The Need for New Methods to Study Embodied Designing

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2   Todd M. Thrash and Andrew J. Elliot, "Inspiration as a Psychological Construct," *Journal of Personality and Social Psychology* 84, no. 4 (2003): 871–99, DOI: https://doi.org/10.1037/0022-3514.84.4.871; Todd M. Thrash and Andrew J. Elliot, "Inspiration: Core Characteristics, Component Processes, Antecedents, and Function," *Journal of Personality and Social Psychology* 87, no. 6 (2004): 957–73, DOI: https://doi.org/10.1037/0022-3514.87.6.957; Todd M. Thrash et al., "Mediating between the Muse and the Masses: Inspiration and the Actualization of Creative Ideas," *Journal of Personality and Social Psychology* 98, no. 3 (2010): 469–87, DOI: https://doi.org/10.1037/a0017907.

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8   Thrash and Elliot, "Inspiration as a Psychological Construct," 871–89; Hart, "Inspiration: Exploring the Experience," 7–35.

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The Need for New Methods to Study Embodied Designing

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Design studies has inherited much from the cognitive sciences. Karin Lindgaard and Heico Wesellius's article "Once More, with Feeling"[1] posits that an ongoing debate in cognitive science on the embodied nature of cognition should now also find its way into design research to inform how we theorize and research design thinking.

Research on embodied cognition is interested in the ways the body, brain, and environment interact inseparably and dynamically to give rise to intelligent behavior.[2] Lawrence W. Barsalou has specifically advocated an understanding where neurally-based simulations in modality-specific representations, situated and embedded in behavioral contexts, underlie our ability to plan actions and coordinate activities.[3] His theorizing predicts that modality-specific information is activated during cognitive tasks, plays functional roles, and is situated—predictions that do not flow naturally from cognitivist theories. But embodied cognition is not a coherent theory—the various strands of embodied cognition research are defined mainly by the hypotheses that researchers pursue rather than a coherent theoretical framework.[4]

Given that designing is one notable form of intelligent behavior, it would seem obvious that design research could well become informed by utilizing findings and theories from embodied cognition, as suggested by Lindgaard and Wesselius.[5] However, it is not quite clear to me which theories in design or design thinking the authors are targeting. While the embodied cognition critique in cognitive science has set out to refute traditional cognitivist approaches that assume the existence of cognitive amodal symbols and distinct stages of processing—assumptions that also exist in some design theories—a reading of the target article left me uncertain which of the design research classics were supposed to be the recipients of the embodied attack? In part, the issue may be that the scope of the article may be too broad—encompassing, as it does, metaphor, feeling, and embodied cognition—and that each part appears to address somewhat distinct issues in cognition and design research. While cognitivist attempts at conceptualizing thinking in abstract terms—as representations—were the mainstream in cognitive science for a while in the 1950s and 1960s, theorizing on the designerly way of thinking has not left the designed object behind to the same degree, frequently maintaining interactionist and embodied perspectives throughout the history of design research. Indeed, the embodied criticism is perhaps not as new as suggested by Lindgaard and Wesellius. In the 1990s, for example, Vinod Goel[6] championed a relatively similar critique of cognitivist theories in his writings on sketching behavior in design. Goel's work illustrated how far cognitivist science falls short of capturing the richness of thinking implied in design sketches. Sketching has served as one case-in-point where it is

evident that theories assuming underlying amodal symbols and mind-body dualisms cannot explain actual design behavior.[7]

Feelings have also being explored in design, for example through affect-in-cognition[8] or processual feelings, such as feelings of stuckness[9] or epistemic uncertainty.[10]

Some of my writings may also be seen as relating to embodied cognition. Using in-vivo protocol studies of design teams,[11] I have explored the fluctuating role of epistemic feelings of uncertainty in design, documenting how analogical reasoning and mental simulation may turn feelings of uncertainty into approximate information.[12] The concept of mental simulation is related to, but also deviates from, that used by Barsalou. In Barsalou's[13] terminology, simulations are activations of past experience that inform an organism's ongoing behavior and plan for future action, and need not be conscious or complete. My research into mental simulation in design relies on protocol studies and hence implies some conscious awareness of simulating design objects to predict design outcomes — whether functional or aesthetic[14] — although the simulation itself may be very short-lived and quickly forgotten. As such, the two constructs serve similar predictive purposes in subject-object interaction, although "mental simulations" in design, as I have conceptualized it, would be a small and special class of what Barsalou refers to as simulations.

Finally, as regards the dynamics between cognitive systems and the environment, my colleagues and I have found that the types of preinventive structures that were present at design meetings influenced the type of mental processes designers would engage in.[15] Specifically, the presence of prototypes during design meetings led to fewer remote analogies being generated.

To summarize, I am in agreement that an embodied perspective is needed in design research, but perhaps of the opinion that it is already there, scattered throughout the design literature. But of course, bringing the embodied label to the fore — as Lindgaard and Wesellius have attempted in their article — may well help sharpen the vocabulary of a theoretical movement that is already taking place.

A pressing methodological problem, in this regard, is how to study hypotheses related to embodied designing. The use of methods for capturing design cognition — such as the verbal protocol studies I use much of the time myself — may be partly responsible for any bias towards theorizing in terms of mental representations and amodal symbols. More studies are needed of actual hands-on perceiving-acting tinkering-sketching-making designing that do not rely solely on what designers say they do — either post hoc or during designing — but include analysis of physical manipulations. Better methods need to be developed for capturing and analyzing the non-verbal parts of designing, and for integrating these findings with existing methods. The use of psychophysiological measures — such as eye-tracking or GSR — or biosensors capturing bodily postures, for example, may be one way to go. One interesting approach is to utilize video to capture non-verbal tinkering-sketching-making in context, and combine it with protocol data for enhanced understandings of the interaction between designer and object-in-the-making. But such video-based non-verbal units of analysis are notoriously difficult to analyze, and we need to devise better methods for analyzing such person-object interaction, with a distinct eye towards the value in situated hands-on production.

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3 Lawrence W. Barsalou, "Perceptions of Perceptual Symbols," *Behavioral and Brain Sciences* 22, no. 4 (1999): 637–60, DOI: https://doi.org/10.1017/S0140525X99532147.

4 Matheson and Barsalou, "Embodiment and Grounding."

5 Lindgaard and Wesellius, "Once More, with Feeling," 83–92.

6 Vinod Goel, *Sketeches of Thought* (Cambridge, MA: MIT Press, 1995).

7 See also Jonathan Fish and Stephen Scrivener, "Amplifying the Mind's Eye: Sketching and Visual Cognition," *Leonardo* 23, no. 1 (1990): 117–26, DOI: https://doi.org/10.2307/1578475; Ilse M. Verstijnen et al., "Sketching and Creative Discovery," *Design Studies* 19, no. 4 (1998): 519–46, DOI: https://doi.org/10.1016/S0142-694X(98)00017-9.

8 Andy Dong, Maaike Kleinsmann, and Rianne Valkenburg, "Affect-in-Cognition through the Language of Appraisals," *Design Studies* 30, no. 2 (2009): 138–53, DOI: https://doi.org/10.1016/j.destud.2008.12.003.

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10 Bo T. Christensen and Christian D. Schunn, "The Role and Impact of Mental Simulation in Design," *Applied Cognitive Psychology* 23, no. 3 (2009): 327–44, DOI: https://doi.org/10.1002/acp.1464.

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12 Bo T. Christensen and Christian D. Schunn, "The Relationship of Analogical Distance to Analogical Function and Preinventive

Structure: The Case of Engineering Design," *Memory & Cognition* 35, no. 1 (2007): 29–38, DOI: https://doi.org/10.3758/BF03195939; Linden J. Ball and Bo T. Christensen, "Analogical Reasoning and Mental Simulation in Design: Two Strategies Linked to Uncertainty Resolution," *Design Studies* 30, no. 2 (2009): 169–86, DOI: https://doi.org/10.1016/j.destud.2008.12.005.

13 Barsalou, "Perceptions of Perceptual Symbols," 637–60.

14 Bo T. Christensen and Linden J. Ball, "Dimensions of Creative Evaluation: Distinct Design and Reasoning Strategies for Aesthetic, Functional and Originality Judgments," *Design Studies* 45, no. A (2016): 116–36, DOI: https://doi.org/10.1016/j.destud.2015.12.005.

15 Christensen and Schunn, "The Relationship of Analogical Distance."

Design Thinkers Think Like Managers

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Well … perhaps this title is too provocative. Nevertheless, the inspiring article by Karin Lindgaard and Heico Wesselius is an eye-opener. Reading its final lines, I was left with a warning sign. What if we are substantially wrong? What if the way we are bringing design thinking into business school classrooms and into organizations is jeopardizing design and management alike, rather than lifting them up?

The article takes a peculiar perspective. Looking at design thinking as a cognitive style, it offers a script for the evolution of theories of cognition, and then it connects them with design practice. The part that I like most is the first, which illustrates an overview of cognition theories. Thanks to development in the neurosciences, there is an increasing interest in cognition, and design is not immune to this interest. Lindgaard and Wesselius eventually focus on the role of emotions, and, from the broad body of knowledge of cognition theories, they borrow the concept of "sense of fit" or "felt-sense."

> "Rather than treating emotion as separate from rational or higher order thinking, this approach identifies emotion with unconscious processes that guide complex forms of behavior.… [F]eeling emerges — initially as the sense of how well an action might meet the demands presented by the situation. This is feeling a 'sense of fit' […or also

…] our 'felt sense' of a situation. This felt sense is always present, even if we are not actively attending to it.… Cognition has two sides — this felt sense, and symbols. Symbols are explicit expressions, such as language or images. [The felt sense functions to *select* the symbols that *explicate* a meaning]. This is how we have a sense of what to say next, or how to proceed in any situation. Often we only know that something is missing or not right, and as we attend *to this feeling*, we consider alternatives. Our knowing when something is not right or not finished, even if we do not know why, is one of the most tangible ways of noticing our felt sense."[1]

This is an intriguing concept that captures a fundamental way in which design practice occurs. It becomes visible as an intimate feeling for a design direction. Designers leverage the capability to give form to this feeling through visualization and prototypes — sketches, stories, maps, mockups. Then, they work with a "felt sense," reflecting on the visualizations to see which of them may or may not be good. This is an iterative process, moving through new visualizations through appropriate symbols, and a new "sense of fit."

The second part of the article tries to elaborate on this perspective. How does the concept of felt-sense apply to design practice? And here is where the reflection loses its depth compared with the rich elaboration of cognition theories in the first part of the article. The application of the concept of "felt-sense" to the nature of design is not elaborated as it would deserve. Lindgaard and Wesselius have an intuition, a very good one indeed, but they stop there.

Well, it does not matter much anyway, because they point in a promising direction. They leave space for a deeper dive. They can go deeper in the future, and others can contribute to this work.

The key message is this. If we leverage on cognition theories, we can do better in capturing two essential elements in the ontology of design practice. First, skilled designers use the deepest level of cognition, the felt-sense, to drive their exploration of innovation. This felt-sense reflects a rich yet implicit understanding of a situation. Second, skilled designers move easily from the felt-sense to a symbolic representation that reflects the explicit manifestation of a situation. They have the ability to tap the most sophisticated dimensions of our understanding, to make the felt-sense explicit and vice versa. They create a short-circuit between implicit or tacit knowledge, where most new understanding occurs first, and articulated knowledge. Circulation between these two