In Tension with Progression: Grasping the Frictional Tendencies of Speculative, Critical, and other Alternative Designs

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ABSTRACT

Speculative design, critical design, and other alternative designs have emerged as popular approaches and burgeoning traditions within HCI and design research. While examples of this work abound, comparatively little theory exists for grasping alternative designs, and for explicating their relation to other types of design and to design in general. In response this paper develops the key concepts of progressional design, frictional design, and design as prefiguration. The progressional conceptualization of design holds that designs have a primary purpose, and that purpose is to ultimately converge toward and ideally arrive at production. The frictional conceptualization of design radically relaxes teleological assumptions and productional expectations. Frictional designs prefigure possibilities that are compellingly resistant to further progression and final production. Prefiguration grounds both progression and friction in the idea that designs are partial, provisional, and potentially preliminary actualizations of possible futures. To illustrate frictional design, this paper outlines a framework of 5 frictional tendencies: diverging, opposing, accelerating, counterfactualizing, and analogizing. These tendencies represent ways in which frictional designs are directionally *in tension* with the arrow-like vector of progressional design. Several additional concepts are discussed in conclusion to further explicate more nuanced relational potentials between friction and progression: transproductional uses, teleological ambiguity, and relational multiplicity.

CCS CONCEPTS

• **Human-Centered Computing**;

KEYWORDS

Design, Design Theory, Speculative Design, Critical Design, Design Fiction

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1 INTRODUCTION

Conceptually navigating the nuanced and evolving landscape of design presents a much greater challenge now than it did a century ago when the modern professions of design first emerged. Since the Industrial Revolution, the design landscape has significantly expanded such that it now prominently includes notions of design as a set of human-centered methods [61], as an empirically informed process [95], as a mode of organizational learning and capacity building [15, 59, 78], as participatory engagement [40, 79], as strategic planning [70], as community-led activism and social justice [24, 46], and as framing and addressing wicked and ill-defined problems [20, 91]. As design approaches and perspectives continue to gain influence within the field of human-computer interaction (HCI) (e.g.,[34, 48, 54, 79, 82, 100, 105, 110, 112]), so to do ideas of design as an expanded practice extending beyond production-oriented aims and outcomes tied to notions of problem-solving, aesthetic-enhancing, profit-generating, and world-transforming intentions and values. If not quite sea changes, these tidal shifts have, understandably, led to a great deal of confusion and conflict. Nowhere is this more pronounced than within the interdisciplinary field of HCI, where engineering and computer sciences approaches to design collide with arts and humanities inflected design perspectives, with anthropologically informed notions of human-centered design perhaps occupying a territory somewhere in between, and efforts to define an intellectual tradition of design (e.g., [60, 83, 90]) on its own terms and with its own forms weaving their way throughout this multi-/inter-/trans-disciplinary design mess.

Most recently one designerly expansion in particular has generated substantial ripples throughout the HCI design research community: The influx of speculative, critical, and other alternatively qualified types of design (collectively referred to in this paper, for simplicity, as *alternative designs*). These alternative design approaches implicitly if not explicitly align with a research through design (RtD) approach, another recent expansionary specialization wherein methods and outcomes of design are used to conduct research inquiry and to generate and communicate knowledge.

At a broad level this paper is motivated by the need and opportunity to develop new conceptual tools for navigating a design landscape shifting and expanding beneath our feet. More specifically, though, this paper aims to help clarify, inspect, and address divisions and corresponding divisiveness flowing through the HCI design research community in the wake of alternative design methods, forms, perspectives, practices, and projects. A general rift often appears within HCI between those that practice and embrace design alternatively, and those who understand and value design more conventionally as an instrumental problem-solving and production-oriented activity. While this division is surely productive in certain

regards, in others it manifests in the form of unwelcome conceptual confusion, confounding discursive conflict, and disciplinary constraint limiting the novel experimentation and innovation of alternative design research. For example, some identify a clear delineation between research through design and new product development [13], or suggest an affinity between research through design and alternative design through a shared commitment to speculation, exploration, and conceptual richness [48]. Others, in apparent contradistinction, define research through design as convergence upon the "right thing" in the form of a "new product" that, if not a saleable commercial good, nonetheless "transforms the world" [105]. This "internal conflict within the [HCI] design research community" has led some to throw up their hands and recommend "filing for divorce," suggesting that warring camps agree to go their own separate ways [54]. Recent research has sought to address such divisions by conceptualizing different modes of criticality in design [82], distancing (alternative) research through design from the expectations of science [48], and articulating myriad methodological, formal, and functional facets of alternative designs [14, 41, 49, 80, 98, 107, 108]. Notwithstanding, a general atmosphere of division remains palpable.

While innumerable examples of speculative, critical, and other alternative design projects and publications circulate within HCI, as well as across the broader design landscape, comparatively little design theory exists for grasping these alternative modes and outcomes of design. Complicating matters further, much of the robust and overarching design theory available appears upon, closer inspection, largely conceived and formulated *without* speculative, critical, and conceptual variants in mind. Alongside alternative RtD projects and publications that document and explicate specific alternative design artifacts (thingly articulations of theory, perhaps, in their own right [18, 84, 105]), this paper argues in line with others [83, 90, 92] that more focused and sustained theoretical research into design is needed to synthesize robust, critical, and generative concepts, and to rework shared discursive vocabularies. The goal, to be clear, is not to definitively resolve division or eliminate the possibility of ever again getting lost within the ever-changing landscape of design. For this is neither possible nor desirable. The split aim, rather, is (a) *making concepts* for *making sense* of alternative shifts and confounding divisions, and (b) seeing what else we might make in the process. The design/HCI theory we make—like the processes of designing things—might be "fluid, unstable, and transitional" [90], "provisional and contingent," [50] and "generative" and "intermediate" [60], rather than definitive. More tangibly, for design researchers such theoretical tools might help to position and explain novel yet unconventional research contributions. They may help develop, refine, and critique alternative design methods and artifacts. For educators, new conceptualizations might help articulate not only what speculative designs are for, but also how to compose and construct them. And for the HCI and design research communities as a whole, such conceptual tools might serve as useful bridging mechanisms between alternative and conventional zones of design in a way that recognizes difference while positively articulating reciprocal value and shared common ground.

The core argument of this paper is layered and twofold. First, this paper argues that revised conceptual tools are needed for describing and explaining not only *what* alternative designs *are for* (their purposes or functions and corresponding methods) but also *how* they work (their tendencies, qualities, forms, techniques), and *how they work in relation to* other more conventional types of design and to design in general. In response to limitations with current concepts, this paper develops a conceptual framework for navigating a design landscape in-flux, and reworking lines between, relations across, and foundations beneath alternative designs and their more conventional counterparts. The framework is composed of three core concepts—designerly progression, friction, and prefiguration. A rough sketch of how the pieces fit together goes as follows: *Conventional designs are progressional, alternative designs are frictional, and all design is prefigural.* Under a progressional theory, design has a primary or ultimate purpose. This purpose is to progressively converge toward to production, an artifactual endpoint given definition through material construction, practical operation, and situational integration. This theory of design is tacitly held by many, if not most, professional design practitioners, educators, and scholars. Frictional designs resemble progressional designs in that they prefigure possible, though perhaps improbable productions. Yet at the same time they appear saliently, deliberately, and compellingly resistant to further progression or final production. The frictional theory of design is tacitly embodied by speculative, critical, conceptual, and other alternative designs. What constitutes both the frictional and progressional as design is that each may be grasped as material prefigurations, which are partial, provisional, and potentially preliminary actualizations of possible futures.

Rather than rigidly grasping the frictional and progressional as irreconcilably antagonistic or exclusively dualistic, frictional designs are best understood as *in tension with progression.* To illustrate and ground frictional design, this paper further elaborates 5 frictional tendencies: divergence, opposition, acceleration, counterfactualization, and analogy. Each tendency contrasts in some way with straightforward progression, although the relational contrast is rarely clear-cut.

In the concluding discussion, I use this framework to present the second, more focused component of the argument. **I argue that a central contribution of alternative RtD within HCI lies in its methodological innovation and experimentation with new *frictional techniques* and *transproductional uses* of design. However, alternative designs remain too often misunderstood, confounded, and constrained by a progressional framework**. One crucial step forward and away from certain excessively sharp divisions is to openly and explicitly recognize the ways in which frictional designs radically relax progressional assumptions and productional expectations, and either directly or indirectly challenge rigid, straightforward progressional design frameworks. In general, I advocate, in line with others [48, 82, 90, 92], that rather than laying down rigid territorial lines or definitive overarching theories that we instead seek to iteratively and contextually sharpen, soften, and readjust divisional lines between alternative designs and whatever remain; nuance and multiply relations between different sides; and revisit and rework common foundations. Towards these ends, I conclude by sketching out three recommendations for HCI design research community: (1) recognize and develop design's transproductional uses and values, (2) clarify, and at times embrace, frictional designs' teleological ambiguity along with (3) its and relational multiplicity with regards to progression.

The paper is divided into four parts. **Part 1** outlines broader expansions and shifts reshaping the design landscape in order to motivate and contextualize the three components of the framework (frictional design, progressional design, and design as prefiguration). I set the stage for friction and progression by contextualizing the rise and resurgence of alternative designs, the emergence of research through design, and their confluence within the disciplinary field of HCI. The third component of the framework—design as prefiguration—is motivated by exposing limitations of existing conceptual foundations of design. Overall, this contextualization in its own right will, I hope, provide a valuable ancillary contribution as a navigational map useful to the broader HCI and design research communities. **Part 2** outlines specific limitations of current design theory. Three basic zones are highlighted between alternative and conventional conceptualizations of design: *divisionary lines*, *connective relations*, and *common foundations*. **Part 3**, elaborates each of the three key concepts of the framework—prefiguration, then progression, and finally friction. **Part 4** applies the progressional-frictional-prefigural framework within HCI design research, drawing out additional insights and pathways forward.

2 BROADER EXPANSIONS AND ALTERNATIVE SHIFTS IN DESIGN

Contextualized within an expanding design landscape, this section provides a map outlining key areas of design discussed throughout the remainder of the paper: alternative designs, research through design, and conventional designs.

2.1 The Expanding Design Landscape

The expansion of design—professionally, educationally, and disciplinarily—has been noted by many scholars and theorists [30, 42, 92]. At the most encompassing edges of this expansion, some scholars characterize design in the most general sense as a fundamental human activity, one traceable to the dawn of human civilization and the first human uses of technology [23, 76, 83]. Centrally, however, most contemporary discourses of Design named as such take specific professional practices as their core. Most historians place the emergence of the modern professional designer during the Industrial Revolution. In the early 1900s, earlier vernacular, craft, and guild traditions bifurcated into two distinct and enduring groups: designers who conceive and plan, and manufacturers and others who build and produce (e.g., [58]). These core professional practices include graphic design, industrial design, furniture design, interior design, architectural design, urban design, and more recently interaction design, user experience design, and service design. Since industrialization, design has typically been conceptualized as activities aimed toward and eventually resulting in new product development—ranging from incremental improvements to disruptive and transformative innovation. That is, design is commonly grasped as instrumental and production-oriented activity (what I will later characterize as progressional design). Since the design professions were distinguished from productional occupations by their expertise in planning, modeling, and representation of future productions (what I will later broadly refer to as material prefiguration), professional design expertise has tended to remain downstream of basic and applied research and development (R&D) activities.

However, within the past few decades design has come to viewed by many as useful *beyond* new product development per se. Design is now considered as a method, skillset, and perspective for strategic planning and organizational learning [15, 59, 70, 78], participatory engagement [40, 79] and activism [24, 46], and basic and applied research inquiry [84, 100, 105]. Design has further been expanded through its application within new and emerging contexts, such as design thinking methods applied to public policy, social justice, environmental sustainability, management and innovation, and the everyday design of one's own life [22]. Today, design is now commonly understood to greatly extend the professions of design, leading scholars to proclaim that everybody designs [73, 99, 109].

2.2 Alternative Shifts: Speculative Design, Critical Design, and So On.

Against the backdrop of these broader expansions of the design landscape, a variety of alternatively qualified modes and forms of design have also emerged. In this paper the term ***alternative designs*** is used as shorthand in place of the cumbersome phrase *speculative design, critical design, conceptual design, adversarial design, discursive, reflective design, design for debate, design fiction, and so on.* Dunne and Raby's 2002 publication of *Design Noir: The Secret Life of Electronic Objects* is often cited as a key inflection point that helped drive critical, speculative, and conceptual design into a more mainstream view [36]. However, the impulses and orientations of critical design trace back to at least the birth of contemporary professional design in the early 1900s. Widely referenced historical antecedents include the speculative architecture of Archigram and Superstudio, Italian anti-design of the 1960s, and a range of other experimental and conceptual design projects. Less commonly recognized precursors, however, are found within the very origins of professional design education including the enormously influential Bauhaus School of Design in Germany, and one of its lessor known counterparts, the Russian VKhUTEMAS. Design's speculative and critical tendencies are exemplified, for instance, in Krutzekov's Flying City project (see Figure 3 and [63]) and Walter Gropius' commitment to artistic opposition and resistance: "The most important thing is to remain in the opposition. This way one stays fresh" (cited in [45]:63). Given Design's rich—albeit less widely acknowledged—traditions of speculative, critical, conceptual, and experimental activity, recent momentum driving alternative design approaches is perhaps best understood as both a rise *and a resurgence.*

Speculative design, critical design, conceptual design, and other related terms are sometimes used synonymously or conjunctively (e.g., [86]). However these terms are frequently also used with subtle distinctions based on geographical and contextual usages [1]. (For a more detailed unpacking of these distinctions, see [72, 85]) Not surprisingly, they are thus often used inconsistently and in ways that sometimes contradict one another. Speculative design and critical design represent two of the most prominent strands and commonly referenced terms of alternative designs. Dunne and Raby have described critical design as "design that asks carefully crafted questions and makes us think" [36]:58. Recently, however, the term critical design appears to have fallen somewhat out of

fashion in favor of speculative design. DiSalvo and Lukens distinguish speculative design according to its orientation to the future: "a particular characteristic of speculative design is that it tends to be future-oriented" [32]:27. This future-orientation "should not be mistaken as being futuristic in a fantasy-like sense, suggesting that it is 'unreal' and therefore dismissible," but rather "an emphasis on the future should be read as part of a broader exploration of the space of possibilities created by technology" (p. 27). Beyond speculative and critical design per se, other prominent alternative conceptualizations of design include adversarial design [30], reflective design [98], discursive design [103], and design fiction [12, 13, 66, 102] Others have articulated alternative modes of design by slicing of a more narrow methodological or conceptual facet demonstrated via novel design artifacts and processes, such as Wakkary's material speculation [107, 108], Elsden et al's speculative enactments [41], Odom et al's slow design [80], and Gaver et al's ludic design [49].

It must also be stressed that books and articles presenting overarching labels and detailed conceptualizations are not the only way in which ideas about alternative designs are articulated. Designers and researchers often describe and explain alternative design artifacts and projects within academic publications (e.g., [13, 14, 29, 43, 43]), exhibitions (e.g., [1, 11]), print monographs (e.g., [11, 53]), and other forms and formats of presentation, such as online documentation (e.g. [10, 75, 89])—what Bowers and Gaver might call conceptual "annotations" [18]. Comprehensive theories, influential writings, and prominent labels represent neither a final say nor a privileged status on matters of articulating alternative designs. However, they do often define the verbal labels and terminology through which these ideas are communicated, discussed, critiqued, and propagated.

Amid this amalgam of alternatively qualified designs, several preliminary points of relative clarity stand out. Speculative design, critical design, design fiction, and related discourses evidence attempts and evince desires to *distinguish between* two clusters of design activity. Moreover, the hierarchical relation between these two clusters is asymmetric in that one cluster is roughly characterized as more mainstream, prevalent, or established.

In the second part of this paper, the concept of *frictional design* will be articulated as a way of explaining how alternatives work and how they relate to other, more conventional types of design. However, friction is not devised as an "overarching label" (as Pierce et al suggest [82]). Neither does it supplant or stand strictly alongside speculative design, critical design, or any other alternative variants. Instead this concept takes an alternate cut through alternative designs by describing their tendencies and techniques, as distinct from their purposes and functions.

2.3 Conventional Cores: Production-Oriented, Human-Centered, and So-Called Real-World Design

Alternative conceptualizations of design implicitly if not explicitly reference a more mainstream, traditional, or conventional counterpart. At the center of the wider expansions and alternative shifts lies a core of design we might loosely refer to, for lack of a better term, as ***conventional design***. This conventional core of design is casually referred to with notions such as "practical design," "pragmatic design," "commercial design," "real-world design," or "professional design." Throughout this paper, the term conventional design is used as shorthand for referencing these notions. Some specific areas associated with conventional design include human-centered design, the design of industrially produced goods, software interface and user experience design for consumer products and services, most design activity involving a designer-client relation, and much of professional design practice, education, and academic discourse in general.

Oftentimes conventional qualifiers are not needed. But with the emergence of alternative designs, increasingly the context demands either a conventional or alternative qualifier. In the second part of this paper, the concept of progressional design will be articulated as a way of more rigorously characterizing conventional notions of design as convergent, production-oriented, and teleologically-driven.

2.4 Academic and Intellectual Turns: Research through Design

Research through design (RtD) represents a second expansionary shift connected to alternative designs. This paper uses the term ***research through design (RtD)*** as commonly used within design and HCI research to refer to research activity that integrally employs design processes and outcomes to generate knowledge and to communicate that knowledge, often with, through, or embedded within artifactual design outcomes [48, 84, 100, 105]. RtD is similar to, and often used synonymously with notions of constructive design research [67] and design inquiry [48, 93]. Research through design is generally considered a subfield of *design research*, which includes design theory, design studies, and design philosophy.

Research through design has established robust foundations in HCI and often meshing seamlessly with conventional design perspectives. As evidenced by a multitude of HCI research publications, workshops, and conference sessions, research through design has also provided a strong foothold for the influx of alternative design activity within HCI. Alternative design projects, publications, and practices within HCI typically fall comfortably under the umbrella of research through design. However not all research through design projects involve alternative design approaches.

Research through design typically occurs in academia's ivory towers or else within the interstitial spaces of self-directed creative practice, as opposed to the "swampy lowlands of professional practice" [96]. However, this positioning does not insulate the narrower territories of research through design from the expansions and shifts occurring across the broader design landscape. Despite recent research working to firm up the conceptual and disciplinary foundations of RtD (e.g., [1, 18, 48, 51, 56, 82, 100]), the lines between and relationships among alternative designs, conventional designs, and research through design remain unclear and frequently contested.

3 LIMITS OF EXISTING ALTERNATIVE/CONVENTIONAL LINES, RELATIONS, AND FOUNDATIONS

This section takes a closer look at divisions, relations, and foundations of prior conceptualizations of alternative designs and of design broadly. Two conclusions are drawn from this review. First,

existing lines of distinction and relations between alternative and conventional designs tend to be some combination of imprecise and internally inconsistent, overly antagonistic and misleadingly dualistic, or else distinctly one-sided and narrow by neglecting to delineate in relation to other types of design and to design in general. Second, prevailing general theories or definitions of design do not readily account for or accommodate alternative designs.

3.1 Divisionary Lines and Connective Relations

Alternative lines and relations are both too sharp and too dull. Sharp divisional lines between alternative and conventional designs can be rhetorically compelling and creatively inspiring. Yet they typically fall short with regards to the conceptual rigor and robustness desired within the context of research and theoretical discourse. One such favored distinction is Dunne and Raby's critical versus affirmative division. Affirmative design "reinforces how things are now" and "conforms to cultural, social, technical and economic design," whereas critical design "asks carefully crafted questions," "makes us think," and "provides a critique of the prevailing situation through designs that embody alternative social, cultural, technical or economic values" [36]:58. Forlizzi et al make a similarly sharp distinction between pragmatic constructive design research "that focuses on articulating a preferred or possible future" and critical/speculative design that "generate discussion and reflection on the present or likely future," polemically proposing "a divorce" between the two camps in a CHI recent workshop proposal [54]. The divisive concepts have proven useful in certain regards, including providing polemic inspiration and clarifying methodological differences. However, at the same time these distinctions are conceptually imprecise and internally inconsistent. For example, all speculative designs arguably "propose possible" or even "preferable"—albeit perhaps unlikely or controversial—futures. Disruptive design innovations that have resulted in successful mass-market consumer products evince some degree of criticality and "alternative values," at minimum implying that existing solutions are inadequate and current situations are in need of improvement [82]. And all designs—sketches, mockups, prototypes, concept videos, etc— quite clearly are devised to "make us think" and "generate discussion and reflection" on the present and future: Is this a good design? Should we build it? What impacts might it have on users, on the bottom-line, on the world?

Alternative lines and relations are excessively divisive. A second limitation of sharp divisions, such as critical versus affirmative design, is that they are overly antagonistic and misleadingly dualistic. In drawing sharp divisive lines, these approaches overlook and obscure a multitude of other observable and possible relations between either side. For example, forms of designerly speculation and critique are readily located within commercially-driven design [112]. Speculative and critical design clearly, at minimum, mimic and resemble more conventional forms of design. And within HCI RtD publications one typically encounters a multiplicity of contributions, some aligned more so with critical design, others with affirmative design.

An alternative approach to drawing sharply divisive lines is to soften, blend, or combine them. In distinguishing "discursive design" from other types of design, Tharp and Tharp advocate a 4-field approach whereby a certain design project or artifact might be grasped as some combination of "commercial design," "responsible design," "experimental design," and "discursive design" [103]. In distinguishing agonistic uses of design, DiSalvo emphasizes that the "adversarial design" label applies to the extent that certain designs "function as objects that challenge and offer alternatives to dominant practices and agendas" [30]:155. DiSalvo thus appears to leave the door open to adversarial designs *also* functioning in other, and potentially contrasting ways, clarifying that adversarial design "is not a practice that is oppositional to design or technology as general domains [30]. Pierce and colleagues have gone so far as to recommend retiring the divisive and misleading label "critical design," and instead suggest continuing to develop "more varied, evolving, and provisional" labels alongside speculative design, adversarial design, design fiction, etc, while recognizing each as design [82].

Alternative lines are one-sided and narrow. Flexible distinctions articulated in prior work, however, tend to be one-sided and narrow, rigorously describing an alternative zone of design but implying rather than articulating precise points of departures from other types of design. Moreover, they assume rather than establish the common ground of design upon which they stand. Yet, as will be argued in the next section, alternative designs do not readily square with prevailing conceptualizations of design. Furthermore, while most alternative designs do self-evidently employ methods, processes, skillsets, and form languages of conventional designs, they also characteristically diverge with regards to purpose, function, or aim. While often dormant or invisible, these foundational discrepancies periodically percolate up or splinter open in the form of confusion and conflict along fuzzy divisional lines.

To be clear, it is expected, and indeed desired that disagreement and ambiguity will continue as to where, how, why, and whether to draw divisional lines between conventional and alternative variants of design. Without seeking to supplant or dismiss existing lines, this discussion does surface specific limitations along with general dimensions or qualities worthy of consideration.

3.2 Insecure Foundations

As outlined in the beginning of this section, design is now commonly understood to greatly extend the narrow and traditional areas of professional expertise [30, 42]. As DiSalvo puts it, "the practice of design extends the professions of design" [30]:16. In line with this expansion, some scholars and theorists have established broader, more general intellectual foundations. Far beyond a professional arena of expertise, some even proclaim that "everyone designs" [22, 73, 99, 109]. If everyone designs, then surely alternative designers do?

By and large, a common ground of design shared by alternative and conventional designs is taken for granted rather than articulated. After all, alternative design processes share many of the conventional methods, techniques, skills, materials, and tools of professional, production-oriented design. And alternative designs certainly look and feel like conventional designs, at least on the surface. Where they depart seems to lie in how they act, why they are devised, and how they are used. But do these alternative aims or functions align with conventional definitions of design?

Upon closer inspection, a shared conceptual foundation of design feels less solid and hospitable to those that break with conventions. Across academic, professional, and colloquial discourses, prevailing characterizations of design converge upon several prominent focal points including purpose, preferability, change, planning, argumentation, production, and a service relationship to others. Yet, upon scrutiny, alternative designs do not easily square with these definitions and theories of design. For example, to take but one of the more favored definitions within HCI, Herbert Simon broadly characterizes design as "courses of action aimed at changing existing situations into preferred ones" [99]:111. Yet many alternative designs propose saliently and deliberately undesirable or contestable futures. To be sure, Simon's definition is broadly crafted, and it is certainly possible to argue that alternative designs—along with a great many other activities—fit within this definition. And some have indeed suggested that the broader of purpose alternative designs *is* ultimately to inform activities for achieving preferred future states. For example, Paula Antonelli writes that "even when [designs] are conceptual, speculative, and not immediately viable, most design experiments are created to prompt dialogue and to anticipate concrete needs, problems, or conditions—in other words, to actively support a greater good to come" [1]. But such arguments, even if logically convincing, nonetheless either stretch the concept of design so far that virtually anything fits, or else employ unsatisfying conceptual gymnastics or brute force to squeeze alternative design into a container that was clearly not designed with speculative and critical design in mind. Subordinating alternative designs to the aims of achieving a preferable state of material change does not satisfactorily account for the fact that alternative design so often explicitly deemphasize or eschew the instrumental achievement of a singular or clear-cut preferred state. Instead they often explicitly promote divergence, multiplicity, and experimentation. Alternative designs are often presented as intended to critique prevailing situations, explore possible futures, and promote debate and dissensus.

In addition to the achievement of preferable situations, other focal points of prevailing conceptualizations of design include production [44, 57], argument associated with plans [21] and service on behalf of others [83]. Yet these notions similarly fail to adequately account for alternative (frictional) designs, which, as will be elaborated, variously prefigure futures that *saliently lack* productional viability, affirmative arguments, and service-oriented client/designer relations. The end result is similar in each case: intricately maneuvering or force-fitting alternative designs into certain prevailing conceptualizations is, at its worst, logically unconvincing, and at best obscures the most salient features of alternative design.

In the remainder of this paper, I will elaborate a framework for rethinking and redrawing lines and relations between alternative and conventional designs, and reconstructing foundations shared between them. This framework consists of three key ideas: designerly progression, friction, and prefiguration.

4 DESIGN AS PREFIGURATION: THE PARTIAL ACTUALIZATION OF POSSIBLE FUTURES

Prevailing theories of design do not adequately account for alternative designs, research through design, and other expansions and shifts. Rather than continuing to expand (as suggested by [42]) or building to the side (as suggested by [92]), by digging slightly deeper below the sedimented layer of current design theory a modified conceptual foundation can be devised to better accommodate alternative designs along with other broader expansions and shifts. This foundation is grounded in the idea of *design as prefiguration.*[1] Across design discourse and theory lies a pervasive yet relatively underdeveloped idea: design is fundamentally a prefigural human activity and artifactual outcome. Familiar material prefigural forms include design sketches, blueprints, prototypes, mockups, enactments, and concept videos. In general, ***prefigurations* are partial, provisional, and potentially preliminary material actualizations of possible futures**.

While a comprehensive elaboration of prefiguration is outside the scope of this paper, the core idea is grasped more readily with the help of a sketch. Sketches are indispensable tools for professional designers. But the sketch is also a microcosm and prototypical model of a generalized design/prefiguration. Colloquially, a sketch is often defined as rough or incomplete drawing that may be used to assist in making a more finished version [26]. To the extent that a sketch is grasped as incomplete and unfinished by the human hand, eye, mind, and imagination, the sketch *prefigures* a possibly more complete, more finished version of itself. But—and this is the crucial part—*prefiguration precedes and may exist independent of intentions to, plans for, arguments in favor of, and material progress towards fuller actualization.* For example, Katerina Kamprani's prefiguration of an Uncomfortable Chair (Figure 3, page 11) is widely recognized and celebrated as a design [27]. Yet one does not readily infer or attribute any sincere intentions, plans, are arguments for actually producing the chair, distributing the chair, or practically attempting to sit on it. (It is worth pointing out that Kamprani's designs are not constructed chair-like objects but rather detailed computer-generated renderings.)

A crucial implication of this conceptual foundation is that prefiguration does not demand any actual intentions, plans, arguments, or material progress towards fuller actualization. Thus, prior to conceptualizing design as, say, problem-solving [28], progress toward

[1] I use the term prefiguration in a different, though related sense to Asad's concept of prefigurative design [3], which is rooted in the concept of prefigurative politics (e.g., [17] [52] [94]) and the anarchist idea that by "practicing more just social relationships and organizational models now, we actually enact those envisioned, liberatory ideals" [3:5]. My use of prefiguration shares the basic emphasis on future possibilities. But to the extent that prefigurative design [3] and prefigural politics are committed to progressional movement whereby "smaller scale interactions and relationships scale up to eventually replace oppressive systems and institutions and realize the visions of liberation," (p. 5) those concepts are actually more strongly aligned with what I call progressional design. On the other hand, to the extent that prefigurative design might entail "practicing more just social relationships and organizational models now" and in doing so we are to understand such practices as "enact[ing] those envisioned, liberatory ideals" (p. 5)—albeit at smaller or incomplete scales—the concept aligns well with how I define designerly prefiguration and my claim that designs prefigure—and they are "real" and "useful"—even if they are never fully actualized. In sum, I use the term prefiguration primarily as a convenient English word to name how designs mediate by partially actualizing possible futures, but without any specific anarchist or progressive political orientation.

Figure 1: Progressional designs: Thonet Chair no. 14. The above images depict a specific design's generalized progressional movement from exploratory sketch, to polished rendering, to industrial manufacture and distribution, to final production as defined by its temporal repetition, spatial multiplication, and social and situational integration (in this case, eventually achieving the coveted status of an iconic and historically significant everyday, mass-market consumer production).

a preferred state [99], or an intentional service-oriented relation to others [83], design can be grasped fundamentally as a *prefigural* human activity and artifactual outcome. Material prefiguration forms a common ground of design shared by progressional and frictional designs, one upon which they diverge in certain regards, overlap in others, and relate in ways that evade simple directional comparisons. Having defined a shared common ground of material prefiguration, let us now turn to explicate the progressional theory of design.

5 PROGRESSIONAL DESIGN: PURPOSE, CONVERGENCE, PRODUCTION

Progressional design is a way of theoretically cohering and characterizing notions casually alluded to with practical design, pragmatic design, professional design, real world design, and other informal terms—what I have collectively referred to, rather loosely, as conventional designs. The linkage of two ideas gives definition to progressional design—purpose (telos) and convergence towards production. They relate as follows. **Under a progressional theory, (1) design has a primary purpose (telos[2]) and (2) that purpose is to ultimately tend toward convergence toward production.** A progressional theory of design holds that prefigurations are instrumental tools for convergently progressing toward and ultimately and ideally actualizing productions. Most prevailing notions of design tacitly adhere to or privilege this progressional theory of design. Whenever someone says, in contradistinction to speculative or critical design, that they are doing pragmatic or real-world design, most likely that practice comports with the progressional theory of design.

A metaphor and an example help illuminate design progression. Figuratively, progressional design is an arrow. The arrow has a relatively clear and direct aim, namely to hit its emergent target. This arrow-like progression of design is diagrammatically illustrated by visualizations of human-centered design processes, such as those popularized by IDEO, the Stanford D-School, Hugh Dubberly [35], Vijay Kumar [68], and the UK Design Council [104]. Each outlines roughly comparable stages: "understand the challenge," "brainstorm radical ideas," "make prototypes," and "deliver solutions that work." Diagrammatically these stages form a progressional arrow. While circular iteration—rather than rigidly linear, sequential progression (e.g., a waterfall design process)—is indeed a central tenet of human-centered design, these design processes nonetheless verbally describe and visually depict a generalized movement that ultimately distills down to an instrumental arrow. This progression is depicted in Figure 2, where an arrow is neatly superimposed upon influential human-centered process diagrams.

The arrow-like progression of design also reappears across influential theoretical definitions of design. An abstract conceptual arrow extends through Herbert Simon's notion of design as "courses of actions aimed at changing existing situations into preferred ones" [99]:111. The progressional, production-oriented arrow of design appears even more pronounced within John Heskett's thoughtfully encoded definition: "Design [a discipline or profession] is to design [a process or activity] a design [a plan or representation] to produce a design [a consumer product, good, or service]" [57]:3.

Extending the metaphor of an instrumental arrow, additional analytical precision is achieved through the concepts of convergence (the movement) and production (the endpoint). *Convergence* names the developmental process, the tendential directionality, which is to advance or evolve toward operational constructions successively more finished, refined, improved, etc. Convergence alone, however, does not fully define design progression. Progression within a teleological framework implies an articulable target and achievable outcome. *Production*[3] names this target and possible eventual endpoint. In the context of design, the word production carries the connotation of a product, both in the sense of a manufactured, and likely capitalistic and profit-motivated object, and of a discrete material thing (See Figure 1). However, the term production here encompasses a much broader range of artifacts than mass-produced goods.

In casual conversations, designs and researchers will often informally refer to "finished products," "real world things," "functional technologies," and "working systems." Or, as Brenda Laurel

[2]In philosophy, teleology references the idea of explaining in terms of a purpose, end, goal, or function. Teleological activities are generally framed in terms of a final or extrinsic endpoint.

[3]There are a few notable benefits and downsides of using the term *production* to define the target and possible eventual endpoint of designerly progression. On the positive side, production carries familiar connotations of something this is finished, final, and functional. Further, the term is familiar to designers and is often used to refer to core categories of production, including mass-manufactured consumer products. However, one shortcoming of the term is that the term production is also often used in other contexts, such as artistic production or intellectual production.

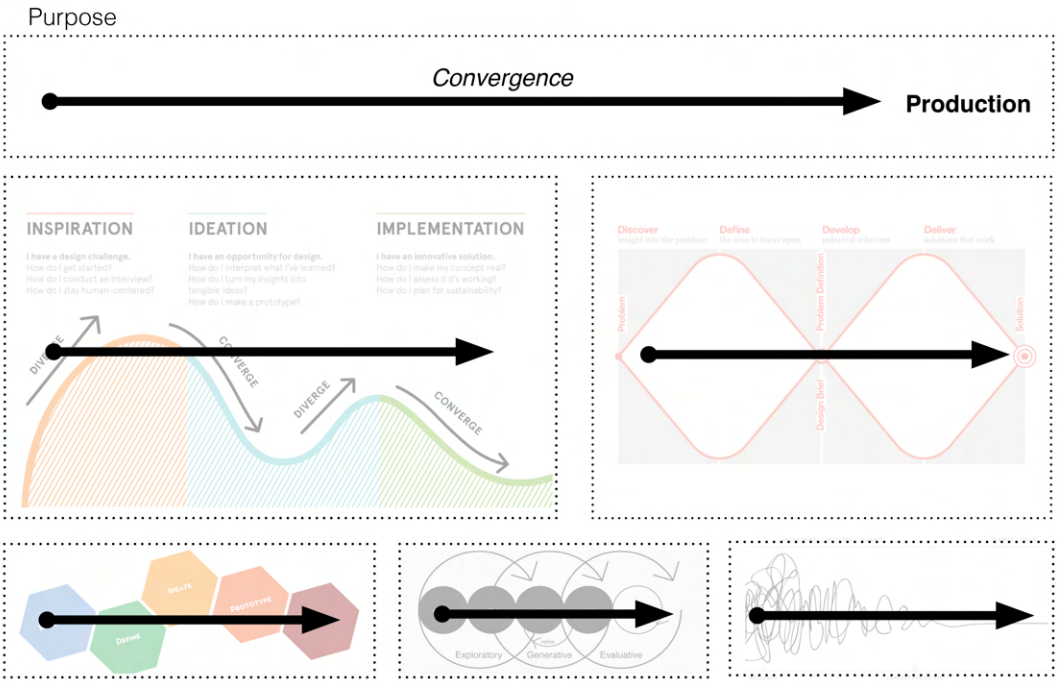

Figure 2: Diagramming the progressional arrow of design. This image superimposes a progressional arrow atop influential diagrams of the human-centered design process (left to right: IDEO design process, UK Design Council's double diamond process, the Stanford D.School's design process, Hugh Dubberly's diagram of the design process, and Design Squiggle by Damien Newman

famously suggested, "A design isn't finished until somebody is using it." Pinning down the intuitive and embedded meanings of such notions is more difficult than may initially appear. This is especially the case if a goal is to distinguish between alternative designs. In what sense is a speculative design proposal not "real," "finished," "functional," or "working?" Rather than seek a comprehensive and singular definition, production is best grasped in successive stages.

In the most general sense, productions are configured (i.e., materially constructed and practically operational) to such a degree that they are grasped as fully or sufficiently finished (i.e., no longer in the process of being designed or produced) and complete (i.e., no longer merely or predominantly an as-yet unconfigured prefiguration). That is, a design is finished when design work ceases and a final design is declared. A design is complete when one no longer perceives any prefigural possibility demanding completion. In this sense, production constitutes an actual or idealized endpoint of progressional convergence, at which point prefiguration fades and gives way to configuration. Complete and finished productions exit the iterative, typically messy and circuitous, orbit of the design process, retrospectively tracing a linear progressional pathway.

In a more specific sense, production is further defined by situational integration within a material and social context. An iconic, mass-produced good, such as the iPhone, exemplifies an extreme version of situational integration defined by spatial multiplication, temporal repetition, and social normalization (See Figure 1 for an alternate example). With even more specificity, it is possible and in certain contexts useful to characterize specific categories of production which the various design professions, disciplines, and traditions specialize in prefiguring. Further analysis would reveal myriad particular characteristics defining production within specific areas of design, such as architectural design, interaction design, graphic design, single-family home design, social media app design, and book cover design. Such an analysis is not needed here, though it is instructive to highlight several higher-level categories of production shared across the various design disciplines, including the categories of commercial productions, industrially mass-produced productions, small-scale boutique or hand-crafted productions, and everyday productions.

In summary, progressional design work like arrows. A progressional theory of design readily appears across most practices, outcomes, and discourses of design, though it is perhaps most clearly illustrated by human-centered design methods and the diagrammatic visualizations and language used to schematize them. Under a progressional theory of design, material prefiguration is primarily or ultimately grasped as a *tool for* achieving some purpose. Within the cultural and disciplinary landscape of Design named as such, this purpose is defined in terms of convergence toward productions—materially constructed, practically operational, and situationally integrated artifacts, which are in turn typically grasped as tools within a teleological framework.

Figure 3: Frictional designs: (left to right) Travel Capsule for moving between Earth and the Flying City (Georgii Krutikov, 1928) The Uncomfortable series (Katerina Kamprani, 2014); Do-Add Chair (Jurgen Bey / Droog Design, 2007) chair design from; The Nipple Chair (Anthony Dunne and Fiona Raby, 2001)

6 FRICTIONAL DESIGNS: IN TENSION WITH PROGRESSION

Under the progressional theory, design has a primary purpose. This purpose is to ultimately and ideally—though not necessarily linearly or successfully—converge towards production. Frictional designs partially align and partially break with progressional designs. While these designs prefigure possible productions, they also appear deliberately and intriguingly resistant toward production—the very production they prefigure! Frictional designs thus exhibit a curious double movement. Ostensibly they propose productions, and yet these partially actualized possibilities appear *saliently, deliberately, and compellingly resistant* to further progression or final production. These unconventional designs are compelling and potentially useful *because, not in spite,* of this progressional resistance.

Frictional designs are best understood as *in tension with progression*, rather than as antithetical to or strictly exclusive from conventional, production-oriented design. Because of this tension frictional designs exhibit inherent ambiguity, ambivalence, and even contradiction (See Figure 3 for some more and less obvious examples). Although much of this may be resolved by recognizing that they are not sincere, straightforward plans and arguments for the productions they literally prefigure. What frictional and progressional designs share in common, that which constitutes both as design, is that they are material prefigurations: partial, provisional, and potentially preliminary actualizations of possible futures.

If the metaphor for progressional design is an arrow, with a primary aim of hitting its emergent target, the guiding metaphor for frictional design is a break or opening. To break is to make inoperable. But it is also: to pause, to suspend, to separate, to interrupt, to breach, to create a gap in continuity or opening upon the surface. Frictional designs break with progressional assumptions, expectations, and their arrow-like movement.

To further explicate friction, I adopt a tendential approach that asks not what frictional designs *are for*, but instead what frictional designs *are doing*, what they *are becoming*, and how they *are associating and relating*—to other progressional designs, to prefiguration, and to the past, present, and the future. This tendential approach contrasts with the teleological approach taken by many design theorists and proponents (e.g., [19, 20, 83]), wherein design is conceptualized predominantly or strictly in terms of human purpose, intention, or a specific type of pragmatic functionality. A tendential approach alternatively seeks to describe apparent causes, effects, associations, connections, and, especially, potentials and possibilities.

This tendential approach—one guided by a cluster of contemporary theory from philosophy and the humanities[4]—was adopted for two reasons. The first is *fit*. Fluid tendencies, rather than essential traits or clear functions, resonates with language and forms used to present alternative designs (e.g., "parallels, tangents, and loops" [29], "provisional, contingent and aspirational" [48]; "partiality, incompleteness, and openness" [82]) The second reason is *necessity*. Prior efforts to characterize alternative designs emphasize an overarching, if broad and unconventional, purpose: alternative designs are *for* speculation, *for* critique, *for* agonism, *for* reflection, *for* discourse, etc. Yet a conceptual foundation of prefiguration allows us to grasp designs without resorting to purpose or function. This adherence to teleology is at least part of the reason why comprehensive and overarching characterizations of alternative designs seem to evade articulation. As it turns out, alternative designs are useful toward many, sometimes competing, and often intersecting aims and ends. One way to cohere various strands of alternative designs lies in first resisting the urge the squeeze them into a single albeit alternate teleological box, and instead flexibly grasping the myriad ways in which they work. The concept of friction is not devised to definitively label or supplant prior stands of alternative designs (speculative design, critical design, design fiction, and so on), but rather to weave an alternate conceptual thread through them by way of tendencies, rather than telos (purpose).

[4]This approach is guided by various contemporary—and it must be said, in certain corners quite fashionable— theoretical currents, many of which have already worked their way from other disciplines into some areas of HCI and design research, such as effect theory [25] [74], feminist new materialisms [9], object-oriented ontology [16], technological mediation [106], performativity [6], and posthumanism [55]. Across this work, three prominent themes inform the analysis that follows. The first is a turn away from the individual human agent toward non-human and distributed agency, such as the basic idea that technologies act in ways other than planned or intended. The second is a dislike of dualisms and an aversion to straightforward causal relations in favor of multiplicity, heterogeneity, diffraction, blending and blurring, affective registers that elude capture by logic and reason, and so on. The third is a penchant for Deleuzian potential and possibility, i.e., a preference for incipient becoming/ontogenesis over static being/ontologically.

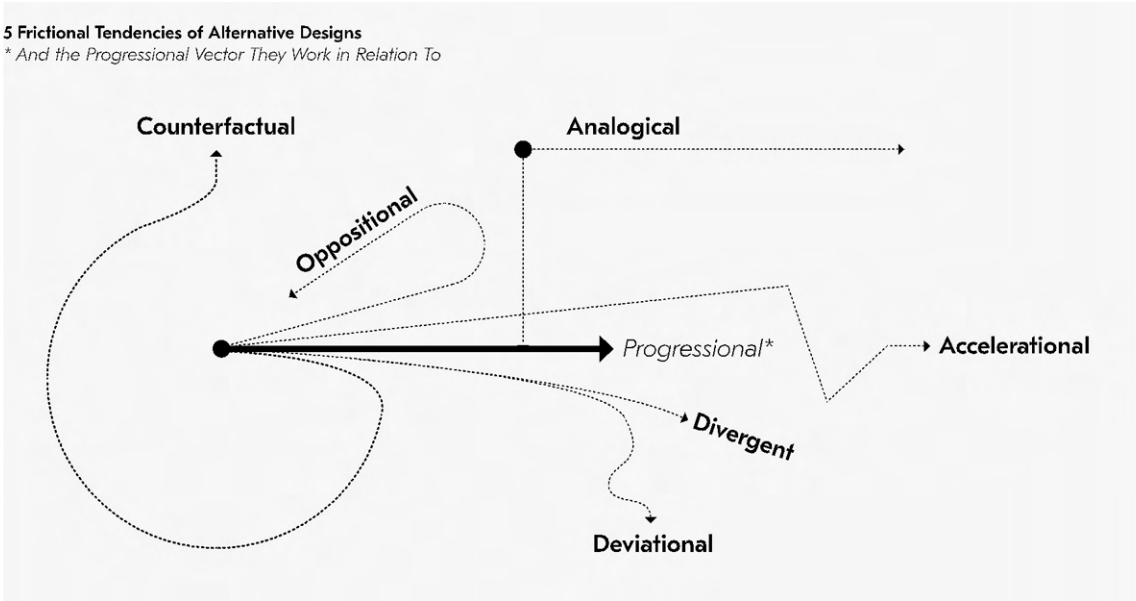

Figure 4: 5 Frictional Tendencies or Vectors of Alternative Designs. (Descriptions of the visualization: The divergent/deviational tendencies are diagrammatically visualized as vectors tending to run orthogonal to progression. The oppositional tendency is visualized as a vector that sharply circles back to reciprocally oppose the forward progressional vector. The accelerational tendency is visualized as a vector that dramatically outpaces the progressional. The counterfactual tendency is visualized as a vector that circles backward toward the past before shooting off in a direction orthogonal to the present. The analogical tendency is visualized as a vector that extends above and runs parallel to the progressional.)

6.1 Frictional Tendencies: A Framework for Disentangling Design Friction

One way to grasp friction more concretely is to model its tendencies as directionalities or vectors. Below I articulate 5 such vectors that work their way throughout alternative designs.

- **Divergent friction.** The divergent tendency in design (and its more extreme variant, the *deviational tendency*) is one of departing from conventions and expectations of today. Divergent and deviational designs are unusual, and thus may trigger responses of excitement, doubt, unease, or confusion.
- **Oppositional friction.** The oppositional tendency in design is one of exhibiting a critical stance toward current practices, technologies, situations, trends, values, etc.
- **Accelerational friction.** The accelerational tendency in design is one of extrapolating the present beyond the boundaries of what is presently feasible, plausible, or imaginable to the point of discomfort, outrage, confusion, or absurdity.
- **Counterfactual friction.** The counterfactual tendency in design is one of concocting alternative histories or worlds that might have transpired, but historically did not or presently have not.
- **Analogical friction.** The analogical tendency in design is one of resisting the literal and direct, and instead promoting associative and metaphorical interpretations.

Each vector represents a frictional tendency to the extent that it tends other than progressionally. Extending the vector metaphor, these tendencies collectively represent a flux of crosscurrents, countercurrents, and parallel currents cutting against, across, and overtop the prevailing progressional momentum of design. A visual representation of the five frictional vectors is depicted in Figure 4

This framework is heuristic in the sense that the 5 tendencies are not the result of an attempt to comprehensively categorize frictional designs, nor were they developed specifically with aims of analytical precision. Indeed, I originally refined the frictional tendency framework specifically as a tool for teaching design students how to concretely compose and construct speculative, critical, and conceptual designs. As a pedagogical tool, I have found this framework to be useful in several specific ways. It is useful for explaining how to conceptually grasp speculative and alternative designs in relation to human-centered design and other progressional design approaches that tend to dominate design education and practice. The framework is also useful for explaining how alternative designs radically relax progressional assumptions and productional expectations. Frictional designs are often designed to work in multiple and potentially contradictory directions, and without a singular overarching purpose (e.g., solve a problem, generate profit, improve user satisfaction, make the world a better place). And as a pedagogical tool, I have found the framework to be particularly useful for explaining specific examples of speculative design, critical design, and other alternative designs. In a similar way, I present this framework here to illustrate friction and to help ground what has until this point remained a largely abstract theoretical discussion. To concretely illustrate friction, two frictional tendencies are discussed in greater detail below.

Figure 5: Divergent/Deviational Friction. (left) Chair renderings from Katerina Kamprani's *The Uncomforable Series.* (right) Sample sketch of Durell Bishop's *Marble Answering Machine.*

Figure 6: Counterfactual frictional designs. *Tilting Bowl* (Everyday Design Studio, 201. Images courtesy Ron Wakkary).

The Divergent/Deviational Tendency. Consider two examples illustrating the divergent/deviational tendency—the first absurdly deviational, the second more subtly divergent. Katerina Kamprani's The Uncomfortable project prefigures, in the form of computer-generated renderings, several absurdly and saliently unusable chairs (Figure 5). While the exact purpose of the design is unclear, what is clear is that these chair designs lack productional intents and viability. Why? Because they are proudly useless with regards to the conventional uses of a chair as a constructed, operational, and situationally integrated tool for comfortably sitting and reposing. Instead, through their flagrant deviation from the norm, the design brings into focus mundane affordances and functions of everyday designed objects hiding in plain sight. Whereas Kamprani's Uncomfortable Chair appears to explore deviation for its own sake, Bishop's Marble Answering Machine showcases a more subtle, obliquely progressional form of divergent friction (Figure 5). Bishop's radical redesign of a telephone answering machine involves a novel tangible interaction paradigm wherein voicemail messages are replayed by dropping an associated marble into an opening on the machine. On the one hand, the Marble Answering Machine has evidently proven *too* frictional to fully configure in the form of a constructed, operational, and integrated production. On the other hand, the idea of a playful, tangible user interface—while quite deviational at the time the Marble Answering was originally presented, when computers were still quite expensive and predominantly utilitarian technologies—has since manifested across a range of mass-market productions. The Marble Answering Machine lives on as a celebrated historical example of the Tangible User Interface (TUI) [87]:3-4, indefinitely suspended in a state of frictional tension with progression. The Marble Answering Machine exemplifies how friction may work to isolate and amplify progressional potentials through prefigural forms destined to prove overly resistant to literal, straightforward productional actualization, but nonetheless which may progressionally succeed via capture or uptake within other designs.

Example 2: The Counterfactual Tendency. The counterfactual tendency is exemplified by Wakkary et al's Tilting Bowl, which they present as a "counterfactual thing" [108]. The Tilting Bowl is a ceramic bowl embedded with a small computer and servo-motor that "unpredictably but gently tilts" at apparently random moments multiple times throughout day [108]:1 (Figure 6). On the one hand, the Tilting Bowl constitutes a production in the most general sense: it is materially constructed and practically operational. Moreover, it resembles or mimics familiar consumer productions, such as ordinary ceramic fruit bowls. On the other hand, the Tilting Bowl deliberately and expectedly exhibits friction with regards to situational integration, i.e., temporal repetition such as regular practical use, spatial multiplication such as mass-market production, and social normalization such as acceptance of the product as familiar and socially-shared aspect of daily life. While in certain regards the Tilting Bowl may progressionally achieve smooth, situational integration (e.g., some participants in Wakkary et al's empirical study used the bowl to store fruit, and learned to appreciate its quirkiness), in other regards the Tilting Bowl frictionally resists

integration and stands out as a glaring, deliberate alternative to the way things actually are and, perhaps, could ever be. For example, it appears improbable that the Tilting Bowl will ever be available as the mass-market consumer product it mimics in certain regards, or that other everyday products will randomly tilt. Indeed, it appears unlikely that anyone outside of a few select research participants will ever own or live with a Tilting Bowl. Wakkary et al summarize their counterfactual approach as follows: "A counterfactual artifact is a fully realized functioning product or system that intentionally contradicts what would normally be considered logical to create given the norms of design and design products, like a tilting bowl." This counterfactual "countering of norms" opens "the possibilities to empirically investigate multiple alternative existences (or what-ifs) as lived-with realities of the counterfactual artifacts" [108]:1. In effect, the counterfactual tendency triggers a layer or zone within the present wherein one reimagines the current world is it might or could—but alas, is not and probably will never—fully actually be.

6.2 Transproductional Value: Making Use of Friction

If frictional RtD breaks with the progressional assumption that design is necessarily upstream of production and technological solutions, then what exactly are we to make of these designs? How can we generally grasp their uses, effects, or value—teleologically or otherwise? A general answer lies in the concept of transproductional value. If, in general, progressional designs are production-oriented, then frictional designs are *transproductional*. Which is to say that they offer purposes, uses, functions, effects, and other types of value other than the production they literally, ostensibly prefigure. Naming transproduction clarifies, in a word, the misconception that all design, including research through design, is ultimately instrumentally subordinated to and in service of progression and production. RtD projects and publications within HCI clearly present research contributions other than or in addition to the actualization of everyday products or knowledge directly intended to inform such productions. Indeed many RtD publications explicitly disavow or distance the design work from production. Consider a small sample of such examples:

> "[The Ritual Machine] *would never be* the result of a massproduction industrial process or be chosen by that family in a commercial context to meet a perceived need. It exists within the home only to create moments of reflection amongst the family about their values and attitudes to separation. In this way, and akin to a provotyping strategy, each machine may be seen in part as both a sensitizing tool (as per cultural probes) and a breaching experiment seeking to provoke reflection" [65]:2482, emphasis added.

> "Importantly, *we do not see* [Inspirational Bits] as being used in the first stages of a potential prototype that is to be extended into a full-blown system. *Nor do we see them* as narrowing down options as in the case of structured methods or design patterns. Rather, they provide a way to produce quick and dirty but fully working sketches with the primary aim of exposing the properties of materials." [101]:1569, emphasis added

> "The Babble *was never seen purely as a prototype product*, either by the volunteers or ourselves: *we never planned to produce it commercially*, and they were always aware of it as part of a research project" [47]:1123, emphasis added.

This paper provides a vocabulary and conceptual framework for clarifying these and myriad other halting caveats and qualifications appearing throughout HCI RtD publications:

> Our approach is frictional, our aims are not strictly progressional, and our contribution is transproductional. We prefigure production, but as a way to imaginatively engage with the future. If you take these designs literally as progressional new product development or R&D, then you're missing some, most, or all of the point!

7 DISCUSSION: REVISITING ALTERNATIVE/CONVENTIONAL LINES, RELATIONS, AND FOUNDATIONS

As a conceptual tool, the progressional-frictional-prefigural framework helps rethink and, if needed, reconfigure three basic zones across alternative designs, conventional designs, and design in general. "*Do*" in the corresponding questions indicates a split concern between *how are we doing this now*, and *how might we do this in the future*:

1. **Lines.** How do we define lines between alternative designs and conventional designs? Are they sharp or loose, flexible or rigid, permeable or closed, antagonistic or amicable? And, upon more rigorous inspection, how well do these presumed lines actually hold up?
2. **Relations.** How do we define relations between alternative and conventional designs? Are they separate and autonomous? Integrated or interweaving? Does one inform the other? Is one subordinated to the other? And are the views from either side symmetric?
3. **Foundations.** How do we define the conceptual foundation(s) of design upon which both alternative and conventional designs apparently stand? Do alternative and conventional design stand on equal footing atop this foundation? Is the foundation more hospitable to one than the other? And is the foundation stable and coherent?

In conclusion, I focus the progressional-frictional-prefigural framework onto the specific disciplinary concerns within HCI outlined in the introduction. I argue that alternative RtD within HCI is methodologically experimenting with and innovating new frictional techniques and transproductional uses, yet these are too often confounded and constrained by tacitly held progressional design framework. Based on this insight, I outline three recommendations going forward: (1) recognize and develop design's transproductional uses and values, (2) clarify, and at times embrace, frictional designs' teleological ambiguity, and (3) its relational multiplicity with regards to progression.

7.1 Exposing Progressional Assumptions

Delineating frictional and progressional lines of design brings into sharper focus a confounding and contentious zone of division across design discourses: *foundational purpose*. The progressional theory of design does not merely describe tangible design activities and outcomes. Progression further names and explains a set of predominating—one might say hegemonic—assumptions and values concerning the purposes of design. As this paper has argued, prevailing conceptualizations and discourses of design tend to tacitly assume and implicitly adhere to the tenets of progressional design. Under this view, design has a primary or overarching purpose, which is to ultimately converge toward constructed, operational, and integrated productions. However, alternative designs in general—including alternative RtD within HCI—saliently break from the progressional theory of design. Instead, they embody what this paper has characterized as a frictional theory of design: they prefigure possible productions, yet these partial, provisional actualizations appear saliently and compellingly resistant to further progression or final production. While frictional designs are not purely progressional, neither are they strictly anti-productional. Rather, they are compellingly *in tension with progression*. A frictional theory of design thus entails *loosening and suspending*—perhaps indefinitely—rigid progressional assumptions and productional expectations.

The previous section presented quotes illustrative of a recurring rhetorical tactic within HCI publications: alert the reader that this thing that resembles a new consumer product or solution is, in fact, actually *not* a product or solution. Why are such explicit disclaimers and defensive posturings needed? The answer is not simply that frictional designs look like conventional designs but act alternatively. Progressional assumptions and productional aims and expectations are often deeply ingrained, rarely interrogated, and difficult to clearly articulate. While Design exhibits a rich history of speculative, conceptual, critical, and experimental activity, it is nonetheless a relatively new and radical idea that one would conceive, explore, refine, sketch, prototype, deploy, and study a possible new production (prefiguration) but for reasons and towards ends primarily other than finally, actually producing, distributing, using, and integrating it (production). Indeed, I argue that **verbal and artifactual articulations of this idea within frictional RtD research publications and projects constitute on ongoing methodological innovation of design research and HCI**. Yet across the wider HCI and design research communities, this idea often remains implicit and uneasily grasped or accepted. As discussed further below, the substantive problems stemming from the predominance of progressional assumptions within HCI design research is not merely one of confusion but also of disciplinary constraint. For example, progressional expectations constrain frictional experimentation and innovation to the extent that researchers are pressured to appease subtle progressional expectations or values—for example, articulating actionable progressional design recommendations, building a "functional prototype" when a detailed drawings or concept videos might be sufficient, or including a user study or field trial deployment when some other method of assessment might be more illuminating or economical.

One crucial step toward resolving unnecessary confusion, conflict, and constraint within HCI design discourse is to **openly and explicitly recognize that frictional RtD radically relaxes progressional assumptions and corresponding productional expectations**. Relaxing progressional assumptions reciprocally demands confronting and challenging the pervasive, though often tacit application of progressional design expectations onto frictional RtD and designerly prefiguration in general.

7.2 Recognizing and Developing Design's Transproductional Uses and Values

Departing from a progressional paradigm of new product development or production-oriented research and development (R&D), much RtD within HCI instead pioneers and refines new transproductional uses of design. These include previously articulated notions of design as a mode, tool, or embodiment of critique, speculation, reflection, debate, and discourse. But other transproductional uses are possible. For example, Wakkary et al describe the aim of their design study of the Tilting Bowl as one of "enhanc[ing] our philosophical understanding of digital artifacts" by "exploring alternatives with a counterfactual artifact" and considering "lived-with reflections" from trained philosopher who lived with the Tilting Bowl in their homes [108]:10. Liu et al design a set of "tools for mushroom foraging" that also function as "tools [for] provocation" with the "intention of sparking the imagination of designers so that we can picture new roles and relationship for technology within a precarious present" and offering "a vision of wearable extending our human sensor capacities into the environment, thus, allowing us to notice, attend to, and become struck by nonhuman lives" [71]:2.

More generally, we might characterize these and other examples of frictional RtD as using design (i.e., prefiguration) as a *tool for inquiry* [48, 92, 93]. Crucially, this inquiry need not generate knowledge that directly informs progressional design or yields successful production of, say, a mass-market consumer product or a widely-adopted infrastructural technology that solves a problem, changes the world, or creates monetary, pragmatic, or experiential value. Design as a tool for inquiry may alternatively or additionally produce knowledge whose value and use transcends production and knowledge aimed at directly informing progressional design.

Indeed, transproductional uses of design extend beyond the saliently frictional. Transproductional uses also emerge within other expansionary modes of design—some progressional, others less so. Previously I mentioned expansions of design as participatory engagement, activism, and organizational learning. These types of design activity are transproductional to the extent that they are valued for, say, consensus or capacity building *in the absence of* progressional potentials and productional outcomes. Many, however, fail to recognize or admit that gathering people around a table to create, debate, and assess possible productions (i.e., to engage in the activity of design) is often done to create value that ultimately does not depend upon the *actual* achievement of a production that transforms the world, solves a problem, or realizes a preferred situation. Sometimes production is, in effect, a tacitly agreed upon pretense that drives design activity but does not constitute its expected or desired outcome. As Pelle Ehn has suggested of participatory design, the goal is not necessarily to resolve conflict through technological solutions (productions), but rather to leverage design activities

and forms as "boundary objects" used within "design-games" with goals of highlighting concerns, resolving disagreements, and more generally promoting democratic processes and values within an organization or society [40]:92. Production and transproduction help clarify that oftentimes the ostensive goal or game-like assumptions of a design process is progression and production, yet the actual intended and expected goals transcend the literal productional prefiguration that enables activities of imagination, reflection, debate, etc. In a similar vein, some argue that value of designing lies not in the achievement of a solution, necessarily, but in the learning and interpersonal relations forged through the process [70]

Transproduction further exposes a gap of this project, namely the need to positively articulate alternative uses and values of frictional designs. By focusing on how frictional designs work via tendencies, rather than what they are for via telos, this paper says comparatively little concerning specific uses, purposes, aims, and outcomes of friction. As a largely negatively defined concept, transproductional value represents an abstract container whose contents and contours RtD and HCI must continue working to positively articulate. Frictional designs are useful for far more than critique, speculation, reflection, and debate. Overly relying upon these frameworks to legitimize research through design projects and outcomes may limit more radical experimentation, rigorous assessment, clear-eyed criticism—including the uncomfortable, inwardly focused variety—and forging connections with and demonstrating value to outside audiences. Future work must continue to explain the benefits of using an ostensive/possible production towards ends other than literal, straightforward production. Throughout, this paper has hinted at this value: **prefiguration activates the imagination and triggers future-oriented thinking, a capacity whose use extends well beyond actualizing said imagined future**. As the next section elaborates, there are more subtle effects of frictional design as well, including the power of productional prefigurations to capture attention, attract eyeballs and funding, and circulate throughout media outlets under the ambiguous pretense of a viable and sincere potential production.

7.3 Nuancing and Multiplying Conventional/Alternative Relations

Is research through design "clearly not commercial product development," [13]:703 as Blythe observes? Or is research through design ultimately an endeavor to "make the right thing: a product that transforms the world," [105]:493 as Zimmerman et al have it? The answer, I argue, is *yes*—sometimes one, sometimes the other, and sometimes both, or not quite either. Friction and progression help us out of this dualistic bind (is design or RtD production-oriented, or not?) by clarifying that frictional designs are teleologically ambiguous and, furthermore, frictional designs can and do relate to progressional design in a multitude of sometimes contradictory ways—some teleological, others less so. As a way of nuancing and diversifying relations between alternative and conventional designs, this section uses friction and progression to forge two additional concepts. *Teleological ambiguity* and *relational multiplicity* allow us to avoid the pitfalls of either instrumentally subsuming friction within a progressional framework (e.g., where are the dreaded "implications for [progressional] design"? [33]), or else splitting the two approaches off into completely separate, insulated spheres (e.g., "a divorce" [54] or polemic "Affirmative Design" versus "Critical Design" split [38]).

7.3.1 Teleological Ambiguity. Frictional designs are in two senses ambiguous with regards to purpose. They are ***inherently ambiguous*** in that their most defining characteristic is salient and compelling resistance to further progression or final production. Friction—a state of tension with progression—sets these designs apart from those that exhibit clear, direct, and straightforward progressional intentions, potentials, and achievements. Recognizing this inherent teleological ambiguity explains how, without proper contextualization, frictional design is inherently prone to interpretive confusion. If a designer fails to explain or position the design, or a viewer lacks the requisite frameworks of interpretation, then a frictional design will likely appear to either knowingly contradict its implied purpose or else simply appear as a bad (progressional) design. The HCI design research community should thus not only recognize this inherent teleological ambiguity but further work to highlight and explain it. Doing so will help avoid frustrating misinterpretations.

In a second sense, frictional designs are also sometimes ***expressly ambiguous*** with regards to purpose in that the verbal presentation of a design, or deliberate lack thereof, sends mixed or divergent messages. Expressed ambiguity means that teleological ambiguity is intended, or at least knowingly tolerated *by design*. Sometimes this takes the form of artistic ambiguity, where grappling with ambivalent or contradictory aims and impulses is an intended and desired response from the viewer/user/participant. For example, prior work in HCI has articulated the value of ambiguity [50], defamiliarization [8], and multiple interpretations [97] as deliberate and potentially valuable qualities of design.

In academic contexts, where the exposition of research papers is typically expected to clarify the existence and value of any artistic ambiguity of the work, expressed ambiguity more commonly arises as a result of presenting frictional designs within multiple contexts, to multiple audiences, and with differing or competing messages and connotations. For example, some HCI RtD publications highlight progressional potentials of frictional designs (e.g., conducting a user study and reporting that people "liked" or "enjoyed" it), while at the same time explicitly distancing the work from new product development. Instead, the knowledge contributions are framed in ways that transcend validated potential or actionable recommendations for progressional design practice (See section 6.2 for examples.) This type of expressed ambiguity in part is explained by that fact that design research projects are often presented in multiple venues including research publications, design exhibitions, participatory engagements, prototype deployments, and press releases; *and* to diverse and heterogenous audiences composed of multidisciplinary academics, practitioners, funding bodies, research participants, journalists, and broader publics.

This paper is not the first to call attention to this issue. Blythe, quoted further above, goes on to explain that the "confusion is, in part, political, as the institutions in which such research takes place [universities] are undergoing change" [13]:703. This leads to "a tendency in framing research to emphasize the possible commercial applications" which "often finds its way in University press

releases about research prototypes" [13]:702. The situation Blythe describes is further explained by recognizing that a progressional framework generally forms the interpretive atmosphere of most encounters with design and technology. Not only designers and academics, but also journalists, writers, administrators, and the general public are predisposed to perceive production-oriented intents and potentials in virtually all technological prefiguration, including design sketches, mockups, concept videos, prototypes, and early stage productions. If production is *not* the intended or expected outcome, then one generally expects this to be explicitly clarified. This is most easily accomplished by bracketing off the work under the label of Art, Fiction, or Culture. This cultural dominance of progressional design is also what allows artistic and interventionist tactics of tactical media [88] to thrive, preying upon people's culturally inscribed instincts to see progressional potentials and intents in all technological prefiguration.

In contrast with inherent ambiguity, expressed frictional design ambiguity unfolds into myriad disciplinary issues beyond the scope of this paper. Here I highlight but one notable effect of expressed ambiguity in frictional designs: Reinforcing progressional expectations will tend to elevate disciplinary status and amplify rhetorical power within any culture that privileges progressional aims, such as HCI, computer science, engineering, and popular cultural framings of design and technology. For example, building a "functional" operational prototype will typically hold higher status than a comparable visual illustration or "non-functional" experience prototype. There are many valid reasons to build a frictional operational prototype to support transproductional uses—for example, gaining insight through the process of making (e.g.,[62, 81]), or enabling participants to more concretely experience possible future manifestations of technology (e.g., [49, 65]). However, building an operationally robust prototype also may be influenced and motivated by goals of appeasing the progressional expectations of peer reviewers, funding bodies, lab visitors, and conference goers. Aside from possible accusations of duplicity, I would argue the more pressing limitation is one of disciplinary and methodological constraint: if one audience privileges the transproductional values of frictional design while another is allowed to predominantly see progressional value, then the most novel contributions of frictional RtD may remain obscured, stunted, and tacitly constrained by progressional assumptions and productional expectations.

7.3.2 Relational Multiplicity. If frictional designs are teleologically ambiguous, how might we generally grasp their relationship to progression? Dunne and Raby's affirmative versus critical distinctions [36, 38] suggests an ***autonomous model,*** whereby alternative designs are split off into a sphere of relative insulation from and unaccountability to other types of design. Alternately, if we look toward Kerridge's concept of speculative design as "upstream engagement" with science and technology [64], we discern an ***instrumental model*** whereby alternative designs are grasped as momentarily suspended from yet ultimately instrumentally subordinated to progressional aims and outcomes. However given the inherent and expressed ambiguity of frictional designs, the extreme version of either model may be much too brittle. Of the autonomous model, one might ask, *But if alternative designs, in essence, look but don't act like other designs, than are they not alternately, or indeed more appropriately grasped as Art, Fiction, Culture, or Criticism* (contra [39])? Of the instrumental model one might ask, *If alternative designs are grasped as incubators of sorts for developing, exploring, showcasing, and teaching methods and concepts that are ultimately in service to progressional frameworks and productional outcomes, then does this not contradict the stated aims and ethos of so much of this work?*

Instead, we are better off looking at the actual forms and words of frictional RtD projects. Pick at random an alternative RtD publication within HCI and you are likely to read multiple contributions with varying degrees of alignment with progressional potentials, frictional tendencies, and transproductional uses. Perhaps, then, the best relational model is not singular and unidirectional but plural and open-ended. A good way of managing teleological ambiguity is to explicate and promote ***relational multiplicity*** between frictional and progressional designs. Frictional design need not be strictly instrumentally subordinated to progressional design (e.g., framing speculative design as "upstream engagement" with science and technology), but neither must frictional design be antagonistically cleaved apart from progressional design (e.g., critical versus affirmative) such that it operates with an autonomy akin to that of Art, freed from expectations of, accountability to, or value for progressional design. Instead, we ought to recognize that a certain design prefiguration, project, or presentation may entail both relations, as well as a multiplicity of other, less instrumental or hierarchical relations. The goal, then, is not to select *the right* model, but to search for and synthesize *more* models—applying and combining as needed for a given frictional RtD project, publication, and context of engagement.

Within experimental and conceptual design traditions, we might recognize frictional tendencies situated within *atelic* design activity—that is, activity guided not by telos and defined by an endpoint, but instead as intrinsically motivated activity fully realized in the present and whose potentials and possibilities remain virtually inexhaustible. This model aligns with "curiosity-driven" approaches to basic scientific research and artistic pursuits. HCI design research, so often constrained by "practical functionality" (telos) and understood as something of an R&D lab for professional (i.e., progressional) design practice, sometimes seems to overlook the existence, value, and necessity of such atelic activity.

In pursuit of more relational models, *integrally* we might recognize the more subtle workings of friction within divergent brainstorming and concept exploration stages of human-centered design. *Obliquely*, we might observe the readiness with which design speculation feeds into loosely or indirectly progressional futuring activities such as industry concept cars and corporate concept videos [112]. *Reciprocally*, we might locate the frictional—including the counterfactual, analogical, oppositional, accelerational, and deviational tendencies—within virtually anything, at some point: failed mass-market products, quirky boutique items, fringe subcultural technologies, and actual consumer goods lying around unused, perhaps still in boxes, never living up to their marketed or imagined potentials at the point of purchase.

8 CONCLUSION: DOING DESIGN THEORY DIFFERENTLY

"Indeed, design's capacity to deal with complexity and conflicting concerns is perhaps its most fascinating feature. . .a key reason we enjoy dichotomies so much in design is because they allow us to address conflict, collision, and contradiction, opening up new perspectives and potentials as a result. As is the case here: to ask the question of what design theory is *mad*e in the context of practice-based design research is to ask for trouble. And trouble is precisely what we want." [90]:2.

What use is design theory? HCI and design researchers propose and demonstrate different ways of making and thinking design theory [7, 23, 30, 38, 48, 53, 60, 77, 90].While these approach differ in many ways, they share a commitment to doing, making, and using design theory in ways resonate with the practices, aims, and artifactual outcomes of design. That is, they agree we should do design theory differently from, say, the sciences and arts. Moreover, we many suggest we should do design theory diversely and provisionally, much as one makes many exploratory sketches in the process of designing a possible future product.

Design theory constructs conceptual tools for making more things and ideas relevant to design. This paper has presented a set of conceptual tools packaged as a framework for articulating assumptions, lines, relations, and foundations across alternative designs and conceptual designs. The iterative exploration and refinement of these tools was motivated by an acute divisiveness within the HCI design research community in response to an influx of speculative, critical, and other alternative research through design projects and approaches, and a broader need and opportunity for revised concepts to help navigate an expanding and shifting design landscape in-flux.

At a general level this paper is motivated by a need to develop new conceptual tools for navigating a shifting and expanding disciplinary design landscape. This paper has argued that much design theory and discourse has been created with progressional designs in mind. Further, the rise of alternative designs has led to tensions with the HCI and design research communities. Prevailing conceptualizations of design do not adequately account for alternative designs and other disciplinary expansions, including research through design. In response, this paper has elaborated three primary concepts: prefiguration, progression, and friction. As conceptual tools, these ideas have been used to reveal a number of insights and to forge several key arguments:

- **Once articulated, progressional assumptions appear everywhere.** They are perhaps especially pronounced within HCI, a field grounded in engineering, computer science, and cognitive and behavioral science perspectives. Exposing progressional assumptions helps clarify at what points, and in which directions, alternative designs frictionally depart. Explicitly loosening or suspending progressional assumptions and production-oriented expectations may provide alternative designs with a more suitable space for interpretation, experimentation, and invention.
- Pervasive informal distinctions such as "pragmatic," "real", and "functional" truly distract us from more elucidating, critical, and generative distinctions. A speculative prototype or concept video is a real, practical, functional thing. It is a tool used to imagine the future! Where it differs from other types of design is that it is highly *prefigural* (as opposed to configured), *frictional* (saliently, compellingly, and apparently deliberatively resistant to production), and used *transproductionally* (e.g., for imaginatively speculative without expecting or pursuing actualization). So-called practical designs, functional designs, and real-world designs align with progressional theories of design. Speculative, critical, reflective, discursive, and fictional design approaches stand out against progression because of their frictional tendencies.
- **On the ground, alternative and conventional is not an either-or proposition as it is sometimes presented.** Frictional designs are *teleologically ambiguous*. At minimum, they mimic, resemble, and reference design progression. Beyond this, they often edge into or ambivalently mix with progressional impulses and potentials. Sometimes sharp divisional borders around frictional designs are useful and appropriate. But in general, frictional designs are better grasped via *relational multiplicity*. A frictional design can be more or less directly useful towards progression. A speculative design might frictionally propose an idea that can be carried through elsewhere in the form of a successful commercial product (e.g., the divergent Marble Answering Machine and its uptake in tangible interaction design approaches and commercial products). Or, a speculative design might lead to a new method or technique useful across multiple areas of design practice. Else, a speculative design might be used to exemplify and generate concepts that are more widely or narrowly applicable to areas of thought or action-oriented domains *beyond or adjacent to Design* and HCI (e.g., Wakkary et al's insights about human-technology relations connected to the counterfactual Tilting Bowl).
- Alternative designs might look and feel like progressional designs, but their aims and impulses tend to differ markedly from their more conventional counterparts. Part of the confusion and conflict concerning alternative designs may be traced to foundational conceptualizations of design, which do not adequately account for or readily accommodate design's speculative, critical, conceptual, and experimental variants without ultimately squeezing them into a teleological, progressional box. Conceptualizing design as material prefiguration—partial, provisional, and potentially preliminary actualizations of possible future configurations—represents a route to more readily and comfortably grasping alternative, conventional, progressional, and frictional designs together, *as designs*.

In summary, there are two basic ways in which these ideas may be of use to HCI and design research. First, they may help resolve some issues. For example, why are there heated debates about the value of alternative designs? Why do some say speculative design is not practical or useful? Why do some say conventional design is too narrowly focused on solutions? One answer lies in recognizing that some designs prioritize progression, and some prioritize friction (a tension with progression) and transproductional uses (e.g., debate, critique, inquiry). Instead of treating this as an antagonistic

dichotomy, some debates may, perhaps, dissipate if we see that friction and progression are simply two types of emphasis. Sometimes both co-exist. Sometimes one is clearly dominant.

Second, these concepts may help reveal new issues, spark new debates, and enable new design research knowledge and experimentation—including new ways of writing and framing research through design projects and publications within HCI. For example, this paper has raised the question of how alternative/frictional designs can be used in relation to progressional designs. Sometimes alternative designs are indirectly used to "make better products" (progressional productions). Others are best grasped via frictional tendencies (e.g., divergent, accelerational, counterfactual) and serving other aims (e.g., criticism, debate). This paper has further highlighted the need for future work to articulate and experiment with different models for how friction can be used with regards to progressional design. Many design research projects and papers appear caught between frictional and progressional expectations, demands, metrics of successes, traditions, and so on. Clearer articulations of when and where research through design work is *not* rigidly and tacitly committed to a progressional framework may help researchers better frame different research contributions, as well as continue to experiment and innovate with the new frictional methods, approaches, uses, and values. Thus, while the concepts presented in this paper may help to resolve some issues of conceptual confusion and disciplinary division, the subsequent opportunities to "open up new perspectives as potentials and a result" are perhaps, as Johan Redström suggests, the primary value of making design theory.

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