New Values of New Design

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Driven by advances in building and information technology and accelerated by the tumultuous period of global economic restructuring that commenced in 2008, architecture and interior design practice is today confronted with the necessity of fundamental change. According to the “Building Futures” group at the Royal Institute of British Architects and US-based “Design Futures Council,” both of which this past year published studies on this very topic, a great deal depends on what happens in China and other emerging markets, where many European and US firms now have offices. And that is not only because these are the most vibrant markets for architecture and design services, but also because the demands placed on practitioners in these markets are fundamentally changing the way buildings are designed and delivered, at home and abroad. Both studies suggest that all sectors of the A/E/C industry will face increasingly fierce competition that will, of necessity, force practices large and small to compete less on cost and more on value. In the very near future buildings and their interiors will be valued almost entirely based on performance—economic, cultural, environmental—and only those firms able to create these and other forms of added value will survive. Disruptive technologies like building information modeling and integrated product delivery will enable all firms, even those competing solely on the basis of cost, to design better buildings and deliver them more efficiently. But in such a fiercely competitive global marketplace, efficiency alone will not be enough to guarantee market viability. The real differentiator will instead be design.

One of the unexpected consequences of the economic downturn has been that the debate over the value of architecture is now focused less on style and the exquisite, designed object, and more on the economic and societal value added by design. And that is because almost everyone now acknowledges that we need new design values as much as—perhaps more than—we need new designs. The most promising development, in this regard, and one that affects architecture and design practice as well as design education, is the growing recognition that design is not only a product—a table, building, plan or landscape—but also a creative process and a powerful engine of innovation. Design, as we all know, has become an important feature of our increasingly innovation driven economy. But it is not only *the design* that is important. What is perhaps just as important is the value added by what design leaders like David Kelly of IDEO call “design thinking,” a form of design prototyping that follows a classic distinction made by business and innovation guru Peter Drucker between problem solving, which answers without questioning the problem given and therefore adds nothing new, and innovation, which interrogates and reforms the problem given and adds value by creating new knowledge and new products not anticipated in the problem. Problem solving shapes the known while innovation coaxes into existence the unknown. Design thinking is a “thinking by doing” in which plausible solutions are prototyped, interrogated and redesigned. Prototypes, which IDEO call “the shorthand of innovation,” are not, however, variations of a projected final design—they are not guesses extrapolated from the designer’s perfect idea about what the final design *might be*—but are instead “what ifs” that the designer uses to drive the innovation process itself. The designer uses the prototype to "think through" as many factors as necessary—material, cost, fabrication, etc.—and adjust the design accordingly. Not only are the assumptions of the problem given transformed—opening the way for innovations—but also with each prototype new design knowledge is generated that can be shared and discussed among teams of designers whose additional input further enhances the innovation process.

Perhaps the best illustration of this can be found in engineer Peter Rice's wonderful, posthumously published book, *An Engineer Imagines* (1994), where he writes the following about engineering innovation. "Probably every solution put forward by an engineer has some unusual element, some feature that could be called innovative, but is not recognized because it is buried in an otherwise conventional solution. And if we examine the nature of these otherwise innovative or inventive elements, we will find that it is just the result of the engineer being intelligent or sensible about the way some detail has always been, and in so reassessing the problem from another point of view." Rice here reveals in this short passage the key to understanding the engineer's design process. Rather than design alternative solutions to the problem at hand, the engineer instead reassesses and reposes the problem "from another point of view." Engineering problems, he says, are shaped by objective parameters and so each problem has only one solution. That is why the problem must be approached with an intelligence that comes from knowing about the problem and the way it "has always been" as well as knowing and understanding various solutions to an array of similar problems and the objective parameters that shape them.

Engineering innovations come, he says, not because engineers go looking for innovative solutions. Rather, they result from the engineer's shaping and reshaping the problem. Solutions are not always final solutions and are often more important in helping lead the engineer to more clearly define the problem than as designs in their own right. It is this sensible approach that in fact defines the engineer's disposition towards the problem. As each problem is shaped by objective parameters, so then are these parameters shaped by a particular point of view. And it is just these points of view that the engineer considers and reconsiders in shaping each proposed solution, until finally *the right problem* emerges. Invoking the title of Rice's book, we could say that the "engineer imagines" alternatives that reveal what the design solution *might be* depending on which parameters are considered in posing the problem. Breaking with the "what is" in pursuit of the "what if", the engineer uses *the design* to think through and solve problems. Knowing which parameters—which "what if"—to work with and in what ways is enhanced and expanded with every new problem the engineer poses and solves whether it results in an innovation or not. Even within the framework of a single design problem each parametric change and subsequent question and solution increases the engineer's design knowledge or intelligence about a material, a structure, or a process. And this knowledge can become important in other or future problems when adjusting the parameters that shape those problems. The rewards of innovation extend, then, beyond the immediate problem at hand and become engines for creating new design intelligence that further enhances the engineer's ability to design innovative solutions.

Rice ultimately leaves us to draw the surprising conclusion that design drives innovation rather than the other way around. And it is this incredibly powerful insight that offers the key to developing new values for new design, especially for design education.

Following this insight, we at the University of Kentucky College of Design have, over the last several years, entered a number of atypical research collaborations that have not only allowed us to make a very good argument for the value added by design, but have, for us at least, laid the foundation for a new design research model that is centered as much on producing the design knowledge necessary for innovation as on the design itself. Among our most important collaborators has been the Center for Applied Energy Research at the University of Kentucky. This all began as a series of conversations with CAER Director Rodney Andrews to discuss how to take best advantage of our successful entry into the US Department of Energy's 2009 Solar Decathlon competition. The Solar Decathlon was an important design project for the University of Kentucky and the College of Design, which presented the colleges of Design, Agriculture, Engineering and Communication a unique opportunity to work collaboratively on a common project and ultimately to achieve an uncommon result. This, of course, is what everyone hoped for and worked very hard to achieve. But just as important as the ultimate result—the award winning s.ky blue solar house and our ninth place finish overall—the entire competition cycle process, from initial selection to final judging, reaffirmed the importance of research, knowledge creation and knowledge transfer.

Among the most significant products that resulted from the design, fabrication, and transport of our s.ky blue solar house was the creation of new bodies of knowledge and areas of expertise. Working collaboratively with faculty, students and staff from other colleges necessarily meant being confronted with unfamiliar knowledge and expertise. Success required that we develop new ways of formulating and solving problems and thus new ways of working with others. In the case of the s.ky blue solar house, working across common software platforms and on hybrid, interdisciplinary teams yielded solutions that would have been impossible to achieve working within the framework of a single discipline or field of expertise. That is why the use of prototypes to very quickly "think through" and solve problems became such an integral part of the s.ky blue solar house design process. Prototypes, three dimensional physical models, created with digital design and fabrication tools and technologies such as CNC milling, 3D printing, and laser-cutting, enabled even those without technical expertise to analyze, discuss and make necessary adjustments that improved the design.

Prototyping, of course, is an iterative process: a problem is defined; solutions are proposed; results are examined; the problem is redefined; new solutions are proposed; and, ultimately, a satisfactory problem and solution results. With the aid of digital design and fabrication tools, this process is not only accelerated but it is also made more economical and the design more realistic and precise. In the College of Design, prototyping has come to define a new model of design research in which the focus is not so much on the creation of a final design but rather on the creation of design knowledge itself. With each s.ky blue solar house prototype, for example, as with each prototype of its component parts, new knowledge was created, even in those instances where the solution itself was found to be unsatisfactory. Prototyping produces numerous plausible solutions, and while only one of these will ultimately prove to be the "right solution," each prototype—even "failures"—produces valuable knowledge available for future development or repurposing. This does not mean that we in the College of Design are not interested in final designs. On the contrary: we were thrilled with the final s.ky blue solar house. Rather, it means that we view the "final design" as a design prototype, as both a solution to the problem at hand—the DOE sponsored Solar Decathlon—and a trigger for new design problems and ultimately new "final design" solutions, which, in turn, will lead to new problems. This future-oriented, innovation-driven model of design research enables knowledge to be activated and made available for use in projects that cannot be known or predicted in advance.

Indeed, the s.ky blue solar house was the trigger for a multi-year research and design project begun in 2009 with the Center for Applied Energy. The project, House Boat to Energy Efficient Residences (hereafter HBEER), is a multi-year initiative that seeks to design and build energy-efficient homes in former houseboat manufacturing plants. We proposed, at the outset, to produce manufactured homes with a purchase cost of between $60,000 and $100,000 with energy costs of $1 per day or less. Sponsored, in part, by the Kentucky Housing Corporation and Kentucky Highlands Inc., a non-profit investment company that focuses on job creation in a 22 county area of southeastern Kentucky, these homes will be manufactured in house boat plants in the Cumberland Lake area near Somerset, Kentucky, which due to the recent economic downturn, have been forced to cease operations. The objective is to put laid off houseboat workers back to work building manufactured housing. In addition to job creation, the HBEER project will follow a "slow manufacturing" agenda and will use at least 90% Kentucky made products—including a number of recycled material applications we are currently researching in the College of Design, such as using fly ash for a range of component parts—in the manufacture of the housing units themselves.

In Fall 2009, a team of professors and students in the College of Design researched and designed a variety of energy efficient house prototypes, including modular, pod-and-panel, and stick-built units. At the end of 2010, nine design prototypes were produced and two were ultimately chosen to manufacture in one of the houseboat plants. Over the course of the year, we invited user groups, city, county, state and federal agencies, venture capitalists, practicing architects and engineers, as well as houseboat plant owners and operators, to review, analyze and help develop these prototypes. After each review, the designs were refined, improved and prepared for the next review. Almost all of the students who worked on the s.ky blue solar house were also members of the HBEER team. These students, in particular, brought an expertise in energy-focused design that greatly enhanced the capabilities of our HBEER team. Indeed, the transfer of knowledge and expertise gained during the Solar Decathlon competition to the HBEER project traces the path of an arc leading directly from design research conducted at the University of Kentucky to design products meant to address important energy and economic needs of communities in the Commonwealth of Kentucky and beyond.

Ultimately, we should view the s.ky blue solar house both as a final design solution and also as a prototype and trigger for future design projects, a vehicle for the production of future knowledge. Soon we will be able to make the same observation about our first full scale HBEER units, the first two of which will be delivered and occupied by the end of fall 2011. It is with projects like these that, in my view, we begin to see glimpses of what new values of new design practice and education might look like. Cheap, fast and adaptable, so that hundreds of iterations can be designed, sorted, and discarded. Big, bold, and dumb, so that clients, stakeholders, even other designers, can engage in transparent, productive discussion that might lead to better problems and better solutions. And finally, apposite not perfect, so that if the design needs to adapt to changing conditions, it can do so with minimal effort and cost. If architecture and design is to thrive during and after the current economic downturn, it will have to adapt to these and other values of the "good enough" revolution, where the quick and dirty have eclipsed the slow and polished and the cheap and simple have eclipsed the expensive and complicated. It is no wonder that in such times, business schools, the military and engineering schools have embraced design thinking. The question remains whether design schools and colleges will join them or will continue as they did before the downturn. What is more certain, however, is that architecture and design offices and design schools unwilling or unable to innovate, communicate, and adapt, will soon be left behind, comforted only by the memories of those expensive, incomprehensible, perfectly designed things that not too long ago fascinated us all.