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TOWARD A CONSTRATING ORIENTED PRAGMATISM UNDERSTANDING OF DESIGN CREATIVITY

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Abstract: This paper explores the potentials of pragmatist philosophy to enrich the discourse on design creativity in general and the concept of constraints specifically. The concept of constraints is central in vanguard creativity research, and recent contributions have begun to explore constraints as nuanced and situated phenomena. In this paper, we argue that pragmatism can inspire and inform the study of constraints in design creativity by offering a coherent and well-developed frame of understanding how designerly inquiry unfolds as a complex interplay between the designer and the resources at hand in the situation, which may continuously alternate between constraining and enabling roles, or even take on both roles simultaneously. Through this, pragmatism can lead to a more situated, dialogical approach to constraint management and manipulation, thus facilitating new insights into design creativity.

Keywords: *design creativity, pragmatism, constraints*

1. Introduction

Since Guilford's seminal inaugural APA address in 1950 (1950), research into creativity has evolved at a remarkable pace with work spanning several academic disciplines. As one such, design research is now an expansive field with contributions from psychology, engineering, management, HCI, AI, and informatics, among others. Much scholarly work in design concerns tangible artefacts and their contextual appropriation by users, not least within interaction design. Although at the core of most of such studies, *design creativity* as a particular phenomenon displayed by skillful practitioners still appears somewhat impalpable. We have been intrigued by the evasiveness of this fundamental concept as a seemingly consensually understood term that nevertheless turns out to be a conceptual challenge when explored in depth. What Johnson-Laird (1988) notes on creativity, that it is often most beneficial to define it *a posteriori*, seems to apply to design creativity as well, as it is typically conveyed as a part of a concluding summation of concrete project findings. Rather than follow that avenue of thought, we deem it more fruitful to contribute to advancing the understanding of *design creativity* by extracting

the concept and considering it in the light of John Dewey's seminal work on *pragmatism*. As we will argue, Deweyan pragmatism has influenced the development of design theory so a natural step, we claim, is to look at design creativity in a pragmatist perspective. To ensure the topicality of this analytical stance, we turn toward vanguard creativity research based on psychology and philosophy. There, we find a growing interest in the complex role of constraints as both enablers and restrainers of creative agency, and, notably, a conceptual shift toward a more situated, even dialogical understanding of constraints that mirrors key thoughts within pragmatism. In itself, pragmatism sheds light on key issues in current design research, however, the pragmatist concept of *inquiry* seems especially potent for understanding design creativity when the latest work on the complex role of constraints as a creative resource in design processes is taken into account as well.

To ensure the concept of design creativity comes to the fore of the paper, we begin (2.) by presenting key aspects of ongoing constraints research, not least the aforementioned shift toward a more situated understanding of constraints as elements open to creative manipulation by the agents involved. We then proceed to introduce the pragmatism of John Dewey (3.), which leads to our discussion (4.) of how pragmatism, informed by constraints research, may enrich the concept of design creativity, especially with regard to design as an inherently technological mode of inquiry and the understanding of design creativity as an emergent, situated, reciprocal, and distributed phenomenon. Finally (5.), we end the paper by briefly considering paths for future work. In order to ensure a satisfactory treatment of the core aspects of the paper, our focus is primarily theoretical. We are hopeful that the contraint-oriented pragmatist understanding of design creativity presented here will form the basis for in-depth case studies in future work.

2. From problem-solving to creative manipulation of constraints in design

As argued by (Gross, 1986), most design-related disciplines emphasize the presence of constraints as vital to an understanding of the creative process itself. Some take the argument even further by stating that: *"[formally], all design can be thought of as constraint satisfaction, and one might be tempted to propose global constraint satisfaction as a universal solution for design*" (Chandrasekaran, 1990, p. 65). Breaking away from seminal work in problem-solving, notably (Simon & Newell, 1972), recent attempts to reframe processual design creativity have looked toward metaphors to advance the concept (Casakin, 2007). Other theory contributions address the topic generically (Weisberg, 2006), or conceptualize it as 'requirements engineering' (Maiden et al., 2010) or as a question of 'balance-seeking' (Salustri, Eng & Rogers, 2009), to name a few examples. As noted by Johnson-Laird (1988, p. 202): *"to be creative is to be able to choose among alternatives"*, which is in alignment with many observations by Boden (2004). A key aspect of any creative activity is the agent's ability to handle the constraints presented by the given situation in a constructive, innovative manner that ensures creative progression, regardless of whether the aim be a final design, a cake recipe, or a haiku poem. At a basic level of definition, 'constraints' may be considered more or less synonymous with 'requirements', e.g. (Nuseibeh & Easterbrook, 2000), or in a practice-oriented scope as: *"limitations on action [that] set boundaries on solutions"* (Vandenbosch & Gallagher, 2004, p. 198). Advancing beyond such brief expoundings, however, entails terminological diffusion and conceptual opacity as no comprehensive, cross-disciplinary theory of creativivity constraints has yet been introduced.

Theory contributions to constraints research feature mainly three disciplines: architecture, psychology (seasoned with artistic experience), and philosophy (practical rationality). These contributions range from cubic typologies of design constraints (Lawson, 2006, p. 106), to strategies for allegedly creating artistic breakthroughs by merging dichotomies, e.g. by combining a horizontal and vertical perspective

in a visual work of art (Stokes, 2006; 2009). The latter of the three contributions does not focus on creativity, but presents an array of useful, conceptual clarifications such as the basic distinction between *intrinsic* (primarily immanent in the material itself such as bulk density), *imposed* (by agents, clients etc. in the form of budgets, deadlines, and other demands), and *self-imposed constraints* (self-restraint brought into the situation by the agent herself in expectance of a beneficial, more creative result) (Elster, 2000, pp. 175-269). Although each of these contributions have helped advance research into the relation between constraints and creativity, the disciplinary gaps and lack of shared scope and terminology remain significant.

Rather than taking the constraints 'at face value', recent meta-studies (Onarheim & Wiltschnig, 2010) and cross-domain explorations (Biskjaer, Onarheim & Wiltschnig, 2011) specifically targeting design research have shown a consensual understanding of the complex, dual role of constraints as being both restraining *and* enabling for creative agency. The complexity of this *both-and* characteristic by which the same creativity constraint such as the choice of a particular design material may simultaneously open/enlarge *and* close/reduce the problem/solution space (Dorst & Cross, 2001), has been represented in various ways, e.g., via divergence/convergence (Löwgren & Stolterman, 2004, pp. 29-30; Biskjaer, Dalsgaard & Halskov, 2010). Other theorizations aim to show this dual role by asserting distinctions of constraints such as hard vs. soft (Elster, 2000, p. 190), essential vs. incidental (ibid., p. 4), fixed vs. flexible, or strong vs. weak (Stacey & Eckert, 2010, p. 249).

What is important in order to help optimize creative performance on the path toward highly original results regardless of domain is the reflective approach of the creative agent. This means that current research into constraints has yielded an important, gradual change through which the very properties of the constraints themselves, not least how they affect creative agency, has been brought to the fore. No longer considered unmalleable by definition, recent theory suggests that even the most rigid, inviolable constraints such as the essential need for medical equipment to be sterile (aseptic) may be – and in fact not rarely is – ignored during the design process if it thereby helps yield a more innovative, final design (Onarheim, 2012). The four strategies of constraint manipulation outlined in this study are blackboxing, removal, introduction (of new constraints), and revising (of existing ones). Inspired by a cross-domain study displaying four patterns of similitude based on analyses of the role of constraints in experimental filmmaking and industrial design in plastic pharmaceuticals (Biskjaer et al., 2011), we wish to further argue for scaffolding a new, more refined conceptualization of constraints emphasizing the agent's unbound, personal, creative decision-making as well as the practical outcome and concrete usefulness of such decisions. We are currently taking steps in that direction in an attempt to advocate not only an increased alertness toward the active role and empowerment of the creative agent in the design process, but also a more pronounced emphasis on her ability to engage more experimentally in the design situation itself exactly by way of manipulating and playing with the constraints at hand, be they fixed or flexible, voluntarily chosen, or imposed by colleagues or clients. Such a reflective, yet open-minded approach to the design situation itself based on skillful management of constraints and evident domain knowledge seems a promising path to follow in order to better grasp the impalpability of design creativity. This conceptual shift toward a more situated or dialogical understanding of and engagement with even the most rigid constraints bears resemblance to key aspects of a *Deweyan pragmatist design philosophy*, and it is our contention that such a constraint-oriented, pragmatist stance on design can help shed light on and qualify design creativity, which is at the core of design practices. To be able to present this view, we now proceed to give…

3. A brief introduction to the pragmatism of John Dewey

Pragmatism is a school of thought that emerged in the United States toward the end of the nineteenth century. There have been a number of different and to some extent incongruent interpretations of basic assumptions in the field from the very beginning, see e.g. (Talisse, 2002). However, the different perspectives are joined by a series of basic tenets. Chief among these tenets is the pragmatic maxim, which is the proposition stating that the meaning of our conceptualizations of the world must always be evaluated based on their consequences and implications in practice: our experience in practice-based action precedes doctrines. This is a tenet that unites pragmatism in opposition to rationalist philosophy. Here, we will address one specific strand of pragmatism, that of John Dewey, to scaffold our discussion of the potentials of employing pragmatism as a perspective for understanding design creativity. Due to the scope of the paper, we have selected a set of four central concepts from Dewey's rich oeuvre, which are particularly salient for our discussion of design creativity in general and constraints in particular, namely the concepts of *situation*, *inquiry*, *transformation*, and *technology*.

Situation

Deweyan pragmatism posits that all human activity is situated to the extent that neither the subject, nor phenomena in the world, can be understood outside of the situation. A situation is constituted by the subject and the surrounding environment, including others, artifacts and physico-spatial surroundings as well as social constructs. Our thoughts and actions, as well as the meaning of events and ojects, must be understood in the context of the situation of which they are part. The situation is therefore not something that can be described without taking into account the subject(s) who are part of it. Nor can we understand the subject without looking at the situation in which he/she is placed. In other words, the subject and the situation are reciprocally co-constitutive (Dewey, 1998, pp. 66-67).

Inquiry

Situations may be experienced to be more or less stable and comprehensible. Dewey employs the term *determinate* to denote a stable situation in which the subject has a firm understanding of things; in contrast, *indeterminate* situations present themselves to subjects as instable and unpredictable. When we face indeterminate situations, we may label them as being problematic for us, in which case we will often embark upon a process of inquiry in order to bring an end to the instability, either by getting a better understanding of them, or by actively changing the situation: "*Inquiry is the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituents distinctions and relations as to convert the elements of the original situation into a unified whole"* (ibid., p. 108). Dewey describes the process of inquiry as progressing through states of 1) recognizing that a situation is problematic, 2) identifying the aspects or components of a situation that causes it to be problematic, 3) forming conceptualizations of how the situation may be resolved, and 4) experimenting with and carrying out actions based on these conceptualizations in order to resolve the situation and make it determinate. As an extension of the pragmatic maxim, this implies that the conceptualizations must prove their worth in practice by helping the subject resolve the situation. In this way, Deweyan pragmatism moves beyond the theory-practice dichotomy and instead views knowledge and theories as active phenomena that are formed and reformed through experimental action in the world. It must be stressed that Dewey views the stages of inquiry as highly intertwined and iterative, rather than a fixed model for problem-solving; e.g., later stages of the process may reveal to the subject that the initial understanding of the situation and the problems at hand were improper and thus instigate a new line of inquiry on the basis of a revised understanding of the situation.

Transformation

The goal of inquiry is transformation. As Deweyan pragmatism considers the situation the assemblage of subject, physical surroundings and things, other human actors, and social constructs, the transformation may apply to one, several, or all of these entities and their relations: *"Situations are an intimate, interconnected functional relation involving the inquirer and the environment. The resolution of a problematic situation may involve transforming the inquirer, the environment, and often both. The emphasis is on transformation"* (Dewey, 1925-1953, X, p. 33). Transformation can thus be construed as quite non-disruptive when the subject learns something new about the situation, which causes him to see it in a new, determinate way, whereas transformation may be highly disruptive in cases where all entities of the situation and their interrelations are altered through the course of designerly inquiry.

Technology

The final concept we will treat is technology. In Deweyan terms, technology is a broad, and inclusive concept that denotes the use of resources, means, or instruments to reach an intended result. In this understanding, technology is thus deeply connected with the three preceding concepts: technologies are almost always already part of a given situation. They scaffold the process of inquiry, and they help us transform the situation and may in turn be transformed, since they are co-constitutive components of the situation. Given our focus on constraints and design creativity, one of the central understandings that Dewey's notion of technology brings us is that technologies have a complex, reciprocal nature. Firstly, technologies help us see certain things in a situation, they act as lenses through which we perceive certain phenomena in the world, all the while concealing or obscuring other phenomena. Secondly, technologies can serve as extensions of our faculties for thought and action, enabling us to understand and act in ways that were not possible without them. Thirdly, technologies that become integrated into our lives can guide our thoughts and actions in ways that we may not be consciously aware of. And fourthly, technologies themselves change over time as they are developed.

4. How can constraint-oriented pragmatism enrich insights into design creativity?

Having outlined a rough sketch of these tenets of Deweyan pragmatism, the obvious question of how it can enrich our understanding of design creativity and constraints arises. We shall answer this in two tempi: firstly, by looking at how pragmatism resonates with design in general; secondly, and more extensively, by offering a more specific discussion of how pragmatism may inform and inspire our understanding of creativity and constraints in design.

Regarding the coupling of pragmatism and design, the notion of *inquiry* – understood as the mode of action and thinking by which we identify problematic aspects in our surroundings and intentionally strive to transform them – lies at the centre of pragmatist thinking. This resonates with design, which is inherently an interventionist discipline in which we bring our action and reflection to bear on identifying potentials for positive change and devise new methods, services, products, and environments to that end. By extension, the notion of *ongoing experimentation* is central to both design and pragmatism. The Deweyan perspective stresses how inquiry is an ongoing process of experimentation in which reflection and action are intertwined as conceptualizations are informed by, directed at, and tried out in practice. These experiments have the potential to transform all components in the situation: the designer may be transformed by gaining new insights that alter his view of the problem at hand; existing technologies and products may be re-aligned; new products and services may be developed and introduced into the situation; existing routines and practices may be changed; people's perception of the situation and their potential for acting in it may be altered; or, as is often the case, several or all of these aspects may change reciprocally as a result of designerly inquiry.

A series of past contributions have explicitly employed pragmatist perspectives to inform the field of design, among these McCarthy & Wright's *felt life* perspective on interaction (2007), the work on *aesthetic interaction design* by Petersen et al. (2004), Dalsgaard's work on *designing for inquisitive use* (2008), and the aforementioned work by Schön on *reflective design practice* (1983). The most widely recognized pragmatist contribution to design is arguably Schön's exploration of designers as competent practitioners in *The Reflective Practitioner* (1983) and *Educating the Reflective Practitioner* (1987). Notions such as "reflection-in-action", "reflection-on-action", "problem setting", "framing", "reframing", "repertoire," and "seeing as" have been influential in understanding the design process and the competencies of skillful designers.

We will devote the remainder of the paper to a more thorough discussion of how pragmatism may inform and inspire the understanding of creativity and constraints in design. Given the scope of the paper, we will focus on three main implications of adopting a pragmatist perspective, namely that it prompts an understanding of design creativity as an *emergent*, *situated*, and *reciprocal process*; that design is an *inherently technological mode of inquiry*; and that creativity is a *distributed phenomenon*.

4.1. Design creativity as an emergent, situated, and reciprocal process

Pragmatism conceptualizes inquiry as a fundamentally creative endeavor as it marks out as a departure from habitual thinking toward re-alignment of one-self and the environment in which alternatives to the present state are imagined and brought about. Creativity, in a pragmatist perspective, is not solely a cerebral activity. It is instigated by and – to varying degrees – directed toward environmental conditions, and it is embodied and externalized through the act of creating. The Deweyan perspective thus offers an understanding of design creativity as an *emergent* and *situated phenomenon* that comprises both *action* and *reflection*, and arises *reciprocally* as an interplay between the subject and the environment. Creativity is a common trait; it is not the exclusive domain of gifted creative individuals. This does not mean that everyone exhibits and explores creativity to the same extent, for the capacity for creativity may be honed, and we may be placed in, or actively seek out, situations that place demands on creative practice. Indeed, honing the capacity for creativity is often accomplished by being in challenging situations, to the extent that for instance artists will set up such challenges for themselves as well as for those who encounter their works, as explored in (Dewey, 1934). We will argue that this pragmatist conceptualization resonates clearly with the notions of *self-imposed constraints* in contemporary design creativity research. These conceptualizations may also help us develop our understanding of such constraints by considering how they fit into the assemblage of the situation, most prominently with regard to how they can be employed in the process of transforming the situation into a determinate state. During the crucial first stage of inquiry, such constraints become a technology for directing the design process by helping the designer name and frame the problem, and at later stages they can serve as means to stabilize the situation by the way in which they simultaneously enable certain ways of understanding and acting while ruling out others.

4.2. Design as an inherently technological mode of inquiry

A further consequence of the pragmatist perspective is that it prompts us to consider a more inclusive notion of self-imposed constraints. In a Deweyan understanding, technology is a broad and expansive concept, referring to the use of an artifact or a construct to carry out a task or to achieve an objective. Since designers draw upon numerous resources and instruments – be they semantic, social, or physico-spatial – in the inquiries at the centre of design, design can be considered an inherently technological activity. Technology, in this perspective, is not limited to being a means to an end, something that we employ to facilitate our actions in the world once we have a pre-formulated plan for how to transform

the situation we are in. Technology is always already present, in our repertoires and habits formed by past experience, and in numerous forms in our surroundings. This pervasive nature of technology means that it also frames, directs, and scaffolds our experience of the world: *"... technological arts, in their sum total, do something more than provide a number of separate conveniences and facilities. They shape collective occupations and thus determine direction of interest and attention, and hence affect desire and purpose"* (Dewey, 1934, p. 345). Even technologies that are widely construed to be functional tools frame and shape the experience of inquiry in which they are employed; for instance, Johnson (1997) has explored how different text technologies such as pen and paper, typewriters, and word processors affect the ways in which we think about and engage in the writing process (ibid, p. 145). If we bring this perspective to bear on the notion of constraints, it prompts us to consider how the tools and resources we employ in design in themselves serve a dual role as *constrainers* and *enablers* of our inquiry. In some situations we may well be aware of this dual nature, but this is not necessarily so. Indeed, it is often the case that the more proficient we become at employing specific technologies, the more they shift into the background and the less we consider what they are, precisely because they become taken-for-granted extensions of our faculties and means for acting. Consequentially, a part of becoming a skilled designer can be understood as *internalizing technologies* that not only enable, but also constrain how we perceive, interpret, and act.

4.3. Design creativity as a distributed phenomenon

The reciprocal traits of enabling and constraining also present themselves in the relations between the designer and the design situation. The environment is not a passive recipient to the actions of the subject; it responds to the subject as he tries to transform the situation in creative action. Schön (1983), building directly on Deweyan thinking, has explored this phenomenon through a dialogical metaphor under the label of *"situational back-talk"*, stressing that designers need to (1) accept that back-talk is intrinsic to design, and (2) to embrace it as a resource for moving toward design solutions that are well-aligned with the specific situation and all of its tensions and challenges. Design creativity can thus be described as a *distributed phenomenon* between *inquirer(s)* and *technological resource(s)*. On a semantic level, creative inquiry can for instance be distributed between inquirer and language, which Dewey considered to be: *"the tool of tools"* (Dewey, 1925/1981, p. 134). Poets, for example, often introduce linguistic constraints such as particular poem structures to establish simultaneous tensions and affordances in the writing process. Physical instruments for creative inquiry are often easier to observe and lend themselves well to study. A palpable example of this is how designers use sketches, models, mock-ups, and prototypes when exploring potential future forms of an artifact. In a pragmatist perspective, these provisional forms are more than just ways of communicating ideas; they are a crucial part of the creative work: they serve as an extension or distribution of imagination and allow for the designer to bring the world into the process and enter into multiple reflective conversations to explore potential futures. This understanding of distributed creativity in design is akin to the theory of *distributed cognition*, developed by Hutchins (1995), which holds that cognitive processes occur beyond the individual and can be distributed across people and technologies. A further development is found in Gedenryd (1998), who builds upon both Dewey and Hutchins to develop the term *interactive cognition* to denote the distributed process of creative inquiry, and the term *situating strategies* to denote the particular method of employing resources in the situation to augment imagination: *"Quite simply, these techniques re-create the various parts of this situation that do not yet exist. To make interactive cognition work well, the designer has to create her own working materials; before the world can become a part of cognition, the designer has to create it"* (Gedenryd, 1998, p. 157).

5. Concluding remarks and future paths for conceptualizing design creativity

It seems appropriate to begin by acknowledging that ideally, we would have liked to also relate the theoretical findings of this paper to some of the design projects our lab has been involved in. Such a two-fold strategy, however, lies beyond the scope of this paper. Instead, our aim has been to focus on the fecundity of introducing *a constraint-oriented, pragmatist conceptual framework* to contribute to inspire and inform ongoing research into design creativity. In our view, one of the main reasons the notion of design creativity suffers from the current, terminological cloudiness is the fact that not even 'creativity' is consensually understood; a terminological diffusion that becomes even more significant within design research (Askland, Ostwald & Williams, 2010). Given the fact that some scholars argue that the notion of creativity may be traced back to pre-Socratic philosophers, even ancient mythologies (Mason, 1988), it is quite remarkable that no philosophy of creativity, including a cohesive, conceptual framework, has yet been introduced, although it seems to be slowly emerging, see (Stokes, 2006; 2008; Gaut, 2010).

One of the main arguments presented above is the contention that the importance of constraints in creative activities is gradually being transformed. What current studies of designers suggest is that even inviolable constraints are often being challenged, at least for a while, to allow for a more situated or dialogical, approach to constraint management or better: constraint manipulation. This changing conceptualization of constraints and their relation to creativity, including design, has recently been echoed by leading creativity researchers, notably in an authoritative anthology of creativity research (Kaufman & Sternberg, 2010). As a very young discipline, design obviously relies on much work within related areas of research, which forces it to look both back toward previous contributions to theory that might help qualify its ongoing theoretical advancements, as well as toward vanguard currents in creativity research. In this paper we have done both. Deweyan pragmatism offers a well-developed framework for addressing how *creative inquiry in design* plays out as an interplay between the creative agent (i.e. the designer), and the resources given in the actual situation. This complex dialectic interplay resembles the duality of constraints as adhering to both opening/expanding and constraining/delimiting the problem and solution space for the designer. Until a more unifying theory or even philosophy of creativity, encompassing both design and other forms of creative practice, should arise, we hope to have offered a contribution to the advancement of insights into the complex and intriguing concept of *design creativity* by building on both past and present theorizations.

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