

# Mediating between Architectural Design Ideation and Development through Digital Technology

## *Dynamic Animation Toys and Mediation Methods in Designing*

*Sarah Benton*

*RMIT SLAL Australia, TERROIR Pty Ltd Australia*

*benton@terroir.com.au*

*Negroponte (Negroponte 1969) described how the creative thinking of a designer can become affected by the 'machine' urging the designer to draw a distinction between 'heuristics of form' and 'heuristics of method'. This ensured that by taking advantage of digital technology a symbiotic relationship was maintained between both of these.*

*To date architects have investigated digital tools for generating form and imagery with increasing success, but have arguably fallen short of using those tools for advancing their design methods. The research presented here explores questions not solely focusing on the use of the tools, but on heuristic methods of the profession, to examine the interconnectiveness of the design method and the tool in a symbiotic fashion; to examine the nature of creativity.*

*This paper is taking a critical standpoint about the place of digital tools in an architect's method in the pursuit of poetic architecture and, in particular, its representation, to enable speculation, as opposed to prediction, of ideas in the design process from the early phases.*

*The issue is discussed through the findings of my doctoral research case studies that have proved germane to my particular enquiry, that is, digital mediation between design ideation and design development.*

**Keywords:** *Ideation; development; design process; digital techniques; animation.*

### **1. Introduction**

Negroponte (Negroponte 1969) described the creative thinking of a designer can become affected by the 'machine' suggesting rather that the architectural designer needs to distinguish between 'tool' and 'method' as this enables a more symbiotic

relationship between individual and their tools The research presented here explores the relationship between creative individual and their machines. Up to now architects have been criticized by academics including Tom Kvan and Earl Mark (Kvan, Mark et al. 2003), of exploring digital tools for generating form and imagery but these explorations have not

extended into advancing design methods. The inevitable and inseparable collaboration of man and machine has interested many over history, including the likes of Lewis Mumford (Mumford 1955) and more recently Marvin Minsky (Minsky 1987) and Mitchell and McCullough (Mitchell and McCullough 1991). However, as Tom Kvan and Earl Mark identify, there is still a frequently expressed opinion of academics and architects alike that computers are 'just another tool' filling an ancillary and service role in the design process. So, similar to Negroponte's suggestion, through a complete integration of media there is potential inherent in computation that facilitates new intellectual and theoretical directions in the conceptualization and communication of designs (Kvan, Mark et al. 2003), (Scriver 2006). It is this potential that will be tested in this paper through the integration of media in a series of live architectural practice projects.

One of these medias, digital animation, has been discussed by practitioners and academics, for example Lynn (Lynn 1999), More (More 2001), Spiller (Spiller 2001), Kolarevic (Kolarevic 2003) and Massad (Massad 2003). It has been brought to architectural design practice typically to extend the tradition of the perspective for flythrough representations. Its other use, as Bob Fear identifies (Fear 2001), has been to act as a sophisticated design 'toy' to create morphological shifts in architectural form through movement in reaction to, or in sympathy with, external forces or even ideologies useful in conceptualization of architecture.

The argument in this paper proposes that an architectural designer needs to advance beyond the sole focus on the complex tools themselves as they become fated to delivering predictive outcomes and view tools as 'toys' which can operate as speculative machines. The notion that animation may contribute to conceptual speculation in a heuristic process makes it a relevant digital tool to investigate this dilemma. Furthermore I am suggesting that, through a heuristic method, the many influences on an architectural project, including idea, pragmatics, and form, can be mediated to prioritize speculative

creativity and its communication between the ideation and development stages. A series of case studies, undertaken within the realities of architectural practice, are presented here. The use and outcomes of applying the dynamic animation tools are compared to assess the implications on both creativity and its communication.

## **2.0 Background**

### **2.1 Embedded-in-architectural-practice project**

I am undertaking an embedded in architectural design practice research program with the aim of understanding the factors that lead to change and innovation to help maintain the competitive position of Australian architectural design and its role in the construction industry in the world market (SIAL RMIT. 2005). This program was presented as a chance for architects with at least three years practice experience to act as postgraduate student interfaces between a practice and their desires to understand the deeper implications of digital in design within their more professional realms.

Weld Coxe identified three types of architectural practice; delivery, service and ideas focused practice (Coxe, Hartung et al. c1987). His study of architectural practices showed an incremental increase in the idea-focused practice where creativity and its communication to the multitude of participants in the architectural design process is of high priority in maintaining an innovatively competitive position in today's global market. The aim of this study is to demonstrate that digital media provides a significant advantage to architectural designers in ideas-based collaborative practices, when used alongside traditional tools, by enhancing creativity and communication within the conceptual stages.

### **2.2 The industry partner firm Terroir**

The industry partner firm associated with this project falls under the idea-focused typology. The practice was formed by three directors, Gerard Reinmuth, Scott

Balmforth and Richard Blythe, based over three Australian locations, of Sydney, Hobart and Launceston, who from the outset have contributed equally to the design practice. The firm's primary interest is in advancing its idea-focused architecture through developing their ideology and design processes. The reality of an architectural firm with multiple directors, multiple ideas, practicing over multiple locations led the firm down a very pragmatic path. This path was the early digitization of the practice that fostered a collective conversation about architecture and what its intention is (Blythe 2005; Malpas, Stamm et al. 2006).

### **2.3 The candidate**

My role is primarily of a designer where I mediate between the 'butter-paper' works and conversations of the directors and the design production team. I rapidly found that the 'young' industry partner firm would not be able to draw-out any particular economic advantage from, say, parametric design or other cutting-edge technologies. Rather the digital media has increasingly assisting me in contributing to the creative practices, generating form and illustration to the conversation held over the email based design process.

### **2.4 Action research methodology**

The research presented here is essentially a conceptual and reflective enterprise that looks to my own experience with the industry partner, Terroir, and the knowledge of some broader developments. This paper derives from a conceptual framework that arises out of my own project case studies and my own in office experiences, but has more general application. The basis for the framework is not primarily empirical - the basis is rather conceptual. The research contribution thereby depends on reflection and argument. Procedures were designed to deal with problems in the immediate situation which arose day to day in the operations of my role in the practice. Specific knowledge for specific problems in specific situations was captured. The step-by step process was constantly monitored over varying periods of time

and by a variety of mechanisms (informal discussion, diaries, case studies, personal reflections and follow-up practice discussions). The design of the methodology was an ongoing process itself. (Cohen and Manion 1994; Berg 1998; Jorgensen 1989; Schön c1983).

### **2.5 The ideation and development stages**

The architect has traditionally held a central position in the design process. Their work and interaction with other participants is considered essential for developing good architectural design solutions and building projects (Coyne, McLaughlin et al. 1996). Traditionally the ideation and development stages have been two periods early in the design process affording time to discover, and then explain, appropriate design and cost options (RAIA 2007).

### **2.6 Design tools and methods**

The architect's tools are ever evolving. In days past the use of traditional media prescribed modes of practice. For example the introduction of paper in the fifteenth century led to an intellectualization of building. The addition of geometric projection advanced the manipulation of form and allowed more complex forms to be described and communicated. Drawing by hand allowed the designer to discover opportunities facilitating rigorous euclidean understanding of form and space. With the introduction of digital tools computer aided drafting prescribed increased efficiency to documentation (Allen 2000). As recently as 2003, Kvan et al posited that advancing 3D digital media facilitated intellectual and theoretical directions but it was not yet fully understood or utilized in architectural design practice (Kvan, Mark et al. 2003). A series of case studies at the 'young' industry partner firm made it possible for me to begin to investigate Kvan et al's suggestions and ask what can digital do for the conceptualization of architecture in our collaborative practice so as to describe a place where digital can become more than 'just tools' and play a part in the established and traditional design process.

## 3.0 Case Studies

### 3.1 The Software

The software used in the following studies included AutoCAD, Autodesk 3D Studio Max (3ds); two commonly utilized architectural programs and Next Limit Technologies RF4; Real Flo; a leading physical simulation tool used typically in the film industry.

### 3.3 Case Study 1: Animated House

This project, a residential dwelling, contained a typical programmatic set of spaces including living, sleeping areas and bathing areas, each requiring certain views to be achieved. Due to the client changing the brief Terroir had already designed and documented two designs for the project. After being approached by the client to redesign and develop a third design, one design director suggest to me offhandedly ‘my sense is that the answer lay somewhere between the previous two designed versions’ (Balmforth 2005). From this I decided to see what would happen if I built a digital model of the old design version then one of new and have dynamic digital techniques compute the versions between so that I could speculatively communicate to the team what the versions in between looked like.

One tool in animation software is the tween, a technique in which frames “in-between” 2 keyframes are automatically created. It seemed plausible to me that if I established the 2 design versions as the 2 keyframes I would be able to digitally generate the design versions in between. The configuration of the dwelling’s pragmatic layout was not yet determined, and allowed me the freedom to play with the animation tool with a reduced regard to any pragmatic requirements. The tween tool produced multiple unarticulated building envelopes that I rendered in a transparent material to maintain an ambiguity in the image. I exported the stills into a movie file and emailed it to the design team. The movie was viewed and critiqued by the team. The team found that this

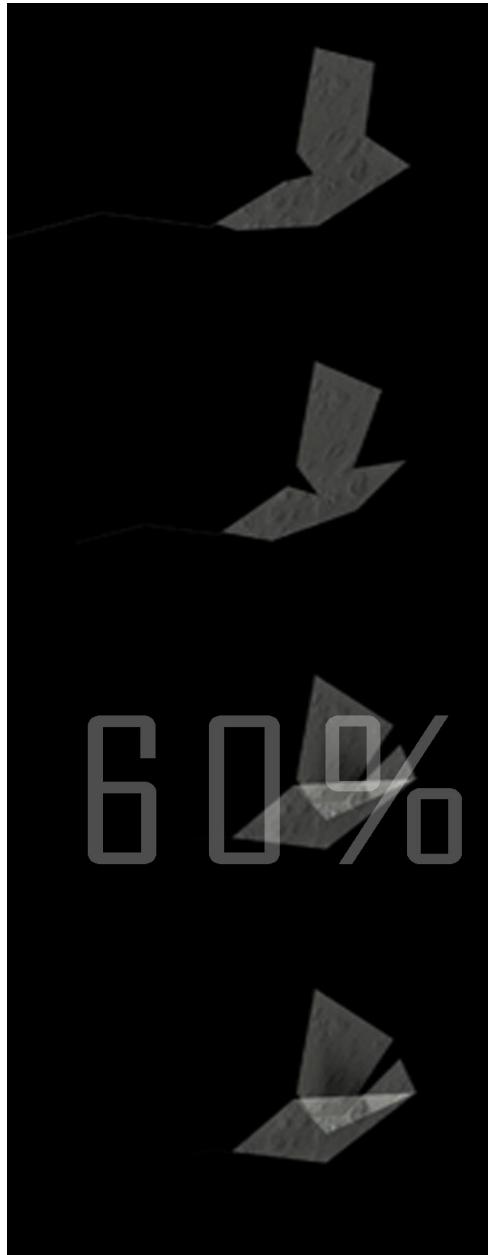


Figure 1  
*Animated House stills*

new representation renewed inspiration for the familiar project and it was agreed that one point, approximately 60% through the morph, best captured the formal idea and met the view and briefing requirements of the client (see figure 1).

Based on the success of this process I was asked to email a set of different views of the 60% stage to one design director who suggestively overlaid pragmatic arrangements by hand which I added back into the digital model. The tween tool was used again to digitally generate the in between design versions of the more detailed model. This process continued, each time developing the design, until the team agreed that the digital object united the main pragmatic, ideological and formal aspirations.

The initial casual request from the director was not meant to suggest a blind use of the technology as a tool such as to not exercise three-dimensional thinking skills. Rather the digital animation enabled discovery and the way the digital form was represented, in a transparent material, enabled ambiguity and speculation for the ideation of the project.

The team found that the animation tool in itself resulted in a purely formal outcome and as such was somewhat dubious for basing the idea of the architectural design upon. However the team conceded that the use of the tool in the interactive process which engaged multiple medias and a heuristic method that worked towards meshing idea, pragmatics and form in an approximate manner, meant that the tool operated beyond a superficial level and, as such, held a valid place in the conceptual and development design process of the office.

This study showed that there remained a need for the creative individual to author parameters alongside the computer's tween tool which suggests that the creative role of the designer isn't removed in the uptake of new digital tools but their contribution adapts to suit any new digital tools and methods. The team has gone on to successfully use this design method in three new projects that present similar problems.

### **3.4 Case Study 2: Hobart Waterfront**

With the findings from the first case study that investigated a commonly used architectural animation tool, an opportunity to test an uncommonly used to architecture animation tool emerged in the design process of a competition. In an early design conversation for this project I noted that the team repeatedly referred to a metaphor of 'turbulence', used to assign a complex overlapping set of ideas, including water and terrain. I had a sense that a dynamic computer program could somehow represent, reinterpret and unite these ideas. A team member had used the uncommonly used tool RealFlo for a project he had undertaken with another firm, and we agreed that running an animation of liquid over the site's terrain would simulate the turbulence metaphor and potentially give a formal representation of the ideas (see figure 2).

Technical problems were experienced in undertaking the task, which were mainly a result of limited computing power. This meant that a body of other design investigations was undertaken by the team, including the more traditional approach of hand drawing 'water flow' over the project site. When the RealFlo stills were finally completed I emailed through a small set of still renderings.

Realflo is a program typically used in the animation industry to simulate water flowing, it is not typically used by architectural practice. Its use in this case study was a reinterpretation of its typical and intended application. The response received regarding the initial images from the team was that the images contributed no more than a form calculated on questionable parameters and was therefore dubious, that is I approximated the contours of the terrain and the computer approximated a water flow. The RealFlo animation was dropped and the other design methods were continued.

Later, whilst completing the presentation panel, the full RealFlo animation had been put together as a movie file. At this point the team was somewhat exhausted as a result of putting together a photomontage, based on images provided

by the competition organizer, of the project idea which was not quite capturing the essence of the turbulence idea. The animation was shared with a director to discuss how the photomontage could be improved. Upon viewing the file the directors responded enthusiastically to the new representation and suggested it best presented the project's idea. As a result some stills were added to the panel at the last minute.

Through this case study I was able to verify that decisively mapping dynamic digital software, both common and uncommon to architecture; within the design process does result in the discovery of innovative and unanticipated formal outcomes. However as a result of the tool's application, through the process of making the idea, it may be realized that there is no productive advancement to the ideology of the project and the tool and the work produced may need to be abandoned.

On analysis of this case study it can be seen that three stages of design occurred that being conversation, speculation, and presentation. As highlighted in this case study, previously abandoned work completed during these stages needs to be regularly reviewed throughout the design process, as it both informs and is informed by the design team. This suggests that the ideation and development process is and needs to be circular as it maximizes creativity.

Both of these case studies also highlighted that the animation tool can operate as a toy, suggesting simple amusement, discovery and play and which can be fundamental in moving a project's design beyond creative stagnation and a team's feeling of exhaustion.

#### 4.0 Concluding remarks and observations

The purpose of this paper was to find the implications of going beyond a sole focus on the tool itself and to understand the relationship between the machine and a designer. Based on the findings in the case studies the following speaks of futures for the creative individual and their machines.

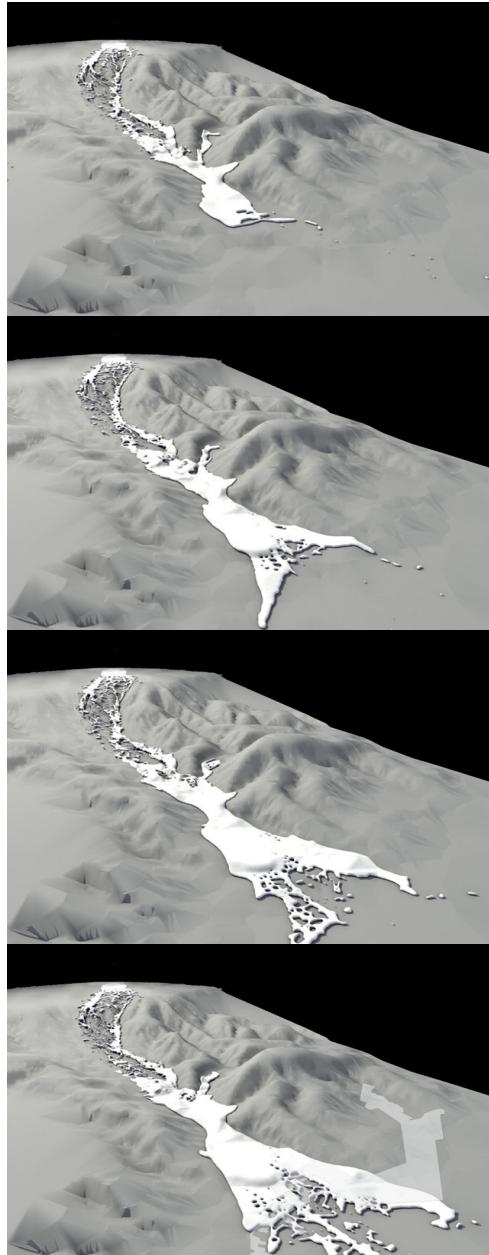


Figure 2  
*RealFlo Animation stills*

#### **4.1 The future of the tool in ideation and development processes**

As a designer in an Australian architectural practice who is expanding the design process to include the use of digital media in the conceptualization process I have been able to understand that a tool can act operatively, similarly to a toy, to facilitate speculation and play. This assists in the creativity of a project as it enables discovery. It also assists in the communication of that creativity through the generation of representations. These can be used to explain both speculative forms during the ideation and refined and predicted forms during design development of a design to a team of people. This approach can move the tool beyond subservience to facilitate conceptualization.

#### **4.2 The future of design methods in ideation and development processes; heuristics and mediation**

Heuristics offers 'soft' methods for drawing towards an approximate, rather than precise, knowledge so as to work toward a problem in a holistic and constructive manner encompassing human observation and experience. Negroponte's suggestion (Negroponte 1969) of a heuristics in method presents an opportunity to coalesce multiple agendas of individuals and tools in an interactive way without removing ambiguity, which is so desired in creativity.

Using a similar approach within the multiple authored industry partner architectural firm Terroir, an integrated and interactive exchange; a 'mediation', saw the creative individual and machine symbiotically move towards an architectural solution. Drawing from Negroponte's heuristics in method and gathered from the findings in the case studies this mediation moves between a human act; of a conversation where the idea was identified, a machine act; generation of a form for that conceptual idea through digital (or traditional) media, a human act; analysis, reflection and adjustment of that generated form, a machine act; reinterpretation or adjustment

of the form through digital media, a human act; an architectural pragmatics overlay where 'reality' was checked. This mediation interconnected the conflicting interests of tool, designer, process, idea and form until the team reached an agreement.

#### **5.0 Future work**

Recent studies have shown that digital tools, in particular the Building Information Model (BIM), are impacting on the typical architectural design process. (Greenway 2006), (Riskus 2006) The changes to how design concepts are translated into the tools architects are using, how the design concepts can be generated and formalized in the tools themselves and how those design concepts are then communicated back to other architects, other industries and clients are having significant impacts on the staging of documentation, fees and architectural roles. This is effecting ideation and development stages and the way we practice design. Our design concepts and ideas need to become less ambiguous so as to translate them into the tools and we need to communicate the ideas earlier to other collaborators. This ultimately pressures the time a designer has for discovery and exploration of design ideas. The shift into using digital tools have some architects who are already using BIM software suggesting that the biggest benefit to advancing their design process by the uptake of these complex digital tools is in increasing the efficiency of their methods to allow them to spend more of their time focusing on high-value design problems (Rinella and Bedrick 2006; Riskus 2006; Greenway 2006).

The case studies in this paper showed that human acts of conversation and thinking about the problem were interconnected with machine acts which generated and made present those ideas. This reaffirms that a creative link manifests as what we think (poesies) and what we do (techne). These are not directly about efficiency, economics and rationality. As such, in terms of predicting the future, it

seems a new issue has arisen where we now need to carefully manage our architectural design process to mediate the external forces of documentation and collaboration, enable a space to continue expanding our toolset and manage our time to ensure design concept exploration, in thinking and in making, can occur as this holistic approach may indeed advance our architectural creativity.

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