TOOLS FOR CONVIVIALITY
Transcribing design

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ABSTRACT: This paper presents the outcomes and findings of a semester long transdisciplinary design studio recently taught at RMIT University, involving students from the disciplines of architecture, industrial design and landscape design. The focus of the studio was to investigate the creation and appropriation of tools for innovative design processes. Drawing on craft theory and theories of design and computation, this paper illustrates how tools can transgress disciplinary boundaries and investigates how an understanding of the intricate relationship between tools, techniques, the media they operate in and the design outcome is the premise of a more informed design approach.

KEYWORDS: Craft Theory, Design and Computation, Design studio pedagogy, Tooling

RÉSUMÉ: Cet article présente les résultats et conclusions d’un atelier de design transdisciplinaire donné à la RMIT University avec des étudiants en architecture, en design industriel et en design de paysage. L’objectif était d’examiner la création et l’appropriation d’outils consacrés aux processus innovateurs en design. S’appuyant sur la théorie des métiers et sur les théories en design et informatique, cet article illustre comment les outils peuvent dépasser les limites des disciplines qui leur sont propres, et il explore comment une compréhension de la relation complexe unissant outils, techniques et médias est la prémisses d’une approche de design mieux informée.

MOTS-CLÉS: Théorie des métiers, design et informatique, pédagogie en atelier de design, équipement
1. INTRODUCTION

The process of designing is an intriguing area for researchers, with its vaguely defined problems and poorly understood procedures that lead to the final design outcome. More often than not, we come across the “black box” analogy, especially in reference to design ideation. However, the ideation phase in design has arguably become more transparent due to the impact of information technologies and the increased interest in design tools and techniques. We are at a period where our self-conscious attitude towards design tools and techniques results in an expanded formal vocabulary as well as a more informed assessment of our design intentions.

This paper presents the outcomes and findings of a semester long transdisciplinary design studio recently taught at RMIT University, involving students from disciplines of architecture, industrial design and landscape design. The focus of the studio was to investigate the creation and appropriation of tools for innovative design processes across different design disciplines.

Drawing on craft theory and theories of design and computation, we discuss how tools can transgress disciplinary boundaries and investigate how an understanding of the intricate relationship between tools, techniques, the media they operate in and the design outcome form the basis of a more informed design approach. By focusing on the coexistence, polarities and tensions between analogue and digital design tools, we aim to illustrate how a new compositional logic can be developed through the nexus between traditional and advanced technologies and how these might influence material processes.

2. RECIPES FOR DESIGN: AN INQUIRY ON METHOD

FIGURE 1. PETER JENNY’S REDESIGN OF ALFRED NEWECZERAL’S 1947 REX PEELER AS A DESIGN TOOL. (GÄNSHIRT 2007).
One of the major inspirations during our conception of this studio was Peter Jenny’s reconfiguration of Alfred Neweczeral’s 1947 Rex peeler as a design tool. (Gänshirt 2007: p.96) Together with Bruce Mau’s Incomplete Manifesto for Design (1998), where he invites designers to make their own tools, Jenny’s redesigned Rex peeler quite aptly summarised our intentions—to analyse conventional tools from within and outside the domain of design in order to subvert their use and explore their potential for informing our design thinking.

As we intended the studio to be a self reflexive and process oriented experience, we sought to recruit students with a preliminary understanding of their individual design methodologies. The prospective participants needed to have already acquired a range of design skills—established a “comfort zone” in their design processes—so that we could challenge them to go beyond their conventional approach throughout the semester by exchanging ideas with students from other design disciplines. The vertical studio system of RMIT School of Architecture and Design, combined with our request for upper level students from architecture, landscape design and industrial design, facilitated the desired level of exchange not only between different design disciplines, but also between different levels of design skills.

2.1. “Destructive Analysis”

“I want to fatten the belt with those instruments that tend us infinitely closer to the precise. If a tool is a refined prosthetic that evolves the self…the more we are introduced to, the further we can tread.

I am curious about tools for designing and process oriented design, where designer is one step removed from immediate outcome. I like the education that a tool can provide in this instance.

I want to script
I want to print
I want to boldly craft using techniques presently unknown to me.”

(Dominique Hall, studio participant, written comment on her expectations from the studio submitted at the start of the semester, March 2008)

The semester started with an intensive period of procedural analysis, where we asked the participants to provide us with a list of their individual design skills and to write up their motivations for joining the studio. There was an equal amount of interest in a traditional hands-on approach and computation, and the studio structure allowed for a training period in their design medium of preference.

The main challenge for students in the first half of the semester was to develop a critical distance from the design strategies to which they were accustomed. By asking for a design recipe from each participant, we aimed to estrange them to their naturalized processes, so as to provide the space for a procedural leap of faith. Polanyi (1958) calls this sort of estrangement from a naturalized
skill ‘destructive analysis’, as it temporarily shifts focal attention to previously unnoticed subsidiary processes, paralysing the very use of skill during the analysis period. We allowed for this shift of attention during the first half of the semester, where we provided weekly instructions in the form of intensive design charrettes, focusing on different portions of the design process.

*figure 2. DESIGN RECIPE BY PATRICK EBERLE.*

Our intention for the weekly design charrettes was to collaboratively build up a repository of analogue and digital design tool prototypes that would be used and developed throughout the second phase of the studio. After an intensive period of weekly presentations and discussions on collectively produced design tools, the students were required to develop and utilize their design tools within the context of a conventional design project for the second half of the semester.
The main strategy we utilised throughout the first half of the semester was to point out a range of possibilities for the designing of design tools. The brief for our first charrette titled *Seek, Destroy and Restore*, called for the analysis of a conventional tool of choice, which was to be subsequently decomposed and recomposed as a design tool. In this instance, we not only tested the students’ understanding of a design tool, but also aimed to expand their cognitive capacities by challenging them to see different affordances in everyday tools.

According to craft theory, the decomposition and recomposition approach is a vital constituent of design understanding, where making and fixing become complementary parts of a continuum. When talking about an act of repair that changes the essential function of a tool, Richard Sennett refers to a “jump of domains” (2008:200). According to Sennett, this jump expands the tool’s previous applicability, while the very act of repair provides the designer with a deeper understanding of its application.

Following the first charrette, we asked students to form groups involving different design disciplines in order to work on the remaining charrettes collaboratively. We also arranged training sessions to familiarise students with available modelling and computation facilities at the school of design. These training sessions involved sessions in the model making workshop, digital prototyping workshop and an introductory weekend workshop in Grasshopper, the scripting platform for Rhino, a popular 3D CAD package. Students were then asked to employ their new skills in the construction of design tools while exploring concepts such as measurement, pattern making, and generative algorithms. In exploring these concepts, they were encouraged to use both physical and digital modelling to develop their tool sets.

While the students produced an impressive set of design tools in the first phase, there was also heated debate about when a tool becomes a design tool. This ambiguity became evident at midsemester, when students were asked to reflect on the work they had done during the first phase and needed to speculate on which tool they want to use in the context of the given design problem. We were initially surprised to see how little students actually thought about why and when they use the tools they developed. However, this apparent lack of critical thinking makes sense within the context of Polanyi’s (1958) discussion on focal and subsidiary awareness in skill formation. In this case, the students had temporarily shifted all their attention to the production of tools at the expense of the bigger picture which would have generated their design intent.
FIGURE 3. ANALYTICAL DRAWING OF AN EGGBEATER, CHARRETT 1, MICHAEL LYON.

FIGURE 4. EGGBEATER RECONFIGURED AS A CASSETTE REWINNER, CHARRETT 1, MICHAEL LYON.
2.2. Convivial Tools

“Tools are intrinsic to social relationships. An individual relates himself in action to his society through the use of tools that he actively masters, or by which he is passively acted upon. To the degree that he masters his tools, he can invest the world with his meaning; to the degree that he is mastered by his tools, the shape of the tool determines his own self-image. Convivial tools are those which give each person who uses them the greatest opportunity to enrich the environment with the fruits of his or her vision.” (Illich 1973)

Considering how contemporary information technologies largely depend on the dynamics of communities of interest and networked intelligence, we designed a wiki site at the start of the semester to be used as an online workbench for information sharing and asynchronous feedback. The students were then able to use the wiki as an active platform for information sharing, as well as a virtual studio space that enabled them to track each other’s progress. This created a positive synergy among the students, leading to the production of an exciting exhibition and a well crafted studio catalogue at the end of the semester.

Our pedagogical approach was mainly based on the idea of collective intelligence. Through our studio teaching, we explored the impact of conviviality in generating an atmosphere that leads to an accumulation of innovative know-how. As the semester progressed, we were increasingly convinced about the critical impact of peer group interaction in the development of skills across design disciplines.

3. FROM TOOLS TO PROCEDURES

Critics of medium theory question whether the tools utilised and the media that they operate in actually determine the nature of the end product (Potts 2008). By focusing exclusively on tools, we risked being overly deterministic about the effect of techniques, while overlooking other factors in design like context or programmatic concerns. However, questioning the nature of a design tool provided us with invaluable insights on how we use procedures when designing.

By focusing on design tools, we introduced students to the concept of physical computation, and invited them to think about performative aspects of design by producing design tools with simple purposes. To some extent this helped us get rid of the “black box” effect, as we tried to unveil the mysteries of design ideation process by showing how small steps can lead to complexity in an end product. In some cases, even a simple geometric device was instrumental in introducing students to rule based geometry and parametric design.
FIGURE 5. ANALYTICAL DRAWING OF AN ELLIPSE DRAWING TRAMMEL, BY SCOTT CROWE.
Associative computational design models are not models in the same sense as cardboard or balsa wood models, but differ from their analogous cousins. They are procedural tools, in which implicit geometry is based on a network of interconnected entities which are described by a system of explicit and implicit design rules. Inherent to a parametric design approach is the initial necessity of having to explicitly define all parameters and rules of the system at the very beginning. This means that the designer first needs to conceptualise the design intentions and to de-compose the design task into discrete parts in order to be able to describe local and global geometric relationships by explicitly defined low level sets of rules and parameters.

By introducing these principles of de-composition and re-composition, we aimed to familiarise our students with a new aesthetic language that expresses a coherent and seamless adaptive logic. By using material or algorithmic tools, students initiated their designs with a governing procedure, a driver, that can be inflected and affected by a combination of contextual, physical and design based parameters.

4. ENGAGING PROCEDURES: FROM MATERIAL EMERGENCE TO ALGORITHMIC EMERGENCE

“One thing we recognized when programming was the inherent scale change that is required when working. Because programming requires the explicit relationship between all objectives and outcomes, working with this interface it was very easy to get lost in detail (it is all detail). […] To zoom in and out
of scales with the project was a major factor in creating something we sought from an entirely new technique.” (Scott Crowe, studio participant, comment on his studio experience, submitted at the end of the semester, October 2008)

Over the past few years we have recognised that students increasingly make their designs software-dependent. Rather than developing a strong design idea and finding or creating an appropriate tool for its articulation, they tend to use readily available software tools. The idiosyncrasies of software increase the students’ tendency to generate designs mimicking the latest style in vogue. This uncritical use of software often confuses style with design, resulting in a homogenised architectural repertoire where expert use of techniques displaces well articulated design ideas.

In his Incomplete Manifesto for Growth, Bruce Mau (1998) identifies software as the reason for the homogeneity of contemporary design and suggests avoiding software altogether. In our case, we did not go so far as to avoid the use of software, but instead raised the awareness that ‘tools of representation are never neutral’ (Pérez-Gómez 2002), and that they do not only change the way we work, but deeply influence how we perceive design problems at hand. We addressed this issue in the studio by intentionally suspending the design on the designated project site until later in the semester while challenging students to design prototypical design tools that could be used for a wide range of scenarios and would assist them in their design methods after the studio.

Without a testing ground of their applicability, tools of design lack the actual representation of their potential. The main focus during the second half of the semester was on testing the developed tools on a selected project site, which was an urban block in the city of Melbourne with a couple of heritage buildings, and a massive redevelopment scheme underway. We allowed the students to select the scale of their interventions, while working on different aspects of the site. In the end, the scales of intervention ranged from urban design to product design, all of which informed the resolution of individual proposals. In the following section, we briefly discuss two main strategies employed by the students through representative projects.

4.1. Material Emergence

One of our main emphases throughout the semester was on the use of physical modelling. Driven by craft theory, we insisted on the importance of workmanship of risk as opposed to workmanship of certainty (Pye 1995), inviting students to follow the emergent properties of materials. This philosophy of design is especially important in the current context of information technologies that increase the tendency towards more abstraction at the expense of embodied knowledge (DeLanda 2001).
In their initial explorations during the charrettes, Scott Crowe and Patrick Eberle produced a series of well crafted physical models. The model seen above is one of their initial site models, produced as an urban pattern making tool that is based on the idea of an elastic grid which changes according to different densities within the site. Following their literal take on the idea of an elastic grid, they produced this model with elastic bands of different lengths and resistances to which they attached pieces of cardboard to act as the non-elastic units of the grid. They then explored the emergent patterns by changing the lengths of elastic bands.

Although Crowe and Eberle moved on to scripting and agent based design towards the end of the semester, their idea of a grid changing according to desired densities developed through this model remained. They later utilised the different patterns created by this model as façade elements in their conceptual collages illustrating their final design proposal. That in itself is indicative of the way students regard their “tools” created for the charrettes – they continually subvert the initial purpose of the tool so that it conforms to their changing needs as their design ideas evolve.

4.2. Algorithmic Emergence

In their final project, ‘Time Machine’, Scott Crowe and Patrick Eberle successfully integrated and combined their design tools that they had previously designed and built in the charrettes. The intention of Crowe and Eberle’s project was to make a programmatic analysis of the given site and to produce a system that would allow for the generation of new master plans while acknowledging both quantitative and qualitative aspects of the site. For their final proposal they developed a computational generative design tool that synthesised an agent-based system and a 3 dimensional Cellular Automaton in order to diagrammatically generate future urban design scenarios for their site.

In comparison to other students who embraced the computational approach, Crowe and Eberle were more adept in bringing their design proposal to the desired resolution. They were able to employ their abstract diagram for gener-
ating a series of future urban scenarios on the project site. In order to achieve more control over the output, they introduced a preferred set of spatial relations in conjunction with the functional proximity relations. Their preferred results were represented in terms of expressive collages, which further explored the spatial potentials of the emergent configurations on a more intimate scale.
5. CONCLUSION

During final presentations our studio generated a heated debate on the issues of tool biases, and whether focusing on the tools would undermine issues such as context and program. Most of our colleagues at RMIT commended the focus on physical modeling in the first phase, while noting that the translation into the actual design solution required further articulation. Another comment was on the positive impact of group work among students from different disciplines and how this enriched each student’s skill base.

Although computational generative design methodologies and parametric design are increasingly being associated with digital software environments, we contend that these can be explored in analogue as well as digital media and preferably, through a nexus of both. This is where craft theory provides us with insights by showing simple tool use as the basis of procedural thinking. A compositional and poetic engagement with tools enables the reconsideration of design practice as a process based on iterative evolution and performance. This is by no means advocating a ‘new’ way to design – we just focus on one niche within a wide ecology of design thinking.

Recent design literature features a range of approaches to the concept of tooling in design (Gänshirt 2007; Aranda and Lasch 2006; Kilian et al.). While acknowledging the diversity of related stances, we aimed to show the possibility of an innovative approach within a broader technological spectrum ranging from hand built design tools to preliminary scripting, as opposed to focusing solely on cutting edge technologies.

As the dominant media change, our perceptive and cognitive faculties evolve to adapt to the changing environment. We believe that a grounded understanding of techniques supported by embodied knowledge would greatly support design disciplines in their pursuit of innovation. Changing technolo-
gies in design require new pedagogical approaches, and it is at these points of inflection that critical reflection on the familiar ways of doing things forms the basis of strategies for defining innovation in design.

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