WHY IS MAKING IMPORTANT FOR THE CULTURE OF DESIGN?

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Abstract. A select review of making in design in an epistemological framework presents two dominant approaches and a less practiced third approach. Whereas the first two value the control and accuracy in the processing of information, the third values the uncertainties in the processing of materials. Whereas the first two rely on final product and prior knowledge, the third relies on the processes of formation and flows of matter, and thus is key to a dynamic and sustainable model for design.

Keywords. Making; representation; hylomorphism; design culture.

1. Introduction

The ontological views of the material world, namely the Cartesian metaphysics that separate the mind and the body, and the Aristotelian hylomorphic model of creation seem to dominate our understanding of design today. Maintaining the physical matter, or the product, as a static and passive outcome of predetermined human thought, and making as the imposition of form upon the physical matter with a design in mind, these views frame design as an immaterial, fully intellectual activity. Ironically, the products of design are often material. There is therefore a great discontinuity in practice between the conception and the execution of a design idea, and in return, a disconnect with the environment, as both the resource and the habitat that receives. Perhaps due to skills gained in training, designers often do not design through matter but instead seek the right materials and techniques on the market to materialize their design ideas. The lack of interest in matter prevails in post-production: the behaviours of the materials over time are often not taken into consideration.
In this paper, I explore the alternative framework where design and making, form and its matter, as well as minds and things, are not only causally linked, but strictly interdependent. Recent findings in cognitive science research on embodied and situated cognition as well as in anthropological studies of creativity shed light on what it means to make things. Ideally, form of a thing emerges from the making process itself, established through the active engagement of the maker “with materials that have their own inclinations and vitality” (Ingold, 2013, p. 26). In return, the things we make “mediate, actively shape, and constitute our ways of being in the world and of making sense of the world” (Malafouris, 2013, p. 44).

Pérez-Gomez (2012) states that tools are never neutral as they underlie the whole process of generation of form. As design tools change over time, it is not only the design and its manufacture that undergoes change but also profoundly the thinking of design, its concepts and its language (Thomsen and Tamke, 2009). With the advent of digital fabrication tools and technologies, material practices commonly reappear at the centre of design activity. Is the long existing hylomorphic doctrine in design finally being challenged? If making remains solely “the hierarchical assembly of [digitally] preformed [material] parts into larger wholes” (Ingold, 2013, p. 26), I argue that it cannot yet be considered an integral part of the design activity. Digital fabrication protocols have compulsory predetermined instructions before materialization, and so require precise control over the process.

Only when the material process is favoured as a creative endeavour and over the outcome, we may then begin expecting to encounter with the uncertain. Brancusi observes that subject and form both come from “within matter” and not “forced upon from without” (as cited in Bach et al, 1995, p. 23). In DeLanda’s words, this is “teasing out a form from the material”, rather than “imposing a shape”, where the makers act “more as triggers for spontaneous behaviour and as facilitators of spontaneous processes than as commanders imposing their desires from above” (2002, p. 135). From this perspective, a high-tech making process is deemed ideal when digital fabrication tools are used, not to materialize predefined forms with accuracy but are rather intermediary aids during form finding processes. As such, a process is a making for process (Gürsoy and Özkar, 2015) where materiality, with all the sense experience it comprises of, becomes a design drive. This way tools are constantly changing, adapting to unique situations, and an open community develops to share them. I claim that this inclusive and pluralist view can be the key to establish a dynamic and continuing culture of design that relies on the processes of formation and flows of matter instead of being driven by final products fulfilling templates of prior convictions of experts and authorities.
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In the following section, I elaborate the existing views: how the Cartesian opposition between the mind and the matter, and the representational view of mind emerging thereafter, together with the *hylomorphic* ontology, result in an immaterial conception of design.

2. The backdrop to design as an immaterial activity: symbolic representation and *hylomorphism*

The way we relate with the material world significantly affects how we position ourselves within the world of material things. Western thought, now in the Anthropocene, seems to have been long nourished from ontological and epistemological views grounded on dichotomies separating the immaterial and the material, such as mind and body, minds and things, subject and object, as well as form and matter. Eventually how we shape the world around us has been deeply affected by the way we shape ourselves as the dysfunctional relation of an inner mental entity (the mind) and a material external entity (the body).

Symbolic representation, a consequence of the Cartesian division of the mind and the body, is considered as an intermediary process that feeds the mind with information from the external world and that defines how the mental contents are externalized and materialized by way of various sorts of behavioural output into the world. The mind, in this representational framework, is a “storehouse of passive internal representational structures and procedures” (Malafouris, 2013, p. 25). It is located *inside the brain*. This *intracranial mind* relates with the material world through symbolic externalizations of preconceived mental images. In design, this corresponds to representational drawings and models. According to this representational view, what is outside of the brain is outside of the mind, and the cognitive processing occurs in the brain between perception and action. The representational framework, to a large extent, remains the dominant paradigm in present-day cognitive science that conceptualizes the human mind primarily through representation and information processing. Together with the *hylomorphic* doctrine, they shape the understanding of design as an immaterial, cognitive activity.

*Hylomorphism*, initially credited to Aristotle, is the ontological view that all substances are constituted of form (*morphē*) and matter (*hyle*). Form gives the substance its very essence and identity and actualizes matter, thus, form is substantial whereas matter is not. Form precedes matter; matter does not inform form. This distinction of form and matter consequently evokes a separation between minds and things, and mental and physical actions.
These dichotomies are institutionalized in many domains within the modern society. However, there are instances where these distinctions become problematic, as in the case of design. Design is directly related with the material world as its outcomes usually depict material things in various forms. However, relying on the hylomorphic view where the form precedes the matter and is conceived in advance in the mind, design remains within the domain of the mind and of the immaterial.

3. Design as an immaterial activity

The concept of design as we use today originates in the Renaissance from the Italian word *disegno*, meaning drawing, suggesting both the drawing of lines on paper and drawing forth of an idea from the mind into physical reality, thus implying a direct link between an idea and a thing (Hill, 2005).

The distinction of design and making originating in the Renaissance is derivative of the hylomorphic doctrine. In Leon Batista Alberti’s architectural writings from the mid-fifteenth century, design is a “product of thought” requiring “the mind and the power of reason” (Alberti, [1452] 1998, pp. 5-7). Similarly, Vasari ([1568] 1998) elevates the intellectual labour in design by claiming that “the greatest geniuses sometimes accomplish more when they work less, since they are searching for inventions in their minds, and forming those perfect ideas which their hands then express and reproduce from what they previously conceived with their intellect” (p. 290).

The superiority of the intellectual labour over the manual labour in design became ever more apparent as drawing became essential to design practice as a mode of representation in the Renaissance. This shifted the role of the designers from master craftsmen to *masterminds*, where, as Ingold (2000, p. 295) puts forth, in one field “excellence is attributed to expertise”; in the other it is “attributed to genius”. Craftsmanship, once a main skill of the master craftsmen requiring the ability to handle the uncertainties and intense manual labour, became irrelevant to the profession of the designers. The new role of the designers as the *masterminds* required mastering new representational skills. The designers do not work “with the object of their thought” anymore, as they work at it “through some intervening medium” (Evans, 1997, p. 156). This complies with the representational view of the mind elaborated in the previous section. The mind, confined within the boundaries of the brain, is now detached from the material world. The communication is possible through symbolic externalizations.

These views and the modes of designing are still dominant today. Tim Ingold frequently highlights and criticizes the dominant hylomorphic approach to creation. Ingold (2010, p. 92) claims that hylomorphism became
“ever more deeply embedded in Western thought” influencing how making is conceived. Form is considered as the particular design in mind, matter as the static and passive outcome of predetermined form, and making as the imposition of form on matter “from without, rather than unveiled from within” (Ingold, 2000, p. 339). In what Ingold calls “the standard view” of making to refer to the *hylomorphic* model of creation, “the form pre-exists in the maker’s mind, and is simply impressed upon the material” (ibid, p.342). It is predefined through abstract representations – either through internal representations in one’s mind or through external representations such as drawings. Thinking and judgment precedes making.

4. Making and the approach of the extended mind

I explore a new understanding of design that is neither bounded within the representational framework, nor *hylomorphism*, but is closer to Ingold’s (2010) new approach -- the “textility of making”. Ingold places emphasis on the movements and cooperation between the material and human action in the generation of form. Referring to the work of Deleuze and Guattari, he suggests replacing the *hylomorphic* ontology with “an ontology that assigns primacy to the processes of formation as against their final products, and to the flows and transformations of materials as against states of matter” (Ingold 2010, p.92), therefore thinking through and with the matter. In this alternative approach, the maker effects an ontological transformation in the material, “not through the application of exterior force to inert substance, but through intervening in a play of forces and relations both internal and external to the things under production” (Ingold and Hallam, 2014, p. 4). We call such process in design a *making for* process where uncertainty in the processing of the matter is valued over the control and accuracy in the processing of information (Gürsoy and Özkar, 2015). Conceptualization does not necessarily precede materialization, but instead evolves through the interactions with the materials. The design processes, as well as its tools, are open to constant change, adapting to unique situations. Design and making, form and matter, as well as minds and things are interdependent. This transformation in the material is the outcome of an experience-based connection of the maker-designer, which can be a non-expert as well, to the material at hand.

*Making for* processes are neither dependent on scale nor determined by the tools and technologies employed. Hence a traditional hands-on craft process such as pottery and basket weaving and a high-tech making process can both be *making for* if the focus is on discovering the uncertainties in making instead of materializing predefined forms with accuracy. The physical mod-
el-making processes of Antoni Gaudi and Frei Otto, for instance, can be considered as making for processes as the models not only represent their design ideas, but also guide their three-dimensional form generation. Gaudi and Frei Otto, instead of imposing preconceived forms on matter, explored “matériaity both as genesis and fabrication of [architectural] form” (Voyatzaki, 2015: p. 14).

Over the last decade, there has been an increasing tendency to implement digital fabrication tools to design practice. With the ease provided by these technologies, material practices are once again in the design scene and among the responsibilities of the designers. Digital fabrication protocols, however, require precise instructions and control over the process. Designers have to shape their design representations according to the constraints imposed by the machinery, since machine precision tolerates no mistakes. Drawings once offered the designers a higher status in the Renaissance. Now with the solid interfaces of the digital fabrication tools, the drawing shifts from a measured representation read by the manufacturer, to a direct instruction to the machine. It becomes the "direct handling of the tool, the pressing of the drill or the pointing of the saw" (Thomsen and Tamke, 2009). It is at this critical point that the problematic aspect of the contemporary making arises: attention is directed to how closely the materialized work resembles its digital master rather than how the ideation process is shaped through the materialization of the digital. I argue that in the first case, making cannot yet be considered an integral part of the design activity as design still remains within the immaterial domain.

In Figure 1 and Figure 2, I present a selection of examples, which comply with the making for framework, thus challenge the hylomorphic doctrine and the representational view of mind. The scales of the examples range from the scale of a vase to that of a weekend house. This highlights the insignificance of established professional boundaries when making is at the core of design activity. A material experiment or knowledge can be translated across different settings and scales. In the examples presented in Figure 1, sheet materials gain variable flexibility by regularly arranged cuts. In all of the examples, the material aspects are open to exploration once the slits are cut. The effects of the cuts on the material affordances and constraints are usually unpredictable in advance. The physical interventions yield to emerging shapes and three dimensional form configurations, thus become design drives. In the three examples presented in Figure 2, final forms emerge through the “flows and transformations” of plaster, porcelain and concrete. In all three cases “processes of formation” are essential and constitutively determine the outcome instead of being predetermined by static moulds. As such, design is a material activity and making is an integral part of design.
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Figure 1. First row: EmTech (AA) + ETH Pavilion, conceptual model and the full-scale pavilion. Second row: Air Vase by Torafu Architects. Third row: Dukta. Fourth row: The Wooden Waves by Mamou-Mani, prototype and design.

Figure 2. Top row: P Wall by Matsys. Bottom row left: Sponge Vase by Marcel Wanders, and right: Trufa by Anton Garcia Abril.
Recent findings in cognitive science provide further support for the making for framework. Against the representational view of mind, a number of theoretical frameworks have been established in cognitive science over the years. These include extended cognition (Clark, 1997), embodied cognition (Lakoff, 1999), distributed cognition (Hutchins, 1995), enactive cognition (Varela et al, 1991; Noë, 2004), and situated cognition (Clancey, 1997), with a common point that the material world is a constitutive part of the cognition, challenging the mind/brain association and mind-body dichotomy.

In the embodied cognition framework, the body no longer passively contains the mind, but actively shapes it. The hand in particular, is not a tool to implement what the mind dictates; it effects how the world is perceived. As put forth by Lakoff (1987), “the very structures on which reason is based emerge from bodily sensorimotor experiences” (p.368).

In distributed cognition, besides the primacy of bodily experience in the structuring of human conceptual processes, the boundaries of the mind extend beyond the limits of the body to accommodate “the constraints and affordances of the material reality with which it is constitutively intertwined” (Malafouris, 2013, p.66). Material world is not only the passive background of the embodied activities but becomes “a cognitive artefact”. Similarly, external representations are not simply physical records of the inner mental states, but are extensions of those states. How we externalize our mental contents onto material things actively shapes us. This suggests an on going dialectic of creating things which in turn creates us, where “cognition and action arise together, dialectically forming each other” (ibid, p. 74). These frameworks reverse the hylomorphic model: it is not the mind that imposes its forms on material objects, but rather the latter that give shape to the forms of thought (Gosden, 2005).

5. Conclusion: tools, technologies and the culture of making in design

According to Bergson ([1911] 1944) the “constant characteristic of man and of intelligence” is Homo faber and not Homo sapiens, thus “the faculty of manufacturing artificial objects, especially tools to make tools, and of indefinitively varying the manufacture” (p.153). Similarly Malafouris (2013) argues that the tools are “enactive cognitive prostheses” with which we define and shape ourselves (p.154). In the context of design, as Pérez-Gomez (2012) states, tools underlie the whole process of generation of form. Every tool leaves its trace on the material surface with which it gets into contact. This holds true for digital fabrication tools too. However perfect the digital master is, its materialized outcome will always bear imperfections and traces of the fabrication tool. There is still neither a 3d printer that prints surfaces on
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which the trajectories of its nozzle cannot be traced, nor a CNC milling machine that does not leave the traces of its drill. By way of treating these imperfections as emerging design features, or discoveries the process can become one of making for and break from the “rather tantamount withdrawal of the producer, in person, from the centre to the periphery of the productive process” (Ingold, 2000, p.289).

Knowledge acquired through material engagement and making have long been deemed essential in various pedagogical frameworks, including constructivism (Dewey, 1938; Piaget, 1953) and constructionism (Papert, 1980); and more recently in critical making (Ratto, 2011). Yet a making-centred culture of design is still uncommon in the profession and education despite the well-known historical examples such as Bauhaus, Vkhutemas, and Ulm School of Design. It is through the developments in the digital fabrication tools and technologies in the last decade that we have started to discuss making alongside design, in an embodied and enactive model that extends the mental processes into the world of material things. The technological and social developments also instigated an open design and maker culture that educated designers start to acknowledge as the scope of design knowledge expands in range and to a broader community. This, however, is only the beginning. As we have illustrated above, a culture of making in design emerges only when the material process is continually the drive of the creative endeavour over the outcome.

Multiple examples in our review are testimony for an emerging potential of an inclusive and pluralist culture of design. These examples can be expanded to non-expert designs and makings, too. The approach of making for narrows the gap between the conception and the execution of a design idea, and in return helps preserve the natural and social resources as well as give back to the habitat. A dynamic and sustainable culture of design that relies on the processes of formation and flows of matter can relocate designers at the centre of the materialization processes.

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