Whatever Became of Claims?[1]

Stacy M. Branham
Center for Human-Computer Interaction
Virginia Tech
Blacksburg, VA 24060
sbranham@cs.vt.edu

ABSTRACT
The foundational philosophical commitments of a field of inquiry have a broad hand in defining everything from what questions are of import to how those questions ought to be approached. HCI is no different, and that fact has completely shaped the landscape of its research contribution. In particular, HCI's development has been marked by field-wide and often divisive debate founded upon worldview incongruences; these have greatly affected the path of at least one artifact of research consideration: the claim. This paper puts forth a framework for understanding worldview adherence and transition within the field towards unpacking the nature of the claim. It argues that claims research has been drawn back into isolated investigation and that re-consideration of the claim under new frameworks will provide fruitful new research trajectories.

Author Keywords
claims, design, worldview

ACM Classification Keywords
H5.2 User Interfaces: Theory and Methods

INTRODUCTION
Human-Computer Interaction (HCI) is an interdisciplinary field [10, 23, 26, 40]. This point in itself is clear enough, but I have also made another: that HCI's interdisciplinary nature is often one central to scholarly discussion within the field. In fact, a survey of these papers lists all of the following categories of science as participating under the same umbrella: computer graphics, human factors, cognitive psychology, artificial intelligence, computer science, industrial design, ergonomics, information systems, information science, organizational psychology, industrial engineering, and computer engineering. It is no surprise, then, that a young field such as this takes interest in defining a singular, orienting theme of study, a set of accepted practices, and a cohesive worldview towards making unified progress. Neither is it a surprise that this task is marked by schismatic debate [15, 21, 40, 44, 53, 56] and is as yet unresolved [23, 43].

Such a fragmentation of perspective undoubtedly has made its mark on the development of the field. Different conceptualizations of what constitutes the proper scientific foci of inquiry, approaches and ends, as well as orienting philosophy have emerged and evolved [11, 23, 26]. One product of this phenomenon, and the central attention of this paper, is the *claim*.

The claim was developed in reaction to rifts in the field over the nature of HCI as a consilience between what I term the "convergent" and "divergent" worldviews. Furthermore, claims research has since been drawn back towards the context of the convergent worldview. Of particular interest about claims is the loss of interest in them coincident with this recession to the convergent. One question this paper seeks to probe is just that of its title: whatever became of claims? Through the lens of the paradigmatic shifts in the field, this question will be addressed and a proposition for revitalizing claims research is proposed.

Towards this end, this paper will first address the emergence and defining characteristics of the fundamental worldviews in HCI. It will then turn attention to the development of the claim within this dynamic context for the sake of gaining an understanding of their character with respect to worldviews. Finally, it will propose how and why claims should be revisited from within a new philosophical context.

A NEW HISTORY OF HCI
An essential part of deciding where to go is discovering where you have been. As we will come to see in future sections, this truism can even be identified as instrumental in the birth of that which is the focus of this paper: design rationale in the form of claims. The same heuristic also applies to HCI as a field; by looking back at the prevailing patterns of thought and subsequent reactions to them, we can broaden the scope of context within which to view current work and thus suggest new areas of inquiry. In this spirit, this section will seek to identify and interpret key

[1] The title of this paper is drawn from that of Bruce Archer's *Whatever Became of Design Methodology?* [5]. The significance of the relationship is this: Archer's paper was written just beyond a shift in worldview within the study of design; in light of this shift, his paper is an attempt to re-examine the field in this new philosophical landscape. As does Archer's, this paper seeks to examine claims as artifacts and subjects of research in light of our field's latest worldview shift.

aspects of HCI's history. But, before we begin, let me qualify what is meant by "A New History of HCI".

In the words of my 6th grade art teacher, "there are no lines" in the real world, so do not draw them on your paper. In many ways, this is a guiding principle for my research. Barring reading into the metaphor too deeply, it no doubt serves as a useful aphorism with regard to the situation we find ourselves in when extracting knowledge from reality. Intrinsically, all models are extreme simplifications of existing phenomena; in other words, we draw lines when there are none. Accordingly, the history related here is a simplification of the actual happenings. Clearly, history is a subjective matter in its factual content, in its selective viewing, and in its interpretation, and this telling of HCI's beginnings does not go unaffected in this regard. That said, this interpretation is neither right nor wrong, but acceptable and appropriate for the setting.

Indeed, there are a number of distinct accounts of the history of HCI and the tradition of salient questions and methods of discovery already available [i.e. 11, 23, 26]. Grudin discusses temporal evolution of HCI into a field of three faces, or areas of ongoing research: computer operation, information systems management, and discretionary use. These faces were first seen mid-century and have been developing in parallel ever since. Harrison et al. emphasize the three emergent paradigms, or ideologic frameworks that underpin the nature of relevant research within HCI. These three paradigms, contrary to the three faces, came into being at different points in time, sometimes in reaction to the previous paradigm, and overlap rather than supersede one another. And, Carroll explores the history of HCI with respect to its progression towards a science of design. He takes a similar route as that to be taken here, by loosely distinguishing between a first wave of usability-centered research and a second wave of user-centered research. However, the interpretation that will be put forth here is more concerned with contrast between these two poles; it focuses on key figures and events towards developing a description of their respectively-embedded worldviews. This approach will prove particularly useful in characterizing and making sense of the inherent assumptions attributed to the claim in later sections. Thus, under the title of "A New History of HCI", this section seeks not to invalidate alternate histories or promote this one in particular, but to add to the field's repertoire of historical accounts that may provide useful lenses for inspection.

The Convergent Worldview

The roots of the philosophical underpinnings of HCI can be traced as far back as Aristotle, Plato, Socrates, and Descartes. But, to necessarily narrow our scope, we begin our discussion in 1950s and 1960s United States, during which key actors were taking steps directly influential to our yet-to-emerge field, and during which three fundamental concerns began to surface: computers, design, and people. Computers had been developed for nearly a decade but were not yet commercially-available and would not be in any considerable sense until 1964. Even so, Herbert Simon and his graduate student, Allen Newell, were already developing the first programs to mimic human behavior through the mid 1950s [41], thus sparking the field later to become known as artificial intelligence. This was also the time when, in an effort to meet cold war challenges like the 1957 Sputnik launch, questions of creativity and design came under scientific purview. And, the influence of Taylorism and new developments in computer theory would call into question the nature of man and his relation to machine. Let us take a closer look at a few of the figures and events instrumental within this framework.

In 1962, Morris Asimow—at the time an engineering professor at UCLA—wrote what is widely regarded as the first book on design [6]. It was also the year that John Chris Jones co-organized the first design conference [31]. Having studied engineering, Jones went on to practice as an industrial designer in the 1950s; his frustration with the superficiality of this field led to his long-term engagement with ergonomics and, later, design methods [30]. Jones published papers throughout the 1950s and '60s concerning design automation, operational design, and design planning [28]. In 1963, Christopher Alexander—an architect with an extensive mathematics and science background—and Horst Rittel—a mathematician and sociologist interested in operations research and cybernetics—were recruited to Berkeley's College of Environmental Design [46]. Together with mechanical engineer Bruce Archer, this entire cast of characters spearheaded the design methods movement. As engineers and mathematicians, this group brought, for the first time, a rigorous structure to the design process that lay in stark contrast to the age-old tradition of craft.

Alongside the burgeoning design methods movement came the rise of artificial intelligence (AI). The 1956 Dartmouth AI Conference, coordinated by mathematician and key AI figure John McCarthy, marked the beginnings of the field and provided an audience for Simon's and Newell's unveiling of the first intelligent program [37]. More than a decade later, Simon greatly expanded the implications of AI research in his seminal book *The Sciences of the Artificial* [51]. The book served as a link between artificial intelligence, design, and human cognition. It did so by proposing that computers can simulate the intelligent cognition of humans and, in turn, carry out design tasks. One of the greatest outcomes of this proposition was the equation of man and machine. The thinking went thus: since computers can be made to behave as the human mind, they can be used as a platform for study of human cognition. Moreover, the book calls for the development of a science of design—"a body of intellectually-tough, analytic, partly formalizable, partly empirical, teachable doctrine about the design process." Finally, cognizant that design optimization was not possible, he introduced the notions of bounded rationality—practical limitations on rational thought—and satisficing—choosing not optimal but satisfactory/sufficing solutions.

The common strands between these two movements up through around 1970 lay in a shared worldview. Most of these pioneering men had been strongly influenced by mathematics and science and therefore had a great respect

for quantification and empirical methods of enquiry. Indeed, even as early as 1965, Bruce Archer could see the impact of these on the design tradition:

> The most fundamental challenge to conventional ideas on design has been the growing advocacy of systematic methods of problem solving, borrowed from computer techniques and management theory, for the assessment of design problems and the development of design solutions [4].

As indicated in his remarks, design was looked upon as a problem-solving activity; it was objective, it was rational, and it could be optimized. And, in search of a "hard" science of design and of understanding human activity, there was strong adherence to abstract generalizations, simplistic models, and top-down organization. These are a sampling of the characteristics of the convergent worldview.

The Divergent Worldview

The convergent worldview was not one that would continue unquestioned, even by several of those who championed the fields that embraced it. In 1969, Rittel began to part with his earlier work by distinguishing between the "first generation" and "second generation" design methods [47]. Archer, Jones, and Alexander had more direct statements of dismissal. In 1979, Archer made the following comment: "in retrospect, I can see that I wasted an awful lot of time on trying to bend the methods of operational research and management techniques to design purposes" [5]. Jones similarly admitted that in the 1970's he reacted against design methods, against behaviorism and logical frameworks: "I'm realizing that if designing is applied to life, not just to products, systems and software, there has to be more politics...and less planning" [28]. Perhaps Alexander made the most radical departure, as can be seen in his remarks about that time: "I've disassociated myself from the field... There is so little in what is called 'design methods' that has anything useful to say about how to design buildings that I never even read the literature anymore... I would say forget it, forget the whole thing" [2]. This rejection of the convergent worldview was not unprovoked, but was coincident with the mass failing of large-scale social applications of operations research, of which urban planning was one of many [35, 48].

The reaction against convergent thinking brought with it a new skepticism and acceptance of the limitations of positivist approaches to the study of people, computers, and design. With the landmark introduction of "wicked" and "tame" problems, Kuntz and Rittel established that the complexity of problem definition [48] and the subjectivity of design process [32] are such that the planning problem is intractable. Design methods were not ruled out, but their objective has fundamentally shifted from one that aims to be "rational", "objective", and "scientific" towards "optimization" to one that aims merely to support design as an inherently political, subjective process of argumentation [33]. Both Jones and Archer returned to the notion they reportedly held earlier in their careers that both intuition and rationale are needed in the design process [5, 29, 30]. As for Alexander, one can simply read the first sentences of each of his 1964 and 1979 books and at once detect the stark contrast between the two. His language has completely changed from mathematics to fluid prose (perhaps in the manner of Archer's "designerly way of thinking and communicating" [5]), favoring instead vague and emotionally-charged renderings (e.g. "the quality without a name") [1, 3].

The establishment of a new, divergent worldview was underway. It was a view that embraced the notion that "societal problems... are inherently different from the

Convergent values	Divergent values
quantitative measures	qualitative measures
empiricism	phenomenalism
problem-solving	subjectivity
objectivity	intuition
rationality	creativity
optimization and efficiency	contextualization and situatedness
abstraction	interconnectivity and holism
models and simulation	complexity
hierarchical organization	
structure	

Figure 1. An overview of some of the values that characterize each of the Convergent and Divergent worldviews. As mentioned, this is only a caricature of two ideological perspectives, making it both incomplete and potentially nondescript of particular individuals that may only exhibit these characteristics in degrees. This proves useful, however, as a scaffolding for discussion of research leanings in HCI.

problems that scientists and perhaps some classes of engineers deal with." It marginalized the "systems-approach" that decomposes and structures the world into "inputs" and "outputs" towards achieving "efficiency" [48]. Furthermore, it called into question the idealization and veneration of quantitative measure and objectivity. This thought is articulated well by Archer: "it is demonstrable that the assumptions upon which even the quantitative considerations are based can never be wholly value-free" [5]. Archer also criticized the "alien mode of reasoning" presented to designers by "mathematical and logic models." Indeed, qualitative research and intuitive design became acceptable tenets of this new worldview. Jones noted that the "separation of the rational from the intuitive, of the practical from the creative," once held high by the convergent view, is impossible, and in fact undesirable [29]. Finally, Jones took issue with the "rigidity of procedure" once promoted by design methodology, explaining that the field has "inherit[ed] a poor way of thinking about reality, a picture of the world, of life, that fails to reflect the connections between things." The divergent worldview is, alas, about interconnectedness rather than decomposition, complexity rather than oversimplification, contextualization rather than abstraction.

It is important to clarify at this point that the discussion of transition from the convergent to the divergent worldview is not meant to imply that the shift took place at one particular time or that the one overtook the other. As with most things, the change took root gradually over time and the effects are still being seen today. The convergent worldview was still thriving at the time divergent themes began to emerge, and both are still well adopted today. Furthermore, it is difficult to ascribe an individual completely to one or the other. As an example, though Rittel helped usher in new thinking in the late 1960s and beyond, his approach is still rationale based and characterized by strict hierarchical organization. Alexander, too, built his pattern language as an abstracted hierarchy, although he was clear about the flexible nature of each pattern. And, while Simon can be seen as a father of the convergent movement, some of the core ideas presented in *The Sciences of the Artificial* are still embraced by those of the divergent mindset. Perhaps it is best to look to these worldviews as merely idealized characterizations that are only observed to degrees in reality.

HCI is Born Into the Worldview Debate

Many consider the creation of HCI to have been in the early 1980s [13]. This date puts HCI just beyond our discussion of worldviews, but definitely not without close relation to them. The field was indeed born of and into a research environment where this philosophical clash was taking place, and the field still mirrors this fact. Perhaps one of the greatest examples of the convergent worldview's influence in HCI is in a book and corresponding journal paper co-written by AI's Allen Newell himself [8, 40]. In these works, and to a greater extent in the latter, structured models of human cognition and computer interaction are established as the central mode of filling their prescription for "hardening"—and thus legitimizing—the scientific practice of the field. This body of research became the vehicle for the convergent-divergent discussion within HCI. The first historic response in opposition was given by John Carroll and Robert Campbell in a conversation that would span yet another paper and even a book [15]. The key position taken by Carroll and Campbell is that 1) Newell and Card aim narrowly at "objective calculation and task analysis" and thus limit their models to the extent that real-world situations cannot be accounted for, 2) their "commitment to analyzing performance into isolable units or atoms" has led to extreme disregard for the context of interaction, and 3) their regard of "calculation as the touchstone of hard science" rules out the rich qualitative methods that are necessary for psychological study. These arguments are clearly in direct assailment of the tenets of the convergent worldview.

Lucy Suchman also put forward a dissenting view of the planning movement and the Simonian mode of thought in her 1987 book *Plans and Situated Actions*. [52]. Much like Schön's [50] contribution to the design methods field, Suchman's work was effectively a criticism of the positivist approach to understanding human action. In particular, she questioned the reducibility of man to machine via dislodging the notion of plan-determined action as established by the planning paradigm [42]; while humans may make and use plans, their particular execution is completely dependent upon the context of action. Suchman's work marked a key shift in HCI to the divergent worldview. It has been the fuel for several responses and rebuttals, one co-authored by Herbert Simon himself [53, 56].

Yet another manifestation of the HCI worldview debate surfaced in 1998 in a paper that called into question the scientific validity of several well-cited HCI studies [21]. The paper renewed discussion about the integrity of scientific practice in the field [22, 44]. Most respondents agreed that the implications of the instigating paper provided "too narrow a program for HCI" [12]. Again, we see a resurfacing of worldview tensions.

Not far removed from this discussion of field-wide debate, and of interest to this paper in particular, is the tension between fragmentation and unity of the field. Amidst the schisms that are portrayed here and in other works, the field is undoubtedly drawn together by the obvious objective to understand the relationship between humans, computers, and design. Trying to find more concrete points of differentiation is pressing, but potentially less important than the question which this topic brings to light: is this level of fragmentation *good* for the field? Our research culture of inquiry and dialectical debate has provided up to now a charged platform for open acknowledgement and engagement with our intellectual commitments. Additionally, it provides ample conditions or parting of the field into new and independent fields in their own right (for example, CSCW). Some may see this as a threat necessitating resolution [23]. I am equally ready to interpret this as an opportunity for subfields to coalesce and mature into their own, more focused communities. It is

apparent to me that, as we define HCI communally, our primary activity is that *of* design. Our task is incomprehensibly complex, inherently unpredictable, and so we turn to thoughtful reflection as researchers toward mutually determining HCI's future [36, 50]. It is this very characteristic of the field—thoughtful reflection in action—that motivates this paper.

CLAIMS: STRADDLING TWO WORLDVIEWS

One of the many outgrowths of such debates has been a proposal for mediation between the two worldviews, namely in the form of the *claim* as presented by John Carroll and his collaborators [9, 16]. One of the hallmarks of Carroll's career has been his effort to join elements of both the converging and diverging worldviews towards his own reclamation of Simon's "science of design". Just beyond the first outbreaks of field-defining debate, Carroll began developing such an agenda: "we seek to reconcile the contrasting perspectives of theory-based design and hermeneutics" [16].

The best-of-both-worlds solution that was offered came to rest upon what Carroll and Rosson would later term the "claim" [17]. Claims are hypotheses about the psychological consequences of a crafted artifact on a user in the context of use. According to Carroll and Kellogg [16], these claims are exhibited as inherent qualities in the designed artifact; each feature of the artifact represents the assumptions, or claims, made by the designer. Claims can be documented in informal language during the design process as such concerns are considered or by looking at a designed artifact ex post facto. As user-centered design hypotheses, they can be tested in context and incrementally compiled and carefully abstracted into design theories [19].

Motivations for the claim as described above are grounded in the dialectical opposition between convergence and divergence. Drawing from the convergent worldview and rejecting the divergent, Carroll and Kellogg bolster theory while criticizing the latter for having "no systematic methodology, no conceptual framework, no explicit way to abstract from particular experiences." At the same time, they accept divergent contextualism and reject divergent positivism, saying that "the limited scope of quantitative theories precludes adequate grounding for design decisions." The claim, then, is used to draw from the contextual nature of designed artifact use as well as to contribute to abstract theory of design. In this sense, the claim straddles both worldviews.

WHATEVER BECAME OF CLAIMS?

The claim may have been born of the transition from the convergent to divergent worldview as a compromise to suit both, but there is reason to believe that there has been a return of claims and its relative, design rationale, to convergent framing. For one, rationale has been adopted and very successful within peripheral areas of study, such as artificial intelligence [39] and software engineering [20], that are largely entrenched in the convergent worldview. Furthermore, research efforts extending and branching from Carroll's early conceptions of the claim have taken a similar turn.

Since its inception in the mid 1980s, the claim and the surrounding design processes have come to take on different shapes through developing research efforts. As discussed previously, the earliest formulation of the claim [9, 16] and even that promoted by Carroll today [18] consists of the same three basic elements: a design issue or feature, positive psychological repercussions of that feature, and negative psychological repercussions of that feature. However, several extensions of this concise foundation have been introduced—some by Carroll himself—that have tended it toward the mores of the convergent mindset. In the late 1990s, in collaboration with Alistair Sutcliffe, the claim is greatly expanded to encompass not only a feature, upsides and downsides, but also a claim ID, author, artifact, explanation, scenario, effect, dependencies, issues, theory, relationships, and scope [55]. After the collaboration ended, Sutcliffe proceeded not to modify the claim itself, but to couch it in his software-engineering-based domain theory [54]. And, research that draws from both Sutcliffe and the original work of Carroll has resulted in the creation of a hierarchically-based claims library [45] and increased structure within claims representations [57].

These recent incarnations of the claim seem to be moving closer to the other application areas of design rationale in general. As mentioned previously, rationale is often rigidly structured, both internally (the rationale itself must strictly conform to a format) and externally (the rationale is organized into hierarchical form), although there are degrees of formality [34]. And, as rationale is most prominently used in software engineering and artificial intelligence—where the convergent worldview is dominant—research surrounding it is often conducted without regard to divergent values. Design rationale is closely related to Alexander's design patterns, which encompass rationale for design solutions [2]. While patterns originated from within the domain of architecture and have been arguably most successful thereafter within software engineering. In software engineering, patterns have taken on convergent characteristics, becoming rigid prescriptions for problem solutions—a fact about which Alexander has spoken disapprovingly. Patterns have also been brought into the realm of HCI design [7]. Perhaps the HCI incarnation is more true to Alexander's 1979 introduction of a "timeless way of building," and thus closer to the divergent framework [3]. It does, however, fall short on occasions, by sometimes narrowly-interpreting a pattern "language" to be more about words than symbols in general, and by losing the designerly language that was a staple of Alexander. One particular manifestation of this is seen in the handling of "the quality without a name," where its interpretation is held with much less delicacy and it is more or less given a name: "transparent" or "natural" interaction.

In short, design rationale in general and claims in particular have been drawn back into the context of convergent values. There has been a notable increase in rigidity within and without the rationale, an increased

expectation that rationale is a rational, objective, and algorithmic prescription for design, and a potentially greater detachment of rationale from the context of its use.

Perhaps as an outgrowth of this shift, design rationale, and thus the claim, has in recent years fallen under scrutiny [27]. Some of the more salient criticisms are thus: rationale is lame in the face of the complexity of real-world problems; documenting rationale interrupts the design process; rationale reuse supplants thoughtful reflection; and the constraining nature of rationale discourages creativity in design. It is important to make the distinction that these arguments are not derived from nor applicable to the *inherent* qualities of claims; they are, instead, entrenched in the essential worldview differences between the authors and the frame within which rationale is currently studied. The next section will examine these stances against rationale and inspect the nature of their complaint with respect to HCI's philosophical heritage.

INTRODUCING CLAIMS TO THE DIVERGENT WORLDVIEW

As already demonstrated, claims have begun to find themselves in convergent forms and settings, but the original and most basic form of the claim had quite different characteristics and purpose. Figure 2. shows an example claim in this form; it lists a feature ("use touch to interact with a system"), a possible positive psychological effect ("allows the user to directly manipulate displayed information"), and a possible negative psychological effect ("requires the user to be in contact with the system"). Not only is this the original form of the claim, but it is also the form still promoted by John Carroll himself in his most recent work [18]. And, as I will argue here, there is nothing about this form of the claim that makes it, a priori, suited more to convergent rather than divergent interpretation. Furthermore, I propose that there would be great benefit to bringing the claim under deeper inspection in light of divergent worldview principles.

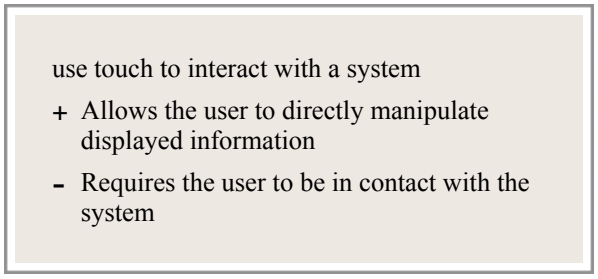

Figure 2. A simple example of a claim. It contains a brief feature description, one psychological upside, and one psychological downside

The motivations for such a re-analysis are twofold. Firstly, and most importantly, reframing claims creates an entirely new branch of inquiry that can lead to unexpected and potentially valuable new insights. One approach to achieving creative results is to take something out of its conventional setting and inject it into a new context; in doing so, previously-minimized characteristics become visible and new appropriations for previously-familiar characteristics become intuitive. This is precisely the aim of reconsidering the claim. Secondly, taking an opportunity to transform claims rather than abandon them altogether is important for drawing upon and building from previously-gathered knowledge. Because claims have been studied for nearly two decades and design rationale as a broader discipline has existed for nearly twice that long, a great knowledge base has already been formed. We understand, for example, that claims put designers in a user-centered and design reasoning mindset [49] as well as present challenges to effective capture [34]. These insights can be leveraged as we move forward into uncharted territories.

Also important to note is that this proposal is suggested as a way to *expand* current claims research, not to dismiss it. It is the belief of the author that a wide research program is vital to balanced growth of the field. Furthermore, the goal is not intended to inappropriately inject claims into an area of poor fit. Harrison et al. warn that "when force-fitting new insights into old paradigms, HCI fails to capitalize on the full value of these approaches" [26]. While the proposal here is, instead, to take ideas from an old paradigm and bring them forward to the new, there is reason to believe (as will be seen in the next section) that such a move would prove an appropriate fit. And, research performed from the perspective of different worldviews not only opens the door for unique or unexpected contributions, but also provides a mode of comparison and contrast in addition to healthy field-wide debate.

Re-conceptualizing the Claim

Next to consider is the prospect of claims to capitalize on divergent worldview considerations; is the claim well-suited? As mentioned in passing, the claim is not an inherently convergence-based artifact, and further inspection of its qualities can make this evident. Firstly, claims can be relatively small—just a few lines of natural-language text. Furthermore, they have an extremely light-weight structure and are intuition-based. All of these characteristics play a role in making the claim a very *flexible* artifact. Being flexible means that each claim takes up little physical space, incorporates very small bits of information, and takes minimal time to document (notwithstanding the need for proper motivation to do so), etc.

Secondly, the claim is a container of ideas that represent value judgments. And, because of their flexible format, they can represent thoughts on a wide-ranging scale from specific to general. For these reasons, the claim is also a very *evocative* artifact. Focused, specific claims can evoke imagery and provide a springboard for launching related threads. Broad, general claims can beg questions of what is and isn't being communicated and provide ample room for imagination exploration. Most importantly, because claims are *interpreted*, they can stimulate different meanings for those that create them and for each individual that consumes them—especially given that claims are value-laden and thus emotionally-charged. These characteristics —flexible, evocative, and interpreted—can all be further emphasized if the claim is divided into its individual

upsides and downsides and its feature, or if these parts are somehow represented by other symbolic media.

Given this portrayal of the qualities inherent of the claim, there is reason to believe that claims might fit within the value system of the divergent worldview. Towards making this case, let us assume at least two new goals for the claim as tools for design: 1) to open rather than close thought, and 2) to become an integral part of the design process. The former is rooted in the idea that design rationale should not be considered a means of reducing the problem space by providing designers a set of fixed alternatives or a solution path; it should serve, rather, to engage designers in critical design questioning and to inspire them towards creative ideas. We have seen that claims can be evocative, partly owing to the fact that they are interpreted. Unlike other forms of rationale, this characteristic fosters critical and divergent thinking; it creates lines of inquiry, thus generating ideas instead of filtering them out. This stands in opposition to the convergent worldview, where efficiency and making progress towards problem solution would preclude activities that widen scope. It also makes use of intuition and vision rather than focusing wholly on rational progression. Finally, lack of structure within and among claims is also a point of distinction. These three points, respectively, motivate a critical viewing of Atwood and Horner's stance that design rationale hinders thoughtful reflection, discourages creativity, and cannot overcome complexity [27]. In my reading of claims, they can open thought rather than close, encourage cross-domain exploration, and aim not to tackle complexity but to put visionary control into the hands of the competent designer.

Let us now turn our attention to the second proposed goal: for claims to become an integral part of design. The purpose of this goal is to bring claims into the flow of design rather than tacking them on as inert bystanders; this is the key to motivating both the use of existing rationale as well as creation of new rationale. It is clear that the flexibility of claims may greatly facilitate this effort by allowing for easy integration with existing design techniques or the creation of new loosely-defined or even improvisational design activities. In contrast with convergent principles, this approach de-emphasizes strict structure to the design activity and creates a playground for intuition as well as rationale. It additionally sidesteps the criticisms given by Horner and Atwood, that rationale necessarily interrupts design. Note that, by pointing out inconsistencies between claims and the critical analysis of rationale given by Horner and Atwood, I am not denying that their assessment holds true for most design rationale research today. The critical point I am trying to make, however, is that these criticisms are not universally true of design rationale and specifically do not hold with claims by virtue of their inherent nature.

Taking Claims in New Directions

There has already been some, but very little, activity in the new research space being proposed. One sign of progress was a workshop held just last year under the name of Creativity and Rationale for Software Engineering [14]. Although the intention was to "identify and synthesize new frameworks and direction, and new research agendas," much of the work presented was just the opposite; instead the position papers only testified to the sway of rationale to the convergent worldview. Two papers, however, were promising with respect to the ideas put forward in this paper—one promoted by Steve Harrison and Deborah Tatar and the other by my own research group [25, 38]. Both papers treat claims and creativity as intertwined rather than antithetical, and claims as generative rather than sterile. This paper is intended to encourage and stimulate similar explorations of the claim in such settings.

One way to approach this new research space might be to consider a host of lightweight, claims-centric design activities. Instead of following traditional, heavyweight, design methods associated with design rationale, these alternatives might be used individually or in combination as brainstorming activities in early-stage design visioning. Unique to these approaches is that inspiration comes from existing knowledge through connections made—via claims—to a diverse network of designers. Such activities would capitalize on the characteristics of claims I have highlighted here, but would also provide the crucial opportunity for both novice and expert designers to compare, select, and even create their own programs of design with these flexible artifacts and external design methods [24, 36]. I will present a few high-level conceptualizations of how such activities might be defined towards sparking interest and research in this area:

1. the designer scrawls a set of undesirable claims for her design situation, then drafts features to match them. When designers might otherwise focus on positive features to incorporate into their design and only afterwards ameliorate consequential downsides, this approach emphasizes the opposite. By having designers brainstorm undesirable claims, they may begin to explore potential features to avoid or features that they might creatively balance by combination with others. This activity will also allow the designer to explore the relationship between feature and form and directly contribute to "knowledge creation and production" that is key to thoughtful interaction design [36].

2. given a random set of upsides and downsides, the designer drafts a solution to match them. This exercise can also encourage designers to think about the relationship between user and form—how shape can represent user tradeoffs. Because the given claims are from different contexts, they might encourage creative leaps by facilitating novel combinations of features or innovative transportation of a feature from one domain to another. Finally, by seamlessly incorporating rationale in a visionary exercise such as this, the activity supports "being creative and analytical at the same time" [36].

3. given pictures of solutions from different domains and a set of random claims, the designer associates fitting claims with the pictures. I like to think of this activity as a game of "pin the claim on the solution." This could be a more collaborative alternative to (2) by replacing the individual drawing activity with the group identification of claims-

artifact relationships. Group interaction might support collaborative construction of meaning and might support design as a "dialectical, dynamic process" [36]. Again, this might help build a sense of connection between psychological effects and physical form. Also, because claims and solutions are already given, they will likely provide for nontraditional connections to be made; the side-effect is a creative new viewing of potentially overlooked features and user tradeoffs.

These approaches are just a few sketches of how claims might be folded into the divergent framework, though there are surely many more opportunities to achieve the same.

CONCLUSION

Claims have been shown to bear resemblance to both the convergent and divergent worldviews, and have arguably been drawn in closer to the convergent in recent years. Furthermore, there have been recent criticisms of the claim that follow more from its association with the convergent worldview than its inherent qualities. It is the argument of this paper that there is value in reexamining claims under the divergent worldview frame in order to expand and build upon what we have already learned about them and to use them as a vehicle for creative exploration. Of course, the ideas generated in this paper need to be substantiated through design activity study. Important questions to focus research efforts upon may be:

1. are claims useful beyond the explicit rationale they contain (i.e. as evocative objects)?
2. how do loosely-structured claims activities steer the design conversation?
3. how can claims be effectively integrated into existing design techniques?

Most importantly, what I have set out to do in this paper is to draw attention to how the evolving worldviews within the field influence the way we characterize research findings and selectively focus future research efforts. The vehicle for this argument has been the claim, an artifact neglected by researchers of the divergent mindset, yet full of untapped promise for unique and potentially surprising new avenues of exploration. In the words of Winograd and Flores, "only by unconcealing [the] tradition [of thought] and making explicit its assumptions can we open ourselves to alternatives and to the new design possibilities that flow from them" [58].

ACKNOWLEDGMENTS

My thanks go to Jason Chong Lee for his help in proof-reading this paper (per Steve's suggestion).

REFERENCES

1. Alexander, C. (1964). *Notes on the Synthesis of Form.* Harvard University Press.
2. Alexander, C. (1971). The State of the Art in Design Methods. *DMG Newsletter, 5*(3), 1-7.
3. Alexander, C. (1979). *The Timeless Way of Building.* New York: Oxford University Press .
4. Archer, L. B. (1965). *Systematic Method for Designers.* London: The Design Council.
5. Archer, L. B. (1979). Whatever Became of Design Methodology?. *Design Studies, 1*(1), 17-18.
6. Asimow, M. (1962). *Introduction to Design.* Englewood Cliffs, NJ: Prentice-Hall.
7. Borchers, J. (2001). *A Pattern Approach to Interaction Design.* New York: John Wiley & Sons.
8. Card, S. K., Moran, T. P., and Newell, A. (1983). *The Psychology of Human-Computer Interaction.* Hillsdale, NJ: Lawrence Erlbaum Associates.
9. Carroll, J. M. (1990). Infinite Detail and Emulation in an Ontologically Minimized HCI. *Proceedings of the SIGCHI conference on Human factors in computing systems: Empowering people*; 1990.
10. Carroll, J. M. (1991). Introduction: The Kittle House Manifesto. In Designing Interaction: Psychology at the Human-Computer Interface (Ed.). New York, NY: Cambridge University Press.
11. Carroll, J. M. (1997). Human-Computer Interaction: Psychology as a Science of Design. *Int. J. Human-Computer Studies, 46*(1), 501-522.
12. Carroll, J. M. (1998). 8. Review Validity, Causal Analysis, and Rare Evaluation Events. *Human-Computer Interaction, 13*, 308-310.
13. Carroll, J. M. (2001). *Human-Computer Interaction in the New Millennium.* New York, NY, USA: ACM Press/Addison-Wesley Publishing Co..
14. Carroll, J. M. (2008, June). Creativity and Rationale in Software Design. 2008 June.
15. Carroll, J. M. and Campbell, R. L. (1987). Softening Up Hard Science: Reply to Newell and Card. *SIGCHI Bull., 19*(1), 74.
16. Carroll, J. M. and Kellogg, W. A. (1989). Artifact as Theory-Nexus: Hermeneutics Meets Theory-Based Design. *Proceedings of the SIGCHI conference on Human factors in computing systems: Wings for the mind*; 1989.
17. Carroll, J. M. and Rosson, M. B. (1992). Getting Around the Task-Artifact Cycle: How to Make Claims and Design by Scenario. *ACM Trans. Inf. Syst., 10*(2), 181-212.
18. Carroll, J. M. and Rosson, M. B. (2003). Design Rationale as Theory. *HCI Models, Theories and Frameworks: Towards and Multidisciplinary Science. San Francisco: Morgan Kaufmann,* 431-461.
19. Carroll, J. M., Singley, M. K., and Rosson, M. B. (1992). Integrating Theory Development with Design Evaluation. *Behaviour & Information Technology, 11*(5), 247-255.

20. Gamma, E., Helm, R., Johnson, R., and Vlissides, J. (1995). *Design Patterns: Elements of Reusable Object-Oriented Software.* Reading, MA: Addison-Wesley .
21. Gray, W. D. and Salzman, M. C. (1998). Damaged Merchandise? A Review of Experiments That Compare Usability Evaluation Methods. *Human-Computer Interaction, 13*(3), 203–261.
22. Gray, W. and Saizman, M. (1998). Repairing Damaged Merchandise: a rejoinder. *HUM COMPUT INTERACT, 13*(3), 325–335.
23. Grudin, J. (2005). Three Faces of HumanComputer Interaction. *IEEE Annals of the History of Computing,* 46-62.
24. Harrison, S., Back, M., and Tatar, D. (2006). "It's Just a Method!": A Pedagogical Experiment in Interdisciplinary Design. *Proceedings of the 6th conference on Designing Interactive systems*; 2006.
25. Harrison, S. and Tatar, D. (2008, June). "It's Just a Rationale!" Creativity in the Formation and Application of Design Rationale. University Park, PA: *in Workshop on Creativity and Rationale in Software Design*; 2008 June.
26. Harrison, S., Tatar, D., and Sengers, P. (2007). The Three Paradigms of HCI. alt.chi.
27. Horner, J. and Atwood, M. E. (2006). Design Rationale: The Rationale and the Barriers. *Proceedings of the 4th Nordic conference on Human-computer interaction: changing roles*.
28. Jones, J. C. (1977). How My Thoughts About Design Methods Have Changed During the Years. *Design Methods and Theories, 11*(1), 48-62.
29. Jones, J. C. (1979, July). Designing Designing. *Design Studies, 1*(1), 31-35.
30. Jones, J. C. (1992). *Design Methods.* Chichester: John Wiley & Sons.
31. Jones, J. C. and Thornley, D. (1962, September). The Conference on Design Methods: Papers Presented at the Conference on Systematic and Intuitive Methods in Engineering, Industrial Design, Architecture and Communications.
32. Kuntz, W. R. and Rittel, H. W. J. (1970). Issues as Elements of Information Systems. Technical report #Research Report 131. Institute of Urban and Regional Development.
33. Kuntz, W. R. and Rittel, H. W. J. (1972). Information Science: On the Structure of its Problems. *Information Storage and Retrieval, 8*(2), 95-98.
34. Lee, J. (1997). Design Rationale Systems: Understanding the Issues. *IEEE EXPERT,* 78-85.
35. Light, J. S. (2003). *From Warfare to Welfare: Defense Intellectuals and Urban Problems in Cold War America.* Baltimore: Johns Hopkins University Press.
36. Löwgren, J. and Stolterman, E. (2004). *Thoughtful Interaction Design: A Design Perspective On Information Technology.* MIT Press.
37. McCarthy, J., Minsky, M. L., Rochester, N., and Shannon, C. E. (1955). A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence. .
38. McCrickard, D. S., Harrison, S., Wahid, S., and Branham, S. M. (2008, June). Putting Creativity First —Inspiring with Image-Based Design Rationale. University Park, PA: *in Workshop on Creativity and Rationale in Software Design*.
39. Mostow, J. (1985). Toward Better Models of the Design Process. *AI Magazine, 6*(1), 44-57.
40. Newell, A. and Card, S. (1985). The Prospects for Psychological Science in Human-Computer Interaction. *Human-Computer Interaction, 1*(3), 209-242.
41. Newell, A. and Simon, H. A. (1956). The Logic Theory Machine—A Complex Information Processing System. *Information Theory, IEEE Transactions on, 2*(3), 61-79.
42. Newell, A. and Simon, H. A. (1972). *Human Problem Solving.* Englewood Cliffs, NJ: Prentice-Hall.
43. Norman, D. A. (1993). Cognition in the Head and in the World: An Introduction to the Special Issue on Situated Action. *Cognitive Science: A Multidisciplinary Journal, 17*(1), 1-6.
44. Olson, G. M. and Moran, T. P. (1998). Commentary on" Damaged Merchandise?". *Human-Computer Interaction, 13*(3), 263–323.
45. Payne, C., Allgood, C. F., Chewar, C. M., Holbrook, C., and McCrickard, D. S. (2003, October). Generalizing Interface Design Knowledge: Lessons Learned from Developing a Claims Library. Las Vegas, NV: *Proceedings of the 2003 IEEE International Conference on Information Reuse and Integration (IRI '03)*; 2003 October .
46. Rith, C. and Dubberly, H. (2007). Why Horst WJ Rittel Matters. *Design Issues, 23*(1), 72-91.
47. Rittel, H. W. J. (1972). On The Planning Crisis: Systems Analysis of the 'First and Second Generation' . *Bedrifts Økonomen, 8*, 390-396.
48. Rittel, H. W. J. and Webber, M. M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences, 4*(2), 155-169.
49. Rosson, M. B. and Carroll, J. M. (2002). *Usability Engineering: Scenario-Based Development of Human-Computer Interaction* . Morgan Kaufmann.
50. Schön, D. A. (1983). *The Reflective Practitioner: How Professionals Think in Action.* Basic Books.
51. Simon, H. A. (1996). *The Sciences of the Artificial.* MIT Press.

52. Suchman, L. A. (1990). *Plans and Situated Action.* Cambridge Univ. Pr..

53. Suchman, L. A. (1993). Response to Vera and Simon's Situated Action: A Symbolic Interpretation. *Cognitive Science, 17*(1), 71-75.

54. Sutcliffe, A. (2002). *The Domain Theory: Patterns for Knowledge and Software Reuse.* Mahwah, NJ: Lawrence Erlbaum Associates, Inc. .

55. Sutcliffe, A. and Carroll, J. (1999). Designing Claims for Reuse in Interactive Systems Design. *International Journal of Human-Computer Studies, 50*(3), 213-241.

56. Vera, A. H. and Simon, H. A. (1993). Situated Action: A Symbolic Interpretation. *Cognitive Science, 17*(1), 7-48.

57. Wahid, S. and McCrickard, D. S. (2006, June). Claims Maps: Treasure Maps for Scenario-Based Design. Orlando FL: *Proceedings of the World Conference on Educational Multimedia/Hypermedia and Educational Telecommunications (ED-MEDIA '06)*; 2006 June.

58. Winograd, T. and Flores, F. (1986). *Understanding Computers and Cognition.* Norwood, NJ, USA: Ablex Publishing Corp. .