Advanced Praxis: Synthesizing Digital and Craft in Design

Tonya Stewart
American University of Sharjah, United Arab Emirates
tstewart@aus.edu

Kevin Sweet
American University of Sharjah, United Arab Emirates
ksweet@aus.edu

Abstract: *Digital fabrication practices have allowed for a level of exactitude and precision unattainable by the designer's hand. While the design community has benefited tremendously from developments in technology, certain qualities reflective of craft have been lost as a result of the overwhelming dependency on computer-based processes. In order to reinvigorate a sense of craft and personal expression into design, modalities of education must evolve to incorporate these characteristics with contemporary digital techniques. By combining craft, digital tools and collaborative efforts a new breed of designer will emerge – one that finds a personal voice in a globalized world. This paper outlines these issues as they were explored in an experimental design studio that focused on the integration of craft with digital fabrication methods that included both students of graphic design and architecture.*

Keywords: *digital fabrication, cross-disciplinary, design pedagogy*

introduction

> *"Since the thing is made by human hands, the craft object preserves the fingerprints – be they real or metaphorical – of the artisan who fashioned it. These imprints are not the signature of the artist; they are not a name. Nor are they a trademark. Rather, they are a sign: the scarcely visible, faded scar commemorating the original brotherhood of men and their separation. Being made by human hands; the craft is made for human hands: we can not only see it but caress it with our fingers." (Paz 1974)*

The Industrial Revolution brought the advent of mass production and since that time, there have been designers, artists and craftsmen who have fought to retain traces of personality, individuality, and humanity in the artifacts produced by an age of mechanization. Today, in the age of digitization, the desire for corporeality in design continues. Digital production with its ease of use, affordability, and capacity for "perfection" has resulted in the creation of artifacts that lack all trace of the human hand. These seemingly ubiquitous objects contain no personality or spirit and lack a connection to the maker, any marks of its creation, or a sense of place – where or in what context it was designed and produced.

While technology has provided us the ability to expand the potential of mass production, it has also enabled us new opportunities with mass customization. As we embrace the new possibilities of digital design and fabrication, it is imperative that we take advantage of the freedom that technology allows through mass customization by finding methods that allow us to reinsert a sense of humanity into designed objects. The responsibility of imbibing this philosophy lies in those who educate the next generation of designers. It is the role of the educator to reinvigorate craft into design by deemphasizing the technology and reducing it to its initial purpose – simply a tool among many tools that exist to serve the intent of the author.

The desire to bring the tactile or corporeal once again into design requires the invigoration of craft within digital practices. Digital tools from disciplines outside of the design profession – such as aeronautics, fluid dynamics, and genetics – have been embraced by a new breed of designer and have found a permanent home in this partnership. As technology advances, software develops, and new computer-controlled machines are produced, these tools will continue to gain in prevalence. The technology allows the designer to push ideas and concepts beyond newly defined limits while software provides an efficiency and productiveness that enables the designer to explore novel, complex iterations in shorter spans of time than ever before. The value of these tools hinges on their being introduced during the education of the designer in conjunction with the synthesis of craft-based methodologies, rather than being approached as a sole means of production.

pedagogy

The hybridization of digital media with an ideology founded in craft serves many purposes in the service of education. First and foremost it enables students to get in touch with the reality of materials and their limitations in the physical world. Students are asked to translate digital designs into physical models in a manner that requires them to interact with the material and to discover its unique characteristics and limitations. "[I]n a paradoxical way, the new techniques and methods of digitally enabled making are reaffirming the long forgotten notion of craft, resulting from a desire to extract intrinsic qualities of material and deploy them for particular effect." (Kolarevic, 2008) Without this synthesis, material attributes usually remain hidden in the vacuum of the digital realm as actions are taken upon a virtual entity without regard for the laws of physics, material properties or other real world phenomenon. Students have, in essence, "fallen out of touch" with the real world. While the ignoring of physical limitations during the early stages of the design process is potentially positive in that it allows students to design freely based purely on ideas and concepts without reservations or preconceptions, the knowledge of material qualities and their properties are critical to determining how their virtual objects will exist. For students new to design, many of whom begin the design process in the virtual realm, this interplay between the digital and the physical is key to gaining a holistic understanding of what they intend to create and how they might push the potentials of the design beyond the banal.

Another benefit resulting from the synthesis of digital tools with craft is that students are put in an advantageous position to respond to their designs through adaptation. The digital medium offers a level of exactitude that gives designers a false sense of security. This level of precision tends to lead to unattainable expectations concerning the physical artifact, wherein one anticipates the final product to be an exact duplicate of the digital model. Tolerances and adaptation to errors in the translation of digital data to physical objects are rarely predicted in advance, and as a result, time is lost in the process of redesigning for unforeseen variances. These are important lessons for beginning designers and should be introduced early in their academic careers. By exposing students earlier to the notion that the precision of the computer is an illusion, they become more open to embracing the inexactitude as a welcome result, opening the door for those "happy accidents" that make design unpredictable and unique. It also demystifies the computer and its software, forcing the students to see that the machine is merely a tool at their disposal, designed to help them to accomplish a desired goal.

Finally, through enabling the engagement of both the digital and material during the first stages of the design process, students are confronted by the sensory and psychological impressions of the physicality of what they have created and may better assimilate these qualities with their conceptual and creative ideals. Only through a direct and haptic experience with materiality can the designer begin to draw poetic connections between concept, form and structure. As Pallasmaa elegantly states, "materials and surfaces have a language of their own. Stone speaks of its distant geological origins, its durability and inherent symbolism of permanence; brick makes one think of earth and fire, gravity and the ageless traditions of construction; bronze evokes the extreme heat of its manufacture, the ancient processes of casting and the passage of time as measured in its patina. Wood speaks of its two existences and time scales; its first life as a growing tree and the second as a human artifact made by the caring hand of a carpenter or cabinetmaker." (Pallasmaa, 2000) Often in a digital design process, it is not until the final steps that the object begins to take physical form: introducing physicality during design conception allows students to respond to the subtle and phenomenal qualities of a material. Providing students the opportunity to hold, touch and experience prototypes or elements of a design in material form enables a level of education that may not be duplicated via technology. In the aim to develop designs and objects that nurture a level of sensitivity and connectivity to their human makers, it is vital to accept that the deep design in which we hope to foster is unobtainable through purely digital means. Through the emergence of these ideas, the final outcome will begin to reveal signs of the creator. Objects will adapt and respond to design decisions that have occurred during the process of development. Digital media that was previously used on its own terms can now be directed to the terms of the designer. The synthesis of the technological and the tactility of craft will reinsert the designer back into – and in touch – with the design process. Attention can once again be directed to the process of making and in locating the unpredicted potentials along the way, a process unrealized through digital means alone. By weaving age-old practices with new technologies, an expanded approach to design can be cultivated.

methodology

The ideology outlined above was explored through an elective course that developed the desire and ability in the students to undertake inventive, complex and personal approaches to potential design solutions. To this end, the course introduced conceptual modes of thinking and focused on increasing the skills of the students, both in digital and analog/hand-based practices. Introductions were provided for modeling software such as Rhino and 3D Studio Max, digital fabrication processes such as laser and water jet cutters, mold-making and casting processes, as well as in use of traditional metal and wood-working equipment. The introduction of these tools was carefully orchestrated to coincide with course objectives and timed to require the students to use digital or analog means during specific parts of their assigned work for short periods of time. The constant flux between digital and analog methods was key to teaching an understanding of these skills as a set of tools and not sole producers of the designed object.

While emphasis was placed on gaining technical knowledge and engaging in a fluid, non-linear design process, assignments were introduced foremost as conceptual endeavors with loosely defined parameters. Students initiated the design process by researching their chosen concept via observation (dissecting, probing, testing, drawing, collages, photography), through reading and the collection of images (books, internet), and then by developing a series of preliminary studies in order to establish a visual language based on their ideas and findings. Short assignments resulting in studies and sketch models were conceived to be exploratory and playful, enabling students to discover abstractions and to draw unforeseen relationships among the disparate elements that they have catalogued. Poetics was often discussed as a way to approach both the gathering of information as well as the organization of material and images used in the creation of process sketches and models. Final project guidelines were structured to enable students to develop their concept formally through the inclusion of design principles such as transparency, layering, pattern and texture. In this way students were given the opportunity to expand their formal vocabulary without the inhibitions, constraints and self-inflicted habits employed during their typical course of study.

Throughout the entire design process students were required to constantly move from the digital to the physical. Data, either in the form of a digital model or 2D drawing, was used to drive complex physical output. This output was then utilized toward the design of an object that required manipulation, reconfiguration and adaptation through the use of their hands. No digitally produced artifact is created to the precision that the computers leads the designer to believe is possible. Students were asked to respond to and adapt to the imperfections of the computer controlled output through various methods that may be considered "traditional" in that they require decisions to be made by the designer and the hand with immediate consequences. Students were encouraged to understand that "the seduction of CAD lies in its speed, the fact that it never tires, and indeed in the reality that its capacities to compute are superior to those anyone working out a drawing by hand. Yet people can pay a personal price for mechanization; misuse of CAD programming diminished the mental understanding of its users." Reintroducing materiality, adaptation, and the phenomenological aspects creation will allow users to regain this lost mental understanding.

figure 1

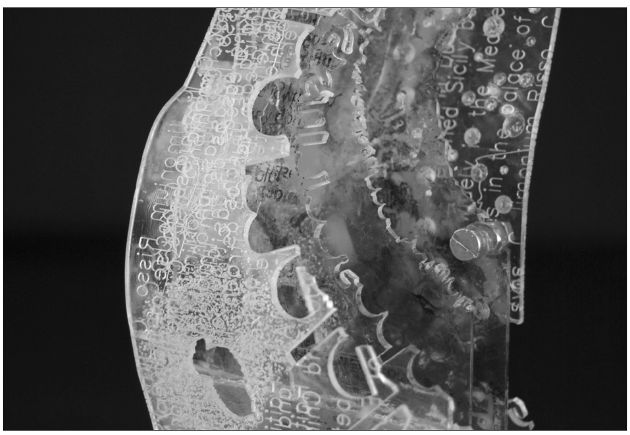

figure 2

conclusion

In reflecting on the outcomes of the course it is apparent that many of the pedagogical ideologies outlined were successfully achieved and many unforeseen benefits realized. The interaction with various materials allowed students to understand their properties and limitations and required them to consider materiality earlier in the design process, where previously these may not have been considered at all. Students began to see the value of understanding materiality in a psychological, sensual manner and how to utilize these phenomena as a means toward an intended concept or idea. They learned how to adapt to an intricate design process and to integrate newly acquired skills and modes of thinking, and to allow the adaptation to invigorate their design in unpredicted forms. They discovered that some of the tools which they had previously regarded as precise actually lack an expected precision when confronted with real, physical limitations. They also learned how to open themselves to a process-driven design approach that invites outside influences and utilizes many tools to achieve results that are based on complex ideas, are intelligently sequenced, and are well crafted. The final outcome of their work went far beyond any preconceived notion they may have started with and was successful due to this process oriented design mentality. It is fair to say that the students learned more while immersed in the process of making than they did from the final product. In the end, the advantage of this immersion and their documentation of the design process was evident to the group as a whole.

The idea of locating signs of craft, individuality, and humanity in the work of designed objects is not a new cause. Ever since society has relied on a mechanized means of production, the fear of losing the mark of the maker has existed. The misuse and overreliance of digital tools has resulted in the creation of an overabundance of sterile, homogenous material objects, many of which define the environments in which we live. The ideas presented in this paper demonstrate that technology is not the cause of this deficiency but rather can be an important element of the solution. It is the role of academia to instill an ideology based on synthesis and individuality into future designers in order to re-evolve the process of design beyond one steered by technology alone.

References

Kolarevic, B and Klinger, K (eds.): 2008, Manufacturing Material Effects: Rethinking Design and Making in Architecture, Routledge, New York, p 7.

Pallasmaa, J: 2000, "Hapticity and Time - Notes on Fragile Architecture," The Architectural Review, vol. 207, no. 1239, pp 78-84.

Paz, O: 1974, In Praise of Hands, Graphic Society, New York, p21.

Sennet, R.: 2008, The Craftsman, Yale University Press, New Haven, p.81.