. The authors seem to tackle this problem head on in the unique ways that they incorporate their study participants into the design fictions. It's a great way of getting over the doom-and-gloom scenarios that characterise so much design fiction work.*
>
> *Now, I said "seem to tackle" in the above paragraph because the paper, as written, leaves a few key questions unanswered. For example, the authors need to provide more detail on exactly what prompts were given to participants, as well as how they were translated among the various languages involved in the study. Given the importance of imagination for the groups being studied, the exact wording matters a great deal. What did the authors tell participants they were doing, exactly?*
>
> *I'm also a bit nervous about the lack of any kind of member checking or similar validation. Yes, there are some kind of fun, quirky design concepts that come out of this. Yes, the authors use those concepts to reflect on underlying societal and cultural developments. But why didn't the authors take these concepts back to their participants? It would be fairly easy to do, and it would help corroborate the authors' interpretations.*
>
> *Minor:*
>
> *- Run a spell checker. Fix the citation formatting*

Response to the Rebuttal

> *Thanks to the authors for the additional details they provided in their rebuttal, especially around the wording of the prompts and activities in which participants engaged. They also provide a sound rationale for not bringing the design concepts back to participants. While I'm still not convinced that it was the best study design, I am OK with the paper being accepted and so have raised my score.*

This reviewer, unlike the others, reads and responds to the author rebuttal. The review emphasizes the ways that the paper in question does or does not advance an understanding of this particular population. The perspective derives from HCI, especially user studies, again briefly outlined below.

Primary Evaluative Frame: User Studies

In addition to the various approaches above, design fiction has been adapted as a means of engaging with study participants. Participatory design has a history of using narrative formats, such as short stories, video, or drama, to engage people in a co-design process; for an overview, see [62]. Thus, design fiction represents a recent innovation in a longer tradition of engagement.

In this capacity, design fiction can play a number of different roles. Sometimes, DF offers researchers a means of working through ethnographic data. For example, Wyche et al. [89] present a series of design concepts inspired by ethnographic fieldwork with evangelical and renewalist Christians. Importantly, these were not meant as implications for systems that should be built, cf. [34], but rather as a means of drawing out and analyzing various thematic patterns in the data. In other cases, study participants are asked to author fictional vignettes that, in many ways, resemble DF. For example, Ambe et al. [2] asked a collection of older amateur creative writers to author short stories about sensing and tracking technologies. These stories were then analyzed to understand the participants' concerns, as well as their hopes, about what such technologies might enable. In yet other cases, DF is employed as a means of eliciting and working through underlying values. For example, Wong et al. [88] presented a series of potential future surveillance technologies to probe participants' underlying values related to privacy. Finally, designers at times have crafted deliberately provocative fictional designs [49][50][85]. Providing such intentionally "broken" visions can serve as a means of eliciting reactions from participants, especially around other, potentially more desirable futures.

When evaluating such uses of DF, we must once again look to the epistemic work that the research aims to accomplish. When it is used as an empirical method to engage with and understand study participants, the focus becomes less on the DF per se and more on the ways that people react to it. That is, the knowledge being produced pertains to the study participants themselves. Some of the deliberately "broken" or provocative suggestions [49][50][85] would not necessarily make for interesting DF in their own right. However, they can be useful if they elicit informative, reactions from study participants. Similarly, one would not necessarily expect that DF written by study participants, a la Ambe et al. [2], would necessarily stand up to a critique based on literary grounds, and nor should it. Instead, such uses of DF should be assessed in terms of how informative they are at revealing participants' concerns, values, biases, fears, hopes, and confusions (about technology). The first supportive review (R5) embodies this perspective. It asks about the lack of member checking with users, and R5's response to the rebuttal suggests that they are still not completely satisfied. However, their interest in design fiction as a method enables them to see a way to accepting the paper.

Reviewer 3 (R3)
Recommendation: Definite Accept

> *This paper has so much going for it. It describes engagement with a highly specific and sensitive population. It uses novel empirical methods. It tackles challenging but important issues. And, most importantly, it moves from the overly abstract theorization of most ethnographies to much more concrete (and useful!) design recommendations.*

> *The authors should be applauded for the time, energy, and other resources they invested to conduct this work. Incorporating users in the design process like this provides a methodological template that can be followed by lots of other work.*

> *Furthermore, the numerous concepts and sketches generated from these collaborations can be used productively by other researchers and designers who wish to work with similar populations or on related issues. They give future designers not just an idea of what these people need but also help us understand their desires, fears, hopes, etc. They help us understand the user, which is just what this sort of work should do.*

> *My only complaint: I just wish the authors had said more about what we should *do*. Clearly, these people need help. It's also pretty clear that the authors believe (rightly so) that technology designers are the ones who can help them. The authors have gained a great deal of knowledge about this population. However, they seem reluctant to use that knowledge to guide design. The fictional designs are lovely, in terms of opening up the space, but a little more specific direction in terms of which of these designs should actually be pursued would go a long way.*

This review sees a contribution in terms of understanding users, but there is also an appreciation of the design work involved in generating the fictions. The value of short fictional vignettes has long been recognized in design work on scenarios and personas, as summarized below.

Primary Evaluative Frame: Scenarios and Personas

Fictional narratives have played a role in interaction design through scenarios and personas since the emergence of HCI as a field. Originally scenarios in HCI drew heavily from work in software engineering. They offer a specific means of representing the patterns of interaction that a user may have with a system. In many cases, scenarios are codified in a formal representation. Such a representation enables logical (and at times automated) reasoning about the steps involved in a process, the actors who perform those processes, and the relationships among them. For example, given a set of scenarios about an automated teller machine (ATM), one could determine if it would ever be possible for the machine to dispense cash without a user having entered their PIN.

Carrol [27] argued for more developed vignettes and this approach often involved the use of personas [29].

Personas offered a means of capturing patterns in user behavior, traits, expectations, values, etc., in ways that are directly relevant to the design task at hand. While they usually (though not always draw inspiration from actual users and sometimes other stakeholders, personas offer a composite of multiple people rather than a depiction of any actual individual [29]. Such omissions can help protect the individual identities of study participants. Seen another way, such synthesized details offer fictional characters and varyingly explicit narratives that can be used to guide design. In this way, personas share some resonances with other uses of fiction in design.

That said, personas are ultimately used to generate design requirements. Thus, the desiderata used to assess the quality of a (series of) persona(e) differ from those applied to other genres of design fiction. The second supportive review (R3) draws on this kind of thinking. It emphasizes specific implications and guidance for designers, a criterion important in this evaluative frame.

Other Evaluative Frames: Thought Experiments, Entertainment, and Corporate Propaganda

There is a longstanding tradition of thought experiments as a form of speculative method in the sciences [21]. Famous thought experiments in the sciences include Galileo's falling bodies, Newton's bucket, Einstein's elevator, and Schrodinger's cat [21]. Thought experiments also underlie much philosophical exploration, including Searle's Chinese room [71] and Putnam's twin earth [65]. In the last 30 years, philosophy has started to grapple with the epistemological power of thought experiments. By understanding the different perspectives on the value of thought experiments as sources of new knowledge, we can better understand how design fiction and other speculative methods might be produced and evaluated.

Contemporary thinking around thought experiments argues that they operate like cognitive simulations that we run in our minds. We use our knowledge of the world and our ability to reason inductively to generate novel insights into phenomena that elude empirical study. Tamar Gendler proposes a version of this perspective as a means of reconciling some of the longstanding disagreements over thought experiments, writing:

> "I will suggest, in the case of imaginary scenarios that evoke certain sorts of quasi-sensory intuitions, their contemplation may bring us to new beliefs about contingent features of the natural world that are produced not inferentially, but quasi-observationally; the presence of a mental image may play a crucial cognitive role in the formation of the belief in question. And, this, albeit fallible, quasi-observational belief-forming mechanism may, in certain contexts, be

> sufficiently reliable to count as a source of justification." [44]

Gendler's point is that the act of contemplating an imaginary scenario can support the development of justifiable beliefs about the world. This perspective is congruent with Bruner's perspective on the social world as a collectively negotiated narrative [23][24]. Both are more concerned with what is *real*, rather than what is *True*, and both perspectives show the value of speculative methods in certain contexts.

It is important to note that none of the perspectives supports claims to certainty: one would not want to build a bridge based on a story that we tell about a bridge. However, when dealing with social phenomena, the stories that people tell about their world, and the imaginations that inform how we formulate our beliefs, are part of the social reality that governs our lives [79]. Epistemologically, these speculative methods can provide us with real insight into social problems.

Thus, in HCI, evaluating speculative methods through the frame of thought experiments means treating them as mental simulations of possible techno-social futures. One would not want to ask, of a thought experiment, what result would be yielded by an equivalent empirical experiment. Instead, one should consider the extent to which the thought experiment surfaces, and makes open for inquiry, beliefs about what configurations between computing and humans are possible and/or desirable. None of the above reviews fully embrace this perspective of design fiction as thought experiments. For example, both R5's request for empirical member checking and R2's suggestion to make some prototypes and test them run contrary to an emphasis on thought experiments as mental simulations.

Design fiction can serve at least two additional functions, each with their own evaluative frame. First, design fiction can be a form of provocative entertainment. Black Mirror, Minority Report, 2001: A Space Odyssey, Star Trek, Elysium and other works of popular culture can be seen as instances of design fiction [11]. Rather than primarily producing knowledge, such examples mostly seek to entertain.

Second, design fiction is often used by organizations, especially corporations, to portray visions of life in the future. These often take the form of videos, such as Corning's *A Day Made of Glass* [31] , the Apple *Knowledge Navigator* [1], or Blue Origin's O'Neill Stations [9], in which the producing corporation's products and/or services feature prominently. Here, the goal is corporate advertising and public relations, which advances a certain agenda or world view, rather than research focused on knowledge production. There are entire disciplines which are already well equipped to critique such fictions – literary studies, film studies, and media studies. There are many competing perspectives within them (e.g., structuralism, psychoanalysis, feminism). This paper focuses on the use of

fiction in HCI, which is both relatively new and carries different consequentialities than other uses of design fiction.

DISCUSSION

There is a popular Facebook group called "Reviewer 2 Must Be Stopped!" where academics post some of the bad reviews they have received and complain that the whole of the peer review system is broken. It is not our intention to add to the large literature on the problems of academic peer review. Rather, we hope to address a particular problem with a relatively new practice.

That said, we have intentionally avoided providing a prescriptive set of criteria or series of steps for reviewing design fiction. We hope the paper has gone some way towards showing that there are different possible contributions and, correspondingly, different evaluative frames. It would not be appropriate for a reviewer of a small qualitative study to complain that the results were not statistically significant and did not generalize. Similarly, it would not be appropriate if a reviewer of a critical design intended to provoke debate complained that it did not illustrate concerns identified in a user study.

Evaluation is, in some sense, a matter of drawing out and identifying the value of something [48]. One question then, becomes what is the value that members of a community wish to take from design fiction? What are researchers, designers, practitioners, etc. trying to achieve by deploying them? The variety of evaluative frames articulated here suggests that different forms of design fiction may offer different kinds of value.

Similarly, different forms of design fiction also create different types of knowledge. Design fiction has a different orientation toward knowledge than do other approaches in HCI. It cannot point to some thing in the world and say "there it is," making it fundamentally different from empirical studies. At the same time, it is also different from the critical essay because it requires different media literacies, interpretive strategies, and mental simulations.

The argument here, then, is fundamentally an argument about the epistemological nature of speculation. That is, what is the nature of knowledge that is produced when we speculate about something that does not (yet) exist? While the philosophical literature on thought experiments reviewed above addresses this point directly, this epistemological issue permeates all the speculative, fiction-based approaches discussed here.

An orientation towards possible futures is an essential aspect of much contemporary HCI scholarship. Increasingly, the outputs of our community have non-trivial consequences for how we conduct commerce, engage in social activity, participate in civic discourses, manage our health and wellbeing, and empower (or disempower) different groups of people. The systems that we build and study are seldom purely abstract in nature: they are deployed in contexts of human activity that touch most people on the planet. We see the recent interest in speculative methods such as design fiction as reflective of our growing need to consider the broader impacts and consequences of technological infrastructures. Design fictions are compelling thinking tools for coming to grips with possible futures. By highlighting the diverse ways that these speculative methods might be deployed and evaluated, we can better address ourselves toward these futures.

CONCLUSION

The spectacle of Jeff Bezos outlining his plans for the future of humanity is reminiscent of numerous James Bond films where the villain reveals his plans for world domination. Granted, Bezos is promising to save, rather than destroy, us. That said, Bond villains are for the most part members of trans-national elites (Le Chifre, Drax, Goldfinger), and they still resonate in societies more divided by wealth than ever. The idea of manufactured worlds leads inevitably to questions about who will have access and who will not. Such questions are answered with dystopian pessimism in movies such as *Elysium* and ignored in technologically focused visions such as those of Blue Origin. This paper is not arguing that one design fiction is better than another. We are facing global threats to our survival, and we need not only technological dreams but also nightmares. How to evaluate design fiction, then, is far from a solely academic question.

To that end, this paper has articulated several different evaluative frames for design fiction, from critical design, narratology, studio design "crits," user studies, design scenarios, and thought experiments. We have argued that the most appropriate evaluative framework for any instance of design fiction should be based on the epistemological tradition on which it draws and the kind of work being done.

This plurality of epistemologies offers multiple trajectories future design fiction could pursue. It would be detrimental if this paper led to a fracturing of design fiction. Having separate epistemic camps that each evaluate the use of speculative methods in their own ways would only aggravate disciplinary divisions. Instead, design fiction should work to cultivate the kind of reflective dialogue across varied epistemological traditions that is a distinguishing feature of HCI at its best.

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