

Parametric design thinking: A case-study of practice-embedded architectural research



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The paper highlights aspects of a particular parametric design thinking (PDT) distilled from practice. It describes the components of PDT – cognitive model, design method and information processing model – that are critical to an efficacious, collaborative search for solutions to architectural problems. The aspect related to the information processing model is afforded a detailed examination, synthesising the state-of-the-art in practice and research. Lastly, case studies spanning six years trace the transfer of methods and knowledge from collaborations and prototypes into projects of Zaha Hadid Architects Computation and Design group (ZHCODE). These exemplify the role of a shared language of geometry and several process related aspects of parametric design critical to its success.

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Keywords: parametric design, design research, research methods, digital design, computer aided design

The distinction between practice and research in architecture is often blurred, and routinely, the act of building is considered research in itself (Till, 2007). Operating in such a context, this paper will highlight a particular form of computationally augmented *design thinking* and its contributions to architectural knowledge. Highlighting the aspects of such a of design thinking, as excavated from a practice-embedded architectural research, drawing attention to the distinctions and synergy between practice and research in architecture, and case-studies of contemporary research and practice spanning six years, form the main contributions of the article.

1 Practice-embedded architectural research

The purpose of an architectural research within contemporary practice, it will be argued, is to generalize a relevant design thinking or method. Such thinking, in turn should be able to synthesize architectural knowledge that can be disseminated to a wider audience other than those involved in the project. The terms of architectural research and parametric design thinking are first briefly expanded and subsequently the practice-embedded architectural research is posited as yielding their combination.

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www.elsevier.com/locate/destud
0142-694X *Design Studies* 52 (2017) 115–143
<http://dx.doi.org/10.1016/j.destud.2017.05.003>

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Architectural research is often misrepresented as mentioned previously. It may be interesting to consider that the Royal Institute of British Architects (RIBA), in its advisory related to R&D tax relief (RIBA, 2012), indicates that architectural research, must contribute directly to the advancement of science or technology. It further notes that science and technology are firmly rooted in the understanding of the physical, material world and its application.

However in a broader sense, architectural research can be considered as:

- a systemic generation of communicable knowledge (Archer, 1995), that involves a deliberate, planned enquiry posed in relation to a task at hand. This includes an explicit intention to make it intelligible to an appropriate audience.
- research *in, through* and *for* architecture (Frayling, 1993), with scholarship in architectural and construction history, development of software, gathering of reference and inspirational materials being examples of each respectively.
- as an *archaeology* of the tacit research that happens in practice (Till, 2007) and generalising it into communicable Research.

Design thinking as a form of solution based thinking, was originally posited in contrast and comparison to the so-called scientific method of knowledge creation (Archer, 1981; Cross, 1982; Simon, 1996). Specifically, design thinking thrives in contexts – termed *wicked problems* (Churchman, 1967; Rittel & Webber, 1973) – where the problem is either ill-formed and/or highly non-linearly connected with the solution i.e. situations where the linear method of problem description and problem solution (Archer, 1979; Dorst & Cross, 2001) might struggle to find solutions. Exact definitions of design thinking have been the subject matter of many symposia including the seminal *Conference on Design Methods* in 1962, 1965 and 1967. In short however, design thinking might be considered as a form of solution oriented thinking that arises from an intersection of a *cognitive model* of the activity – the broad picture of what is thought of as being done, *information processing models* and *methods or procedures of design*.

By extension then, *parametric design thinking* (PDT), the theme of the current issue, may be considered as a computationally augmented form of design thinking. It operates specifically within and in relation to the medium of Computer Aided Design (CAD). It seeks a symbiotic and synergetic relationship with the sciences, particularly computer science.

Practice Embedded Architectural Research (PEAR) arises from the combination of the three specific notions of architectural research noted previously with the understanding of design thinking above. The objectives of such an embedded research may then be thought of as excavating from practice, a design thinking that is communicable. Specifically, it focusses on excavating

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