

A Critical Analysis of How the Digital Design Process Relates To Architecture and Design

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'... cultural categories and concepts are substituted, on the level of meaning and/or the language, by new ones which derive from computer's ontology, epistemology and pragmatics' [Manovich, The Language of New Media, pg.64]

Introduction

Contemporary architecture and design are experiencing an unprecedented period of innovation and adaptation – retooling and developing mechanisms to meet the demands of a heavily networked post-fordist society (Schumacher 2008). Whereas mass society was once characterised by a single universal truth – consumption – our socio-economic condition has now evolved into an amalgamate order of pluralism, characterised by burgeoning lifestyle and career differentiation and environmental uncertainties. In light of this, the disciplines of architecture and design find themselves in a transitional period in which the urgency lies in the recognition and articulation of the varied complexities of contemporary society.

Societal Movements

It could be argued that the last time that the societal condition was faced with such urgently necessary and substantial cultural change was in the late 19th and early 20th centuries when the Modernist movement emerged as a reaction to the technological and economic fallout from the Industrial Revolution.

The 19th century saw the Industrial Revolution's invention of mass production and with it the inexorable exploitation of novel manufacturing techniques and material use. New means of production made products previously reserved for the cultural élite available to the middle classes. Products of this new paradigm were largely superficial facsimiles of furniture and interior objects that referenced 'the skills and virtuosity of individual crafts[people]' without the cost and labour implications that are necessarily embodied in true craftsmanship of this kind (Woodham 1997). The resultant artefacts lost credibility in terms of their translation from beautifully hand crafted artefacts to ill conceived mass produced products. Nicholas Pevsner draws the example of this poor translation in Pardoe, Hoomans & Pardoe's patent velvet pile tapestry carpeting in his appraisal, '...wrong from any point of view' (Pevsner 1991) (Figure 1). This carpeting incorporated an overly elaborate three dimensional pattern which resulted in an uncomfortable surface both to look at as well as walk on. People were '...forced to step over bulging scrolls and into large, unpleasantly realistic flowers' (Pevsner 1991). Pevsner characterises this as total '...ignorance of that basic need in creating patterns, the integrity of surface; and [...] vulgarity in detail' (Pevsner 1991).

In direct opposition to the reinvention of historical artefacts using these new and often inappropriately applied manufacturing techniques and materials, Modernists were ‘...creat[ing] [...] a “machine age” aesthetic truly redolent of the twentieth century which, freed from the shackles of historicism, explored new forms and materials...’ more appropriately suited to contemporary notions of mass-production and societal conditions (Woodham 1997). An economic, social, and political zeitgeist was influencing architecture and product design in terms of the values or meaning structures these might express. For instance, Le Corbusier’s Pavillon de l’Esprit Nouveau installed in the 1925 Exposition Internationale des Arts Décoratifs clearly evidenced his ideological position in terms of the ‘poetics of the utilitarian object’ (Woodham 1997). Le Corbusier favoured purity and standardisation over the excesses of the decorative products that were predominantly found through the rest of the exhibition. Modernist attitudes to decoration in the early part of the twentieth century held that ‘...products that disguised their mode of construction through ornamental embellishment were out of tune with the “spirit of the age” [...] [and] were examples of “bad” design’, a position expounded in Adolf Loos’ *Ornament and Crime* (Woodham 1997).

Fast-forward to 2011, and we again find ourselves faced with a condition of the same urgency and universal magnitude that spawned Modernism. In a contemporary context, Modernism’s reaction to the tenets of the Industrial Revolution has been replaced with a focus on sustainability, adaptability, customisation, and meaning.

Michiel Schwarz and Joost Elffers in *Sustainism Is the New Modernism* characterise a new imperative, one that is concerned with ‘...embracing more sustainable ways of living in an interconnected world’ (Schwarz and Elffers 2010). They state that the twenty-first century ‘...is marked by new attitudes to both manmade and the natural environment, and new approaches to both local and global issues’ (Schwarz and Elffers 2010). The current context demands peoples’ ability to adapt to changing conditions.

Simultaneous to this we see rise of another global imperative in the invention of the internet, and the subsequent development of concepts of customisation and embedded meaning. The level of connectedness that the internet affords coupled with digital capability allows people the ability to cater products specifically to their needs. For instance, contemporary smart phones, although formally identical, can be treated in infinitely different ways in terms of the subjective needs of the particular user thereby imbuing a generic product platform with user specific meaning.

The last decade has seen contemporary architecture and design embrace the digital paradigm as an overarching attitude with the potential to address contemporary cultural multiplicity.

Defining Parametric Design [also Digital Design or Computational Design]

Conceptually, parametric design emerges from the creative exploitation of parametric systems in view of articulating increasingly complex social processes and foundations.

Formally, parametric design refers to the digital technique [thought, approach] in which all design elements and complexes are parametrically malleable. In simple terms, parametric design generates a type of geometric model of which the geometry is a function of a finite set of parameters. This basic premise implies a fundamental ontological shift within the primary elements of architecture and design. Instead of a classical (or thoroughly Modern) reliance on Cartesian geometries, the primitives of parametric design are dynamic geometrical entities. These fundamental geometrical ‘building blocks’ function within animate systems that react to parametric control, and can be made to resonate with each other via programmed scripts (Schumacher 2010).

Parametric design, as a set of techniques, claims relevance on an abundance of scales, from product and interior design, to architecture and urban design. In principle, the larger and more complex the scale of the project, the more pronounced the ability of parametric design to articulate this complexity.

Patrik Schumacher – architect, philosopher and prolific advocate of ‘Parametricism’ (a term he coined in his 2008 essay *Parametricism as Style – Parametricist Manifesto (Schumacher 2008)*) – writes extensively of the ‘superior ability’ of the technique to organise and articulate the increasing diversity and complexity of advanced post-fordist social foundations and ‘life processes’. Schumacher vindicates Parametricism as a vehicle to establish a complex variegated spatial order in which the eventual goal involves the intensification of internal interdependencies within a design, and external affiliations and continuities within large, complex contexts (Schumacher 2008).

In the same paper, Schumacher proposes a set of ‘Methodological Rules’ intended to guide practitioners of the parametric programme/style. He divides the rules into two distinct categories: *Negative Heuristics* (taboos) and *Positive Heuristics* (dogmas). Schumacher defines the negative heuristics as ‘methodologies that formulate strictures that prevent relapse into old patterns that are not fully consistent with the Parametricist ideal’, and the positive heuristics as ‘guiding principles’ and preferred techniques that enable swift and consistent programmatic progression:

Negative heuristics (taboos): avoid rigid geometric primitives like squares, triangles and circles, avoid simple repetition of elements, avoid juxtaposition of unrelated elements or systems.

Positive heuristics (dogmas): consider all forms to be parametrically malleable, differentiate gradually (at variant rates), inflect and correlate systematically (Schumacher 2008).

Implementing Parametric Design

The corporeal implementation of parametric design is still in its infancy. Despite this however, the concept of parametric design boasts universal validity as a valued and mature technique.

The fundamental tendencies that guide parametric design (versioning, iteration, and mass customisation) can be traced back to the beginning of the 1990’s with the key slogan ‘continuous differentiation’ coined by Greg Lynn and Jeff Kipnis. Since then, there has been a prolific dissemination of this tendency as well as a cumulative build up of resolution and refinement within it. In a large part, this development has been facilitated by both the contribution of parametric design mechanisms and scripts, and the willingness of practitioners and educational institutions to utilise them (Schumacher 2008).

Over the past decade, Zaha Hadid Architects (ZHA) has steadily gained notoriety as a leading protagonist of the parametric narrative. ZHA is primarily concerned with the development of large scale, parametrically driven urban projects.

One such project is the 2006 competition winning entry for the Kartal-Pendik Masterplan; a mixed use urban field of 55 hectares, with 6 million square metres of gross buildable area comprising all the necessary programmatic requirements of a city. The brief for the project involved the development of a ‘sub-centre’ on Istanbul’s Asian side to relieve the pressure on the historic centre. The proposed site is composed of reclaimed industrial estates, and is contextually situated within the fine-grained fabric of small suburban towns (Schumacher 2008).

ZHA's Masterplan for the city utilises the inherent context of the site – in particular the converging lines of circulation – as an important parameter for the formal generation of the urban geometry (Figure 2). In parallel with the development of the circulation network (or deformed grid), the design concept introduces the notion of two primary fabric typologies, towers and perimeter blocks, each conceived as generative components that imply a broad range of phenotypical variation. The towers, purposed as articulated cross-towers (Figure 3), are located on circulatory nodes in order to define and enhance the path network. The perimeter blocks inversely correlate height with parcel area so that internal courts morph into enclosed area as parcels get smaller and built forms get taller. 'Pseudo-towers' are formed at specified nodes by 'pinching' the four corners of the four perimeter blocks that meet at such a node. This move allows for the perimeter block type to be adapted to the cross-tower type, consequently creating an overall sense of continuity despite the two distinct urban typologies (note here the adherence to Schumacher's negative heuristics [taboo] – avoid juxtaposition of unrelated elements or systems). The result is a differentiated cityscape that facilitates navigation through its 'lawful constitution' (Figure 4). The masterplan dictates strict adherence to collective site restrictions to facilitate a consistent order complexity which, in ZHA's evaluation, 'supersedes the monotony of older planning developments and the confusing visual chaos that defines unregulated urban growth' (Schumacher 2008).

ZHA furthers their commitment to the continuity of the masterplan through the proposition of a regulated architectural aesthetic. Here 'calligraphy blocks' (Figure 5) – a third fabric typology – have been inserted to aid ventilation of parcel blocks and to conjoin the parcels through the utilisation of a continuous facade (Figure 6). Additional coherence is generated through the formal and aesthetic coordination of landscaped and public spaces (Schumacher 2008).

Despite the achievement of the Kartal-Pendik Masterplan entry (in an economically buoyant middle-eastern context), the ZHA proposal quickly succumbed to a barrage of public criticism – a reality unwanted, but not unexpected.

In his 2008 essay *Parametricism – A New Global Style for Architecture and Urban Design*, Schumacher himself posits that 'the possibility of designing a defined urban field up to 6 million square meters with a single design team' seems 'overstretched and doubtful'. Critics worldwide hastily jumped to augment the stance on parametricism's inability to stand as messianic in the search for a new architectural 'style'.

Urbanist and civic commentator Adam Nathaniel Mayer was scathing in his criticism of ZHA's methods of parametric generation and implementation. In his 2010 essay 'Style and the Pretence of "Parametric" Architecture', Mayer expresses his view of Parametricism as a technique presently lacking in respect for the development of cities:

Anti-contextual and disregarding classic architectural principles such as scale and proportion, parametric designs are better suited for the virtual worlds of video games and science-fiction movies. Just because we have the software to produce buildings that look like the "pods" from the Matrix does not mean that we should build them (Mayer 2010).

Mayer goes onto assert that instead of using the Kartal-Pendik Masterplan as an opportunity to engage with the 'real world' (i.e. appropriate response to context), ZHA continues the tradition of myopic exclusivism within the avant-garde circles of the architectural profession (Mayer 2010).

This sentiment furthers a well-documented line of criticism of contemporary architecture and its exploitation of the 'grand' narrative. Much like the tales of the medieval priesthood that preferred to keep the masses ignorant by communicating in Latin (a foreign language) in order to maintain authority, the illegibility of ZHA's grand narrative promotes a perceptual disconnect and presents parametric architecture as a viscose insularity 'free from the parameters of the site, free from the

parameters of culture, free from the parameters of tectonics and free from the parameters of the environment' (Schumacher 2010).

The tradition of architecture dictates that architecture functions as much via its visual sensation (style, monument) as it does via its organisation (both depend on form). In this way, the organisation of the architecture can only function in its intended sense if it is articulated i.e. made perceptually comprehensible and legible. It is for this reason and no other that the 'authority' of the architect is maintained, as it is 'the architect with his sensibility who remains arbiter' of the organisation and articulation of the desired cultural position.

This practice in itself strikes the nerve of the single most contentious divide in the recent history of the architectural profession; that between the cadre who exalt experimentation and ingenuity of form-making, and those who pursue agendas of 'social relevance and environmental stewardship' (Love).

Whilst the inherent tension between these cultural positions has not yet been fully registered by the profession as a whole, its impact is becoming increasingly hard to ignore.

On the one hand, the situation is generating curious heterogeneous manifestations of self – much like the Kartal-Pendik Masterplan. On the other hand, we see architects reforming their processes to integrate the sustainability agenda into projects, often at the expense of a holistic design process. But in this swing from 'decontextualised digital experimentation' to intensified social conscience, architecture and design is being compromised. Only by examining the inherent causes of this situation can a better approach to design and architecture emerge (Love).

The burgeoning advancement and consequent formal possibilities of computational design have rendered the technique pervasive in the architectural and design professions. The compulsion with which practitioners (especially those new to the profession) pursue the digital paradigm to the 'exclusion of all contextual issues' is astounding. All too often we see projects of varying types embody little more than opaque aesthetic buzz; objects as removed from any context as artefacts in a history museum (Love). Despite the intelligent and constructive work of some practitioners within the field – most notably Neri Oxman, Joris Laarman, Matthias Kohler and Supermanoeuvre – it is too frequently the case that the process of form-finding through input and manipulation of data lacks the nuanced and comprehensive response of the architect/designer.

At the opposite end of the 'ideological spectrum' are those practitioners who renounce the digital paradigm in favour of an insular commitment to a social and/or ecological agenda. A large part of this tendency can be attributed to disciplinary insecurities of relevance in the international debate on global warming. In a New York Times article (20 August, 2009) reporter Robin Pogrebin noted: 'the issue of climate change and the impact of buildings on carbon emissions [are creating] new expectation among clients and the public to look to the expertise of architects for solutions that can help them leave a greener footprint'. Yet just as unsatisfying as myopic digital experimentation is, so is an over-emphasis on research-based outcomes (presented under the guise of good intentions) that neglect the holistic values of the creation of pleasurable and compelling experience (Love).

Conclusion

The current socio-economic and cultural condition poses to the design professions one astutely simple question: 'so where are we?'. What do we now need to do to calibrate the powerful formal possibilities of parametric design with the societal need to reassess discipline priorities? The first step must surely be one of understanding – both, of the complexities and of the requirements of professional practice. If the profession began to meaningfully engage with the context in which they operate, one would expect that a new paradigm would emerge, one that would gain widespread momentum through the relevance of its position. Such a paradigm may then inspire architects and

designers to utilise the capabilities of parametric design to produce meaningful projects appropriate to the current condition (Love).

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