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A critique of the representationalist framing of design

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ABSTRACT

This paper brings attention to the chronological developments in a strand of design research that aimed at demystifying the characteristics and nature of design through what will be argued to have been predominantly a representationalist framework. It discusses how the uncritical acceptance and combination of some of the concepts that have come to be attributed to design (design as an ill-structured, reflective-in-action and ambiguous activity) can contribute to a rather narrow understanding of design- one which reduces the temporal-cultural fluidity of design in how design(ing) is conceptualised; and how the role and intrinsic properties of the frameworks that are used to study design themselves are overlooked in the concepts that are subsequently attributed to the nature of design. The paper maps the research paradigms and core concepts pertinent to this line of design research against a classification of cognition theories in providing a critique of its framing of design knowledge.

KEYWORDS

Design research, design knowledge, design theory, ill-structure, reflection-in-action, ambiguity, representationalism

Introduction

Over the last century that design became a subject of scholarly enquiry, there has been a plethora of work enriching ways of thinking about design and methods used for studying design that has subsequently enabled its inherent controversies to surface through and be subject to critique in efforts akin to that made in this paper. Such diversity reflects a lively and prolific field of research (Buchanan 2007; Lloyd 2017). Interestingly however, despite the breadth of knowledge, there continues to be criticism regarding the lack of clarity in the terminologies and approaches taken, affecting the validity of constructs used in design research and prohibiting reaching theoretical and methodological consensus or rigour (see Cash 2018; Hay et al. 2017; Love 2000; Ralph and Wand 2009). This poses a problem that may be somewhat rectified through

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synthesising different interpretations and definitions (Ralph and Wand 2009), or theory building (Cash 2018). Nevertheless, as Love suggests: '[i]t is perhaps more fruitful to indicate how conflation [of concepts] may lead to the development of erroneous threads of theory or to faulty conclusions' (2000, 297). This latter is where the interest of this paper lies; to illustrate how the paradigmatic conditions created through the course of design research have become conducive to the current state in the understanding of design. As will be unpacked in this paper, the strand of design research that aimed to demystify the characteristics of design as a unique problem-solving activity, consolidated the groundworks for studying design through a proxy of frameworks, attributing characteristics (including the inherent limits and paradoxes) of those frameworks to the nature of design itself (Tahsiri 2018). Three key concepts that became attributed to design in such way were the idea that design can be regarded as *ill-structured* (Simon 1973, 1969) and a *reflective-in-action* (Schön 1983) and *ambiguous* (Goel 1995) activity, which together contributed to a gradual reduction of the temporal-cultural fluidity of design from this strand of design research's approach to studying design, enclosing developments in design knowledge[1] within predominantly a representationalist outlook on design.

Furthermore, a closer look at citation practices in design research suggests there to be an uncritical acceptance of some of these core concepts attributed to design. For example, in reviewing citations to works of Schön, across 120 papers included in the Design Research Society (DRS) conferences (2010-2016), Beck and Chiapello (2018) discuss there to have been limited cases of authors critically analysing or advancing ideas put forth by Schön. Accordingly, Schön's work is mainly cited 'either to support [authors'] research topics, methods or methodologies, and arguments or to credit Schön for concepts or ideas' (2018, 205). Bearing in mind critiques regarding the diversity of theories and concepts within design research (see Love 2000; Melles 2008), it becomes important to conduct more critical examinations of the concepts attributed to design. In 2006, Dorst published a paper in Design Issues, in which he revisited the conceptual framework introduced by Simon, highlighting several paradoxes underlying Simon's (1973) assumptions, and questioned whether researchers should opt for a different way of looking at the nature of design. In this paper, I intend to reflect on some of the issues underlying concepts of 'reflection-in-action' and 'ambiguity', as have been adopted by design research, and examine what the attribution of such concepts to the nature of design has meant in terms of the paradigmatic framing of design knowledge.

How design became known as an ill-structured, reflective-in-action and ambiguous activity

A review of design research from the 1920s onwards shows how the focus of design research has changed over time (Bayazit 2004; Broadbent 2003;

Cross 2001). Cross (2001) summarises the changes as a shift from the aim of creating a 'design science' to that of creating a 'design discipline'. Before the 1980s, arguably, this field was influenced by the 'dual knowledge thesis' (Coyne and Snodgrass 1991), and so when scientific approaches no longer sufficed in illustrating a full picture of design, the alternative was to frame design through everything science was not (see Cross 1993): as a wicked problem (Rittel and Webber 1973). An influential scholar of the time was Simon (1973, 1969) who employed information-processing theory, dividing problem-solving processes into two groups of well-structured and ill-structured problems, in which design was of the latter. Nonetheless, a division between design and the sciences did not yield much usefulness. Therefore, whilst still positivistic in nature, the 'science of design' was created, based on the notion that although design is not science, it can be studied through scientific methods (see Cross 1993), shaping much of the research in the field moving forward.

The turn of the decade also saw with it a phenomenological turn in the work of a group of scholars who by criticising previous approaches, posited accounts which epistemologically engulfed both science and design (such as Coyne and Snodgrass 1991; Glynn 1985; Levy 1985). Gradually researchers strived towards a more pragmatic approach, trying to understand design and design cognition as it appears- in situ. At the heart of this was Schön's (1983) seminal work on *The Reflective Practitioner,* which illustrated design as a reflective-in-action activity and strongly criticised the technical rationality approach taken by Simon (1969). However, as I would like to point out, such critiques did not fundamentally alter the line of work started by proponents of the 'science of design'. Instead, a strand of design research aimed to mediate between the two views by using scientific methods (usually borrowed from other disciplines such as psychology and the cognitive sciences) to study design as a situated activity and create a 'design discipline' or 'design as a discipline'. Respectively, Cross (2001, 54) explains 'design as a discipline' to be a 'science of design based on the reflective practice of design', one that 'seeks to develop domain-independent approaches to theory and research in design'.

Goel's (1995) *Sketches of Thought* reflects a good example of the kind of approach that gained popularity from the late 1990s. Transpired from observing designers in action, the symbol system of design was interrelated with that of sketching, attributing the ambiguity observed in sketching to design: 'ambiguity is important because one does not want to crystalize ideas too early and freeze design development' (Goel 1995, 193). With the emergence of such illustrations about design, it becomes understandable how the 'reflection-in-action' concept associated with nature of design can be seen as what prohibits the early crystallisation of ideas in an otherwise ill-structured type of problem-solving. Chronologically, moving forward from

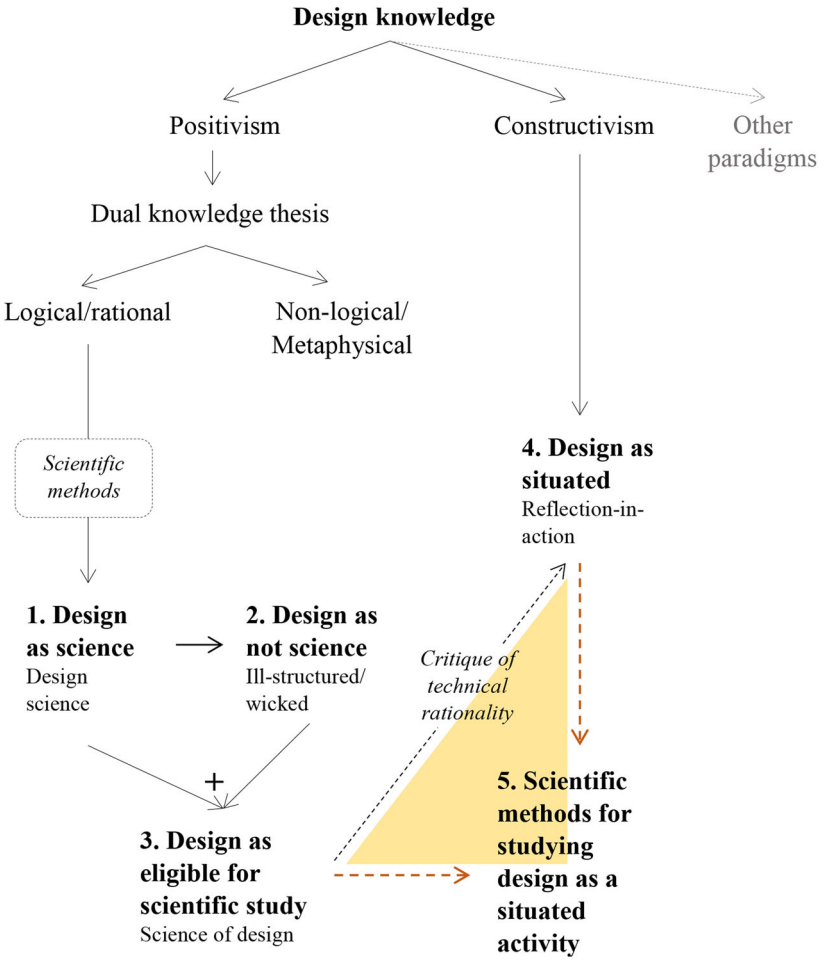

Figure 1. Design knowledge shaped by positivist-constructivist paradigms: An illustration of conceptual developments in design research leading to a 'design discipline'.

Goel's work, systematic methods of observing designers in action such as protocol analysis gained dominance (Chai and Xiao 2012), particularly in the 1990s and early 2000s. This furthered the possibility of a 'design discipline', by perpetuating the idea that design can be ill-structured and ambiguous as well as reflective-in-action (in that its outcomes can be unexpected and open to multiple interpretations) (for example as reflected in Goldschmidt 1997; Suwa, Purcell, and Gero 1998). Noting that Simon's and Schön's insights are discussed to be derived from two different paradigms (Dorst and Dijkhuis 1995; Jahnke 2012), what theoretical and method(olog)ical conditions must there be to enable a constructivist notion of 'design as situated' elicit commonality with the positivistic 'science of design'? This question is further explored throughout the paper; nonetheless as summarised by Figure 1, the two contrasting paradigms effectively became subsided at the expense of 'design discipline'.

Arguably, each singular paradigm can provide a filtered, yet robust and valid perspective on design. Setting the scene for studying design through multiple paradigmatic perspectives and searching for an understanding of design by examining the interrelationships between the individual lines of enquiry, can be beneficial in acquiring a multi-faceted understanding of design (also see Buchanan 2007). However, under-structured acts of convergence can undermine and confuse the possibility of a true paradigm plurality for design research, as the emanated concepts cannot be meaningfully assessed against either paradigm's epistemological or ontological assumptions. If the convergence is seen as having created a new paradigm altogether, it is paramount that the influence of the parent paradigms and assumptions by which the convergence becomes justified are made clear, otherwise concepts pertinent to one parent paradigm may become subsumed by the other. In relation to this latter, the problem is that the new paradigm will in effect be a rendition of one of the parent paradigms, that continue to reinforce a unitary line of inquiry under what will arguably be a false assumption of paradigm plurality. Respectively, design research is missing a thorough delineation of the epistemological and ontological assumptions for a paradigm in which 'design discipline' can operate, which then leaves consequent terminologies and understanding of concepts lacking fine-grained definitions. Additionally, due consideration must be given to the fact that what fuels a convergence in the first place may indeed be due to problematic issues at the level of the concepts and theories shaping a paradigm, hence blurring boundaries between seemingly distinct frameworks. The discussion to follow will elaborate on how at a paradigmatic level, this line of development in design research has seen a reconstruction and nesting of a constructivist paradigm within a positivistic one, inevitably conserving a unitary approach towards the development of design knowledge.

The issue with reflection-in-action

Buchanan states, '[w]e have been slow to recognize the peculiar indeterminacy of subject matter in design and its impact on the nature of design thinking. As a consequence, each of the sciences that have come into contact with design has tended to regard design as an 'applied' version of its own knowledge, methods, and principles. They see in design an instance of their own subject matter and treat design as a *practical demonstration* of the scientific principles of the subject matter' (1992, 19). Design, therefore, takes the shape of frameworks and structures that are applied to it and is appropriated through the culture in which it is used. Thereby, it would seem how we conceptualise and theorise design is entangled with theories and concepts related to how we think and interact with the world (Tahsiri 2018).

'Reflection-in-action' is a concept closely linked with the theory of Situated Cognition. Therefore, understanding the issue with 'reflection-in-action' calls for an understanding of issues related to Situated Cognition.

The nebulous situated cognition

Following on from Chemero's (2009, 17–22) taxonomy of theories of the mind, it could be stated that traditional theories of cognition can be organised into two classes: *representationalist* and *anti-representationalist* theories.[2] Representationalist theorists understand thought as 'relations between people and mental representations that stand for things in the world (their semantic properties)' (Chemero 2009, 20). In other words, a person receives information and processes them internally through a system of symbols. On the other hand, anti-representationalists believe that it is futile to try to understand the world distinct from the agency within it and they avoid hypothesising complex internal representations, as a point of reference, for interpreting events in the external world (Chemero 2009).

The dualism evident here that either accepts or eliminates mental representations from the processes of thinking and interacting with the world collapsed as a new class of theories emerged attending to both facets of mental processes and environmental affordances (Chemero 2009). As explained by Robbins and Aydede (2009, 3), the aim of the emerging theories was to provide 'a picture of mental activity as dependent on the situation of context in which it occurs, whether that situation or context is relatively local (as in the case of embodiment) or relatively global (as in the case of embedding and extension)'. There are several theories under this class (such as Embodied, Extended, etc.) but the most relevant of these theories to design research scholars (within the 'design discipline' strand) has been Situated Cognition. Respectively, Wilson and Myers (2000, 65) discuss that Situated Cognition was 'an alternative to information-processing theory. It seeks to correct some of the oversight of the symbolic-computation approach to cognition, in particular its reliance on stored descriptions of rules and information; its focus on conscious reasoning and thought; and its neglect of cultural and physical context'.

This attention to the physical context in which cognition occurs, encouraged many scholars to take a stance on the matter, which introduced loosely used notions of 'situativity', 'situatedness', 'situated action' in addition to 'Situated Cognition' to the body of literature. Wilson and Myers (2000, 59) reflect on the matter and explain that 'SitCog can be approached from a perspective that remains committed to understanding individual cognitive mechanism [...] Alternatively, SitCog may be seen from an almost entirely social or cultural vantage point'. For example, for Vera and Simon (1993, 47), 'situated action' refers to 'symbolic systems that are specifically designated

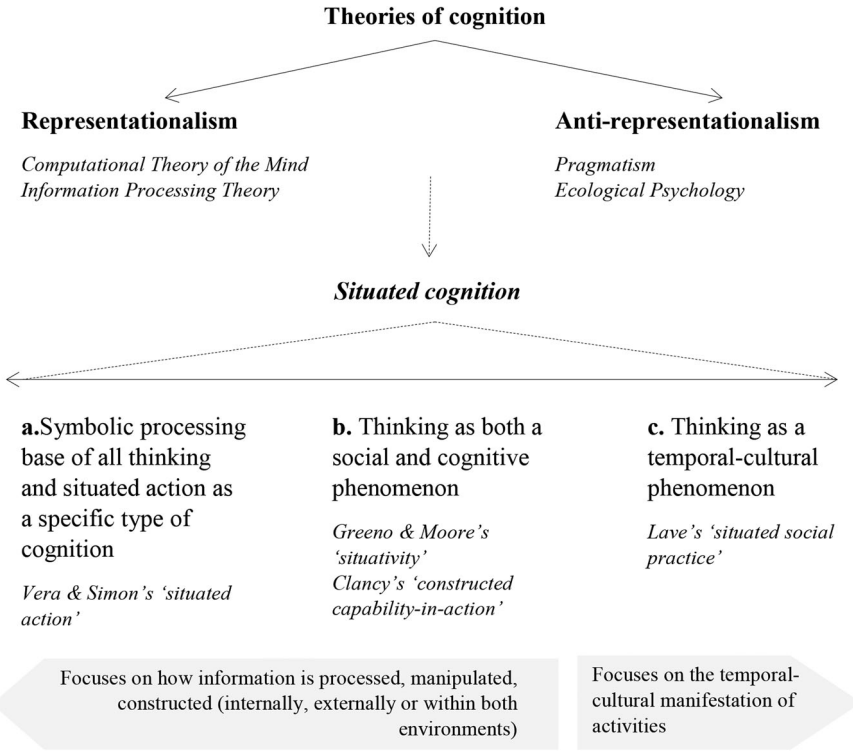

Figure 2. The nebulous state of Situated Cognition, spanning across both representationalist and anti-representationlist accounts of cognition.

to operate adaptively in real time in complex environments'. Accordingly, all cognition involves some 'minimal representation' (1993, 40). However, their view does not suggest that all cognition is situated. In fact, 'situated action' seems to be understood as a specific type of cognitive activity that occurs when the response systems need to act with immediacy or urgency. In such sense compared to planned activity, Vera and Simon (1993, 41) explain that '[b]oth forms of action require some internal representation of the situation–perhaps minimal in the case of situated action, more elaborate in the case of planned behaviour when fewer unexpected events occur'. On the other hand, pragmatists such as Lave (1991) opt for a *decentralised* account of cognition that does not present an individual at the centre of understanding a phenomenon, rather it looks at the unfolding of relationships in and between the social contexts. Here, a temporal-cultural nature to cognition is unveiled. In respect to learning, Lave (1991, 64) frames this 'as a social phenomenon constituted in the experienced, lived-in world, through legitimate peripheral participation in ongoing social practice; the process of changing knowledgeable skill is subsumed in processes of changing identity in and through membership in a community of practitioners; and mastery is an organizational, relational characteristic of communities of practice'.

Others such as Greeno and Moore (1993) took a more mediated approach, synthesising information-processing with stimulus-response theory. They used the term 'situativity' to place emphasis on the idea that all cognitive activity is situated, thereby 'treat[ing] cognition that involves symbols as a special case of cognitive activity' (1993, 50). From a more nuanced perspective scholars like Clancey (1997, 4) define Situated Cognition as 'the study of how human knowledge develops as a means of coordinating activity *with activity itself*'. Here, there is a concurrency of the different neural, social, and representational processes required for actions and thinking to occur (see Clancey 1994, 1991), and knowledge is seen as a '*constructed capability-in-action*' (1997, 4).

It can therefore be understood why Situated Cognition is nebulous in that it can span across both representationalist and anti-representationalist perspectives (as depicted in Figure 2). What occurs as a result is an ambiguous unit of analysis. As Kirshner and Whitson (1997, 6–7) suggest the unit of analysis has either been 'unifocal', in that it has moved from a focus on the individual to focus on the community or social context or has been 'multi-focal' trying to elucidate how the individual and environment interact. Lave explains this to mean that 'situated activity is anything but a simple concept; it is a general theoretical perspective that generates interconnected theories' (1991, 66). While this may be true, the boundary between theories that account for situatedness and reject a pure representationalist view is unclear, with both overlaps and discrepancies in how each view sees the coupling of the mind and environment, as well as the role of body and weaker forms of representations in those processes (Menary 2010; Newen, De Bruin, and Gallagher 2018). Such fluidity in the boundaries between theories, can leave the possibility open for the convergence of different accounts (see Rommetveit 1987) and complicate how the concept of situatedness can be best interpreted as a basis for understanding and studying design.

Nevertheless, what can be interpreted from the various definitions in this mediated class of theories, is that each account either has roots within a representationalist or anti-representationalist school of thought with an extended look onto the other school of thought. In this light, situated accounts of cognition, even those with weaker representationalism compared to traditional representationalism, such as accounts a and b from Figure 2, can be seen as not fully encompassing the temporal-cultural facet of occurrences, as they are mainly concerned with such facet so as long as it contributes to what is considered as cognitive or epistemic. On the other hand, accounts more inclined to anti-representationalism, while refraining the use of representations as a unit of analysis, can find themselves engaging in discourse about mental processes in justifying and theorising about occurrences in the world. Based on the above, referring to Figure 1, one

could question the type of situatedness that Schön's account of design alludes to and whether it paradigmically offers a view of the situatedness of design that is more aligned with either the representationalist or anti-representationalist views. In the section, I will expand on this.

Design as a situated activity through the lens of reflection-in-action

In the context of design research, Schön's description of design as a reflective practice has been crucial in framing how design has been understood as a situated cognitive activity. Schön's (1983) valuable critique of technical rationality expanded the scope for understanding design by bringing attention to a practice-oriented facet of the phenomenon, however its purpose was not to lay out a paradigmatic framework. Thereby the details of paradigmatic differences with Simon's insights are not clearly defined in Schön's writings (Meng 2009). There are also arguments on whether Schön's criticism of technical rationality may have created a 'false dichotomy' (Kinsella 2007, 109; see also Meng 2009). In this light, the placement of Schön's insights within the Situated Cognition spectrum (Figure 2.) becomes rather debatable, raising doubt as to whether the 'science of design based on the reflective practice of design' (Cross 2001, 54) is in fact drawing on two distinct paradigms of inquiry. Following, some of the issues that prevent a purely anti-representationalist reading of Schön's insights are presented.

Central to Schön's (1983) criticism is the idea that actions in the world are not a direct implementation of thought produced in the mind. However, his epistemology of practice does not dissolve nor resolve the divide between thinking and doing. Although both are seen to be epistemic, in the sense that they display a form of knowing, and that doing is not seen as mere vessel for transferring thinking into the world in the pure rationalistic sense, the epistemology of practice suggests that there is a form of knowing (i.e., reflection) that is distinguished from the knowing embedded in action. Therefore, implicit in Schön's writing is that knowing partly occurs internally, within the mind and partly externally within the environment (also see Erlandson 2005), requiring the practitioner to engage in a back-and-forth movement between their internal and external forms of knowing:

> Doing and thinking are complementary. Doing extends thinking in the tests, moves, and probes of experimental action and reflection feeds on doing and its results. Each feeds the other, and sets boundaries for the other or the designer constructs the design world within which he/she sets the dimensions of his/her problem space, and invents the moves by which he/she attempts to find solutions (1983, 280).

Schön explains that knowledge of a practice is displayed through engagement with the practice: a knowledge which is intuitive and hard to describe

verbally. For him, through reflection the practitioner 'surfaces, criticizes, restructures, and embodies [their understandings] in further actions' (1993, 50). The issue with this account can be brought to light by drawing on the Heideggerian phenomenology, wherein tacit knowledge is 'ready-to-hand' and knowledge communicated through reflection is 'present-at-hand' (see Wheeler 2011). For a condition to become 'present-at-hand' requires disembodiment from the situation (Wheeler 2011). This creates a temporal disparity between the action-a-present and reflection (Hébert 2015, 366). So although Schön (1983, 62) describes reflection as 'bounded by the 'action-present', the zone of time in which action can still make a difference to the situation', the action here, more than it be a reference to an embodied situation, refers to the process: a type of reflection-in-process if you will, where the designer is seen to alternate between embodied and disembodied modes. Therefore, when reflecting, a designer cannot be situated in the context of action itself, which stands as a questionable issue of Schön's account (see also Newman 1999, 154). Schön (1983) further explains that in engaging in action, the practitioner is exercising a 'theory-in-use', and when a conflict between what was expected and what occurred happens, learning happens. This is in effect where 'reflection-in-action' is seen to occur: 'when intuitive performances lead to surprise, pleasing and promising or unwanted, we may respond by reflection-in-action' (Schön 1983, 56); which further supports the interpretation that 'reflection-in-action' occurs when an event becomes 'present-at-hand' and we temporarily process the world around us through resorting to memories. Suppose 'reflection-in-action' is to be seen as a response mechanism to surprise or conflict; in that case, one may question whether there may be parallels with Vera and Simon (1993) idea, described earlier, that situated actions occur in moments of immediacy or urgency?

Furthermore, the example Schön chooses in contextualising 'reflection-in-action' is the case of a conversation between the student and tutor in which to arrive at a convergence of meaning in the context of the professional practice the tutor needs to utilise both talking (verbal language) and drawing (pictorial language). In this regard, Schön states that 'drawing and talking are parallel ways of designing, and together make up what I call the language of designing' (1983, 80). However, to be able to discuss how the tutor reflects-in-action, Schön's reliance on the verbalisations of the tutor, pushes drawing actions into the background and talking actions into the foreground, to the extent that talking actions can be assumed as a proxy of drawing actions. Arguably, this practice of analysis itself contributes to a particular framing of the relationship between different types of actions in design which is not necessarily reflective of the nature of design but of the nature of how design has been analysed. Notably, this is later exemplified in the 'see-move-see' model, where an implied linearity (although iterative)

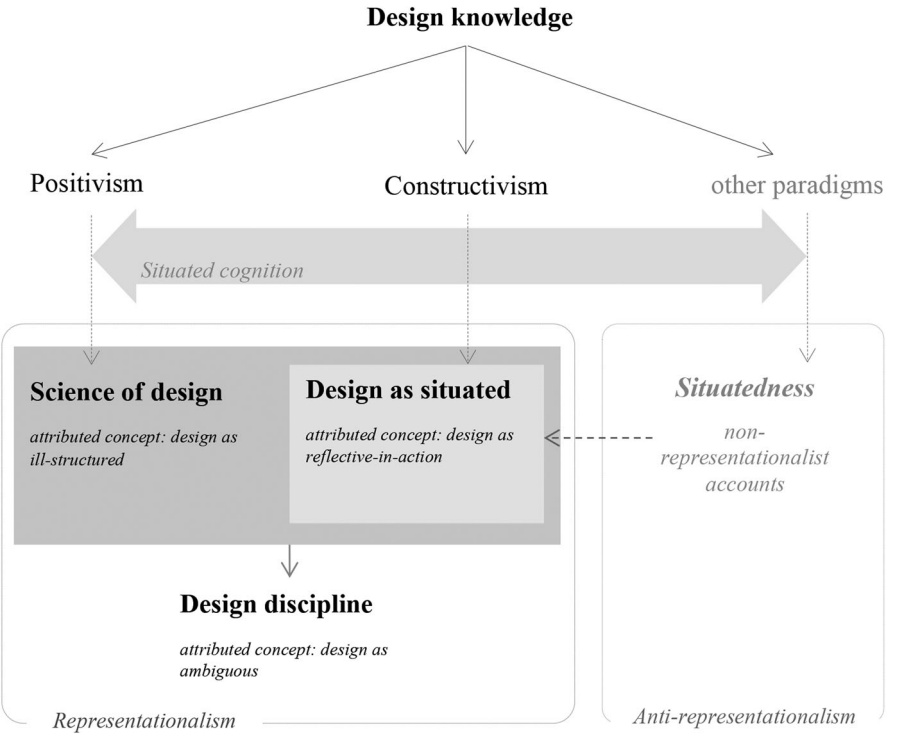

Figure 3. Mapping of Figures 1 and 2, displaying the fundamentally representionalist framework overaching developments in the 'design discipline' line of enquiry.

between actions in designing, is proposed: 'the designer constructs the design world within which he/she sets the dimensions of his/her problem space, and invents the moves by which he/she attempts to find solutions' (Schön 1992, 11). In Schön's writing this observed iterative linearity has solely been related to limits in a designer's ability to deal with complexity, where during the act of drawing itself, one cannot be cognizant of intentions, and no further clear due consideration is given to how the context in which the phenomenon is being analysed in may contribute to such reading. This latter can be regarded somewhat distant from what anti-representationalist oriented scholars insist on, that the 'social scientist's practice must be analysed in the same historical, situated terms as any other practice under investigation' (Lave 1991,67).

Based on the above, there may therefore be as Hébert argues an 'implicit rationalism' (2015, 366) within Schön's framing of 'reflection-in-action', that has not been able to fully account for issues of embodiment of an experience (see Erlandson 2005). Although Schön does not talk about representations and processing of symbolic systems, his epistemology of practice differentiates actions intertwined in a practice based on their epistemic function, in such way that the complexity of the dynamics and context of

practice is reduced to a set of temporally ordered processes. Here, I have not intended to provide a critique of Schön's epistemology of practice, but rather to highlight that his classification of different forms of knowing and theorisation about how they unfold, provides a basis for converging the notion of 'reflection-in-action' with the more representationalist oriented accounts of Situated Cognition.

Figure 3 thus provides a mapping of Figures 1 and 2, whereby the 'science of design' subsumes 'design as situated', nested within a representationalist vantage point. This is of course not to say that design research has only progressed within a representationalist framework, but its prominence particularly in the infancy of design research and the uncritical acceptance and attribution of its emanated concepts to the nature of design, renders this line of development as one in need of much rethinking.

The issue with ambiguity

As discussed, 'design discipline' anchored the understanding of design on the 'science of design'. This sustained an interest in representationalist oriented accounts. As such, to underpin reasons for the ill-structured nature of design, Goel (1995) argued that the traditional Computational Theory of the Mind (CMT) does not suffice in fully explaining the ill-structured nature of design on its own. He turned to observing and analysing what designers do. He posited that the sketching that designers do bears a symbol system that is ambiguous. Although ambiguity was initially framed as a property of sketching, he also implied it to be a necessity in early-stage ideation, in facilitating the exploration and development of alternative solutions (what was labelled as 'lateral transformations' (p.119)). As was claimed, 'lateral transformations need to occur during the preliminary phase of design problem solving and that the density and ambiguity of the symbol system of sketching facilitate these cognitive operations' (1995, 194). He then set out to test this claim by comparing the symbol system of freehand sketching and computer-aided drafting, the latter of which he claimed to be non-dense and unambiguous. By showing that in processes of freehand sketching designers depict a higher frequency of interpretations, it was concluded that the symbol system of sketching is more ambiguous and hence facilitates better opportunities for lateral transformations.

While I do not intend to refute that design(ing) can display ambiguous characteristics or criticise the account put forth by Goel (1995) based on it representationalist orientations, I believe the way in which the above description of ambiguity became adopted into design research created issues of significance. First, it framed ambiguity as an intrinsic property of design and a goal for design support tools. Second, it strengthened the

possibility of quantifying abstract concepts as a means for comparing design processes, through identifying frequency of occurrence of a particular class of design actions (for example, refer to the design protocol studies of the late 1990s and early 2000s).

Following the notion that a symbol system was either ambiguous or not (Goel 1995), the ambiguity of the traditional methods of design, such as freehand sketching, was regarded by some studies as a reason for provision of better support for creative design thinking compared to computer-aided tools (for example, see Bilda and Demirkan 2003). Therefore, this implied that if Computer Aided Design (CAD) tools were to support ambiguity, they would have to employ the symbol system of sketching. Leading on from the attribution of ambiguity to the nature of design, some researchers proposed CAD interfaces that were paper-like, based on the assumption that 'an interface for design should capture the users' intended ambiguity, vagueness, and imprecision and convey these qualities visually and through interactive behavior' (Gross and Do 1996, 183). Nonetheless, the development of new media and tools, is challenging this notion of ambiguity attributed to the nature of design (Tahsiri 2018). While in a conventional representational mode, conducted through freehand sketching, the interlinks between ambiguity and reflective practice may withstand: 'the designer makes a drawing, which stimulates recall of similar forms, visual analogs, or rules and constraints; and the designer reacts in turn by making another drawing. If the drawing is vague or ambiguous, so much the better for stimulating a wider range of recall' (Gross and Do 1996, 183), in a non-conventional mode an altered manifestation of situated practice is revealed. In an algorithmic environment for example, the design process does not progress through the direct manipulation of underdetermined visual representations but rather through the definition and unfolding of logical relationships (Castelo-Branco, Caetano, and Leitão 2022) and thus the flux in the meanings that visual representations may bear in a conventional mode of practice may no longer apply in alternative modes of practice. Arguably, for any concept such as ambiguity, to be regarded as an intrinsic property of design(ing) and a basis for design support tools, it must prevail regardless of the shifts in the practice of design.

In light of the above, one of the advantages of developments in media and tools in design is that it highlights design to be a cultural phenomenon that is fluid in nature and can take up many attributes depending on how it is practised, positing that there may be 'no single definition of design, [… , that] adequately covers the diversity of ideas and methods gathered under the label' (Buchanan 1992, 5). Therefore, to theorise about design based on isolated renditions of design can not only lead to a partial picture but also bound possibilities for the enactment of design. Respectively, Melles (2008,

7) advocates for methodological plurality, moving away from theory building within design research, towards a more pragmatic and mixed-methods platform, that expands 'beyond the qualitative-quantitative divide to include the material and visual elements of design fields'. These extended acts of looking at and engaging with the phenomenon under question can indeed provide grounds for a better integration of time and context in which design occurs into the research process. At the level of methods, approaches are required that can account for non-exhaustive designer-environment coupling possibilities whereby specific characteristics of a particular coupled system (for example, the observed ambiguity of designer-freehand sketching) is regarded as one possible manifestation of design among many. In addition, they should allow a better consideration of temporality of characteristics attributed to the nature of design, in that once a particular coupling becomes obsolete, its associated characteristics may too cease to be relevant to the discourse and understanding of design.

Where to go next?

As highlighted in this paper, striving towards a 'design discipline' inevitably reduces the manifestation of design within a quasi-paradigm that combines concepts derived from different frameworks into a unitary construct. Moreover, it flattens the distance that should consciously be sustained between the framework of inquiry and the phenomenon under study, to the extent that design becomes a phenomenal extension of that framework. Although the fluid and amorphous quality of design itself would have contributed to the emergence of 'design discipline', paradoxically, the way 'design discipline' has been framed does not accommodate a fluid reading of design.

So where can design research go from here? What is clear is that design research now possesses an abundance of texts about design, but what remains to yet be developed is an infrastructure for sense-making of methods, concepts, and theories in relation to one another. Respectively, Love (2000) notes that this has led to an overcomplicating of paradigms of design research and thus puts forth a meta-theoretical analysis method, as a way of outlining the underlying theoretical basis of different paradigms and assessing their epistemological usefulness. I would like to extend on this and argue in favour of a *hermeneutics of design*, which I believe can bring focus to the implications of using different research paradigms on the construction of design knowledge. 'Hermeneutics is the theory and practice of interpretation' (Paterson and Higgs 2005, 342). Hermeneutics encourages us to compare parts in relation to a whole and vice versa in coming to an understanding of a phenomenon. Discourse around hermeneutics and design(ing) are not new (see Coyne and Snodgrass 1992, 1991; Jahnke 2012; Pérez-Gómez 1999). In

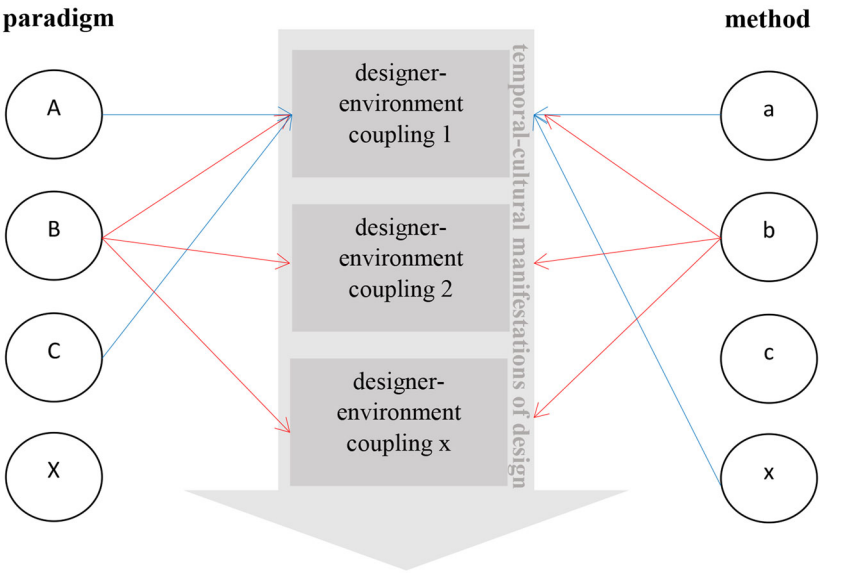

Figure 4. A paradigm-method plurality scheme for empirical studies of design (hypothetical scenarios are shown in different colours.

fact, in design research, it has enabled a way of transcending the subjective-objective arguments, by seeing both subject and object as participants in a 'game of interpretation' (Coyne and Snodgrass 1995, 46). While I acknowledge *design(ing) as hermeneutical* as one among the pluralistic readings of design, through a hermeneutics of design, I am interested in a meta-methodology that can support the meaning-making process of design. By scrutinising texts in relation to the context in which they arise from, it becomes possible to understand why and how certain concepts are attributed to design and evaluate their relevance considering other texts. Dorst (2006, 17) arrives at a similar conclusion in reviewing paradoxes within Simon's conceptual framework. He proposes a different way for understanding the nature of design by describing design 'as the resolution of paradoxes between discourses in a design situation'. By engaging in a cyclic reinterpretation of previous knowledge in light of the new, a tradition of critique that parallels the continuity of empirical design studies can mitigate conceptual confusions that may arise from paradigmatic and methodical diversifications.

Additionally, as highlighted in the paper, a paradigmatic and methodical plurality is required for foregrounding the temporal-cultural makeup of design within empirical work and analysis. Figure 4 presents this scheme.

At the level of methods, a singular method may consider plural conditions of the designer-environment coupling in its analysis, or multiple methods may be used in analysing one designer-environment coupling. At the level of paradigms, a singular paradigm can be used to form multiple lines of

enquiry pertinent to different designer-environment couplings or multiple paradigms can be used to form multiple lines of enquiry for a singular designer-environment coupling. What becomes clear in this proposed scheme for paradigm-method plurality, is that design knowledge is resultant from the synthesis of findings of multiple lines of enquiry rather than from one line of inquiry that converges multiple methods or paradigms. This scheme is intended to allow plurality to operate at the level of an individual study, meanwhile the hermeneutics of design will examine and make sense of paradigm-method plurality across studies in moving towards a more structured and comprehensive understanding of design.

Notes

1. In this paper, design knowledge is understood as the collective knowledge about what it means to design, wherein design is seen as a type of knowing in its own right.
2. Chemero (2009, 17–18) draws on Fodor and Pylyshyn's (1988) classification of 'representationalism' and 'eleminativism' and goes onto add that eleminativism reflects the type of account held by American pragmatists, who are basically anti-representationalists. Therefore, in this paper, I refer to the two overarching classes of theories of the mind as representationalism and anti-representationalism.

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