New Design-Build Directions: Training the Architect as a Product Designer

In the context of disaster relief impact, this paper maps an alternative approach to traditional Design-Build studios in architecture schools based on a studio co-taught by the authors. It first provides a new goal for what such studios should strive to attain. It second presents a model (pedagogy) for attaining those goals. It finally presents a theoretical framework for creating any such studio.

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TRADITIONAL DESIGN-BUILD (CLIENT-ORIENTED SERVICES)

Many architecture schools have introduced Design-Build as an active component in their curricula -- most follow in the footsteps of the high-profile model demonstrated by Samuel Mockbee for the Rural Studio at Auburn University.

These older (hitherto "traditional") Design-Build programs offer students the opportunity to go beyond the abstraction of education in a classroom setting and engage in the realities of practice. Traditional Design-Build studios match students with a real client, one that embodies measurable programmatic needs. That client also provides real project constraints, such as a limited budget. A controllable site is identified - presenting immediate socio-economic context. The site also presents verifiable legal constraints.

Eventually, a real building is constructed, exposing students to all the typical procurement, fabrication, and joinery issues -- only some of which professional architects must consider in practice.

These studios reward students who use resourcefulness, ingenuity, and excessive labor to solve architectural problems outside the context of traditional market forces. Student labor is assumed to supplement limited fabrication budgets. Alternative building materials are found (repurposed DOT signage as roofing, used tires as retaining walls)[1] to ease material budgets. At many times thermal performance or constructability is sacrificed for material availability or non-skilled labor practices.

The pedagogical result is generally applauded, but mixed: students gain design management and construction experience at a cost of months of hard labor and extra-market sacrifices.

This paper wonders if the concessions of "real" client, site, and budget are not too costly for young designers (especially as the recent economic downturn threatens traditionally donated building materials).

NEW DESIGN-BUILD (PRODUCT-ORIENTED DESIGN SERVICES)

A product-oriented Design-Build project based at the New York Institute of Technology (NYIT) proposes a client-less, site-less, and program-less Design-Build studio, driven by the economies of product design, rather than building delivery.

The NYIT studio offers a different set of equally rigorous "real-world" constraints via a research-driven process of designing and fabricating an assembly system.

Professors at NYIT challenged students to develop a kit-of-parts disaster-relief shelter package, where all architectural building materials (roofing purlins and roofing tiles) are up-cycled from reconstituting a patented shipping pallet and the water bottles it transports.

BOTH MODELS ARE AIMED AT SOCIAL IMPACT

> "If you focus on design, you can call yourself a designer. If you focus on the implementation of your design, you can call yourself an architect." Cameron Sinclair, Founder of Architecture for Humanity

For both the traditional Design-Build studio and for the new one proposed here, the primary focus is maximizing social impact.

Since the recession in 2007, the architectural profession has seen an unprecedented spike in social impact projects - in the number of design practices and non-profit organizations like DesigNYC, DesignCorps, and The 1% Program that support these projects; also in the number of funding vehicles and how-to toolkits available to enable these projects.[2]

Social impact design is not new and has traditionally operated under the umbrella of a number related terms including "public interest design," "humanitarian design," "community design," and "participatory design." Consistently, these projects serve the under-served and design for the broader public good. The lack of a clearly defined field means that "Design-Build" is often also thrown into the mix, often simply because the site is located in an disadvantaged neighborhood or because the program is one that serves a community. "In the U.S. alone, according to the ACSA, currently more than 70% of schools of architecture have in-house Design-Build programs, most with a social agenda to provide services to communities in need."[3]

TRADITIONAL DESIGN-BUILD IS INSUFFICIENT FOR SOCIAL IMPACT AT THE DISASTER RELIEF SCALE

Traditional Design-Build studios have addressed social impact by targeting disaster relief situations by using the tried-and-true client, program, site model.

A recent Design-Build university initiative addressing disaster relief is Mississippi State University's College of Architecture, Art + Design's Gulf Coast Community Design studio. Funded by FEMA, the program was established to help rebuild communities along the Gulf Coast after Hurricane Katrina.[4] While there is potential here to replicate the homes that were designed, the studio adopts a fairly conventional Design-Build model understandably limited by the specificity of clients and sites.

Following the 2010 earthquake in Haiti, faculty at the University of Minnesota engaged students in a similar process of providing disaster relief and redevelopment. Without a specific client in mind, students spent the first half of the semester identifying potential clients simply by seeking out local professional partnerships with NGOs and government agencies. In this case, these partners "on the ground" also aided the students in 'understanding the challenges specific to the particular place."[5]

The maximum social impact of these traditional Design-Build studios is creation of one building for one client, with raised public awareness. The implication that the traditional Design-Build model is always adequate, however, limits projects to scenarios where client, site, and program fit within agreed upon categories that characterize the projects for the greater good. Concurrent to the growing interest in social impact design is an increasing interest in providing disaster relief design, also for the greater good.

Disaster relief operates on much larger scales. The problem presents the opportunity to put systems in place for thousands before they are critically needed. The following section discusses just such a larger-scale prototypical approach.

NEW DESIGN-BUILD: THE HOME$_2$O ROOFING SYSTEM STUDIO

A prototypical post-disaster relief project, designed as a kit-of-parts, deployable in a number of sites and for a number of clients. This operates beyond the one-home-one-family model of traditional Design-Build.

COURSE DESCRIPTION

This project first focused students' attention on existing supply streams to disaster-struck areas. Students catalogued relief materials already arriving for immediate need (food, water, etc.). They also researched all the "unintended" uses such materials have enjoyed in other contexts -- for example water bottles as masonry in South America, and tarps as roofing in Asia. This research resulted in a list of distinct potential product delivery streams and partnerships.

The studio then focused design efforts on assembly system/product design (not a singular architectural artifact), on programmatic/performance requirements throughout a product's life-cycle (not a singular use), and on visual communication for investing audiences through social media and crowd-funding (not a singular client).

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Figure 1: Upcycling relief items as building material.

FOR WHOM AND FOR WHERE?

Bryan Bell suggests, "Traditionally, architects and clients start their working relationship when the clients, who understand what architecture is and what they need from it, contact the architect. But when architecture is a community service, it is the architect who seeks out the clients."[6] In the absence of customary client-architect-contractor constituents, students were asked to define project scope, constraints, target audience and sites. They continually shifted between short-term research activities (building a proof-of-concept prototype for a locally specific client and site) and long-term aspirations (leveraging existing shipping, distribution, and disaster relief networks to reach masses in need).

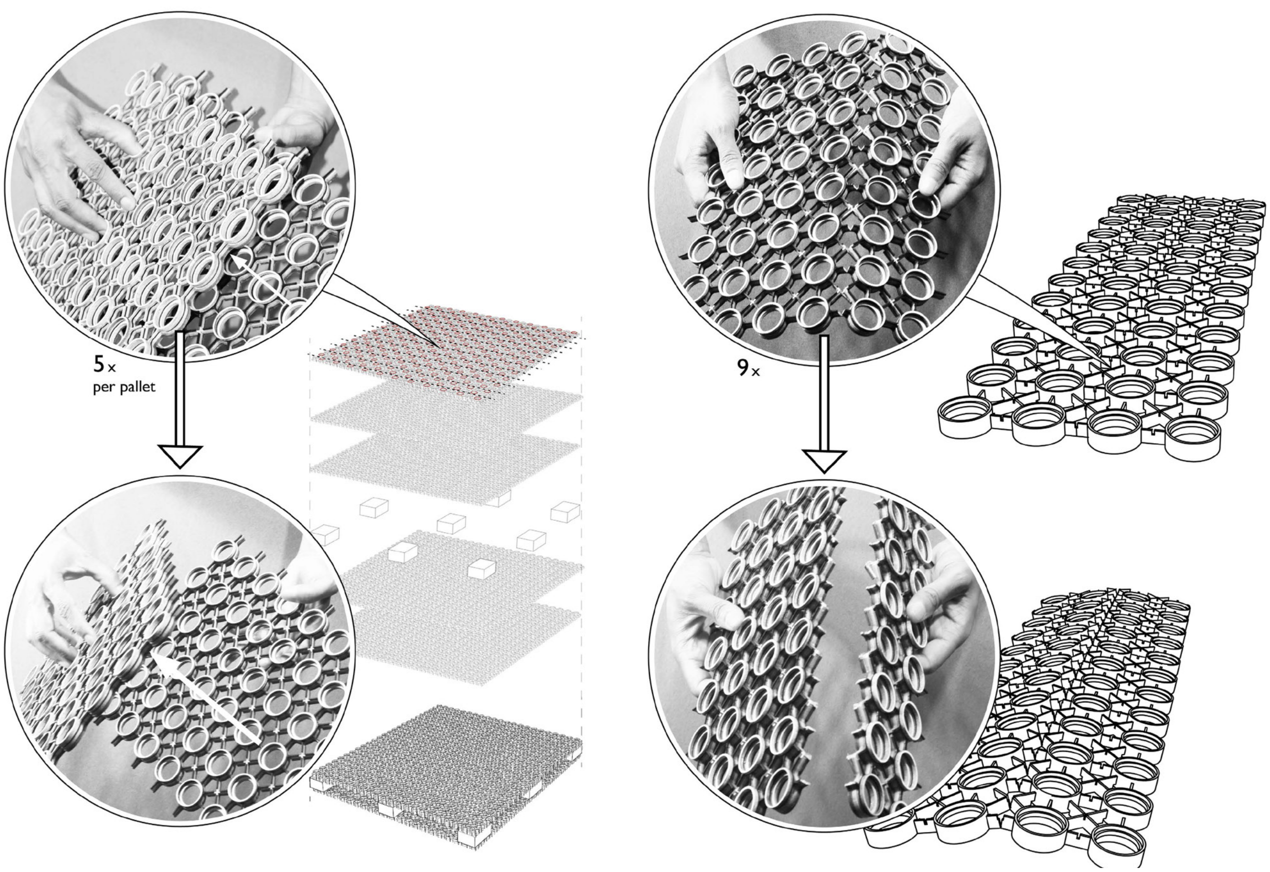
WHAT WAS DESIGNED? (traditional model: building vs. new model: product)

Students considered a full kit-of-parts disaster relief shelter package -- a system that exploits global relief distribution patterns to facilitate local, individual participation. First emergency response, typically, includes aid in the form of water bottles on shipping pallets. Design parameters and attainable goals were first defined for the system. This served as a list of design requirements in lieu of a traditional program. Students agreed that a lightweight, flexible roof system that could be quickly deployed using minimal tools/labor could potentially empower any community anywhere to meet their own needs.

Instead of designing a one-size-fits-all shelter, students designed a material and assembly system to accommodate a variety of roof shapes and sizes appropriate to any number of sites and clients. The system was integrated into the design of a new shipping pallet -- one that delaminates into structural roofing purlins and receives crushed, PET water bottles as roof tiles. The bottles arrayed and layered as a breathable, weather-resistant, roof membrane for a relief shelter.

Design efforts concentrated on a scale atypical of architectural education, but common in product design. Students detailed how the Home$_2$O shipping pallet would delaminate and snap apart by hand to become the roof's substructure. The pallet geometry considered an inherent structural integrity required to meet standard shipping pallet specifications of the food and beverage industry, but also a system by which water bottles could be received and attached in an interlocking pattern similar to spanish tile.

Figure 2: Delaminating the shipping pallet and breaking it apart as linear roofing purlins.



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The delaminated shipping pallet broke apart into linear roofing purlins. These had integrated brackets that fastened crushed, water bottles as roof tiles by simply screwing on the caps. Bottles interlocked and layered to shed water and allow for natural ventilation.

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WHAT WAS BUILT? (traditional model: building vs. new model: prototype)

Students built several prototype pallets and resulting shelters. Each prototype was used to fundraise the next prototype with subsequent improvements. The project launched two Kickstarter campaigns -- the materials for each campaign were earlier prototypes and exhibition material.

The most recent prototype was also the largest -- a full-scale shelter standing on campus. Rapid-prototyped shipping pallets were broken by hand to create the building materials of the shelter.

HOW WAS IT FUNDED? (traditional model: donations, budget vs. new model: crowdfunding, investment)

This design effort was primarily funded through internal school grants and external crowdfunding campaigns.

The kick-off ($12,000) grant was awarded from an application by the professors to the school-wide administration through the NYIT Office of Sponsored Programs. This allowed professors to organize the studio and fund startup building supplies.

The initial research resulted in a school-wide exhibition.

Additional funding was procured through the Kickstarter web site. In the Fall of 2014, earlier student prototypes were filmed and students helped create a “pitch video” to present their design to a worldwide audience. The Kickstarter campaign raised over $4,600 of additional construction funds to build full-scale prototypes.

WHAT REMAINS WHEN THE DESIGNERS LEAVE? (traditional model: building vs. new model: patent)

The studio has concluded, but the school administration continues to find value in the research. In the Spring of 2014, the United States Patent Office awarded NYIT a patent on the device and roof assembly system.

Figure 3: Prototype shipping pallet forklift test.

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THE PEDAGOGICAL RESULTS

The product-oriented Design-Build studio has similar results to traditional Design-Build studios. Students tackled architectonic issues of material, joinery, assembly, fabrication, and construction. Students honed detailing skills in the context of overall project goals. Compassionate problem-solving was foregrounded as a professional skill.

Many important differences between these two Design-Build studio models also became clear. In a product-oriented Design-Build model, student focus is trained more deeply on the supply stream of limited resources. They accept many stiffer constraints that initially appear to remove design freedom. They are forced to create prototypes of their designs in a way for wider audiences to see and appreciate. They work on prototypes that are closer to human scale -- an endeavour that a finite collection students can achieve in one school year -- and not at the much larger scale of real property.

WHY A PRODUCT-ORIENTED DESIGN-BUILD WORKS: "THE QUESTION CONCERNING TECHNOLOGY"

There is a comfortable theoretical framework for any such Design-Build studio -- one that draws on architectural writing from the 1990s and philosophical texts from the 1950s.

Figure 4:Students setting up a load test.

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At the heart of this approach is guiding students to see that opportunities for architecture remain always unrecognized and unrealized, hiding in plain sight in the movement of materials around the globe. Traditional building materials may include the lumber, masonry, or concrete supplied as commonplace materials at conventional jobsites. In time of disaster relief or similar unconventional situations resources (like these building materials) become scarce.

Alternatives must be identified.

One's technological abilities then rest firmly with the ability to identify alternative resources and organize them for use in building.

In his 1953 essay "The Question Concerning Technology," Martin Heidegger provides the framework to recognize that technology is more than a form of instrumentalization. He recognizes that "Instrumentality is considered to be the fundamental characteristic of technology…"[7] but urges readers to not concern any technological analysis with a look at tools, and tool-making.

Alternatively, Heidegger presents us with the concept of Enframing. For the philosopher, Enframing is a process that occurs before the architect acts -- it organizes the world of our resources before we design.[8]

In a NAAB-accredited curriculum, this habit of Enframing natural resources like wood, earth, and stone (into "lumber" "bricks" and "tile," respectively) is studied in Building Construction courses or whole Building Technology sequences.[9]

The type of Design-Build studio proposed in this paper is thus of central importance because it teaches architecture students to find value outside of industry-enframed schemas -- too look at the disaster relief shipments that already provide nutrition and hydration as alternative building supplies. Heidegger states that both the danger and the salvation that technology represents hinges on recognizing Enframing.[10]

This invention of value is a primary method for contributing to society and earning professional remuneration. Teaching students to question existing supply streams creates a freedom from the very breakdowns of society that disaster relief measures ameliorate.

Figure 5: Initial drainage test on the full-scale prototype shelter built by students.

In his 1998 book *Instrumental Form: Words, Buildings: Machines*, Wes Jones wrote about the effect of Enframing on architectural production. He also points out that recognizing architects' predisposition to assume traditional materials of building is sometimes the worst encumberance to new building:

> "In this context, the experienced puzzle-solver knows that the resolution will come of its own accord -- know that the harder one concentrates, the harder it will be to force a solution. To 'get it' one must relax, stop fighting the 'problem' and allow the problem to solve itself. This does not necessarily mean to give up, but to avoid practicing the very attitude of Enframing that is in question. It means to avoid seeing this questioning itself as a will to mastery or control over a problem, or seeing the issue as a 'problem.'" [11]

… in other words the more one accepts constraints (like lack of building resources) as real, the less likely one is able to see unconventional building materials all around them.

CONCLUSION

Traditional client-oriented Design-Build studios are of great value in architectural education, but this paper recognizes some of the costs this method carries.

Alternatively, a product-oriented Design-Build studio can shed large costs that real estate markets levy on traditional Design-Build studios. In the place of a specific client and site, a product-oriented Design-Build studio uses prototyping, product design, and social media to fund architectural propositions and to realize building projects.

The result is still a Design-Build studio where architecture students grapple with joinery, materiality, and constructability, albeit through the intention of designing alternative assembly systems, and without the predilections of client personality or site-specificity. Instead, this studio model rewards a global perspective and systems-thinking -- through analysis of existing supply streams and design of a product interface.

ENDNOTES

1. Andrea Oppenheimer Dean. Rural Studio: Samuel Mockbee and an Architecture of Decency. page 67.
2. Quirk, Vanessa. "After the Meltdown: Where Does Architecture Go From Here?," http://www.huffingtonpost.com/2012/04/18/after-the-meltdown-where-_n_1433349.html
3. Feldman, Roberta, et al. "Wisdom from the Field: Public Interest Architecture in Practice," page 16
4. Lasky, Julie, Social Impact Design Summit White Paper, Cooper-Hewitt, National Design Museum, the NEA, and the Lemelson Foundation, 2013, page 29.
5. Bell, Bryan."Good Deeds, Good Design: Community Service Through Architecture," Princeton Architectural Press, NY 2003, page 22.
6. Lutz, Jim and Comazzi, John."Learning from Disaster: Lessons from Community Based Design in Haiti ," ACSA Conference Proceedings 2011, page 494.
7. *"Instrumentality is considered to be the fundamental characteristic of technology. If we inquire, step by step, into what technology, represented as means, actually is, then we shall arrive at revealing. The possibility of all productive manufacturing lies in revealing. Technology is therefore no mere means. Technology is a way of revealing. If we give heed to this, then another whole realm for the essence of technology will open itself up to us. It is the realm of revealing, i.e., of truth."* Martin Heidegger. "The Question Concerning Technology." p. 9. In The Question Concerning Technology and other essays. Translated by William Lovitt. Harper & Row, New York, 1977.
8. *"...Thus, when man, investigating, observing, ensnares nature as an area of his own conceiving, he has already been claimed by a way of revealing that challenges him to approach nature as an object of research, until even the object itself disappears in to the objectlessness of standing-reserve..." Martin Heidegger. "The Question Concerning Technology."* Martin Heidegger. "The Question Concerning Technology."p. 9. In The Question Concerning Technology and other essays. Translated by William Lovitt. Harper & Row, New York, 1977.
9. *"... Because Physics, indeed already as pure theory, sets nature up to exhibit itself as a coherence of forces calculable in advance, it therefore orders its experiments precisely for the purpose of asking whether and how nature reports itself when set up in this way."* Heidegger. TQCT page 10.
10. *"...The essence of technology lies in Enframing. Its holding sway belongs within destining. Since destining at any given time starts man on a way of revealing, man, thus under way, is continually approaching the brink of the possibility of pursuing and pushing forward nothing but what is revealed in ordering, and of deriving all his standards on this basis. Through this the other possibility is blocked, that man might be admitted more and sooner and ever more primarily to the essance of that which is unconsealed and to its unconcealment, in order that he might experience as his essence his needed belonging to revealing. Placed between these possibilities, man is endangered from out of destining. The destining of revealing is as such, in every one of its modes, and therefore necessarily, danger. "*Heidegger. TQCT page 13.
11. Wes Jones, Instrumental Form: (Boss Architecture) Words, Buildings, Machines, page 168.