Market Innovation for Social Practice

The following projects conducted at Portland State University's School of Architecture, are aimed at addressing social goals in ways that achieve the kinds of market success exemplified by more technologically focused innovations of other disciplines.

MARGARETTE LEITE
Portland State University

INNOVATION

In most Universities, innovation in research and product development involving business and industry partnerships are commonly linked to technologically focused science and engineering programs. Beyond their initial sponsorships, these innovations can lead to patent and copyright agreements that promise continued financial returns and recognition to those institutions and individuals involved. As budgets tighten, these endeavors receive greater encouragement, even pressure, by universities hoping to develop models of support generated by the output of their own faculty and students.

Schools of Architecture are not often at the forefronts of these activities as their primary pedagogical purpose is to educate a service sector profession not primarily engaged in research. Thankfully, architecture programs all over the US are adding coursework that includes community engagement with the goal of moving the profession toward greater social and societal relevance. The School of Architecture at Portland State University (PSU), Oregon, has made major advances in this direction including the inauguration of one of the country's first Centers for Public Interest Design (CPID).[1] While few today would dispute the importance of this movement, there exist significant challenges to the implementation of the relatively difficult to fund opportunities in this area. The following projects described in this paper, outline some initiatives aimed at addressing those social goals in ways that may also achieve the kinds of market success exemplified by the more technologically focused innovations of other disciplines.

The first project to be described is one that failed in certain respects but served as a useful learning experience and a value to society in other ways. The second project described is an award winning design that has found significant market success, and the third represents a course underway that serves to spur students to innovate and create their own businesses around their inventions. All of these projects benefited from the presence, on campus, of a federally funded Green

Building Research Laboratory (GBRL), a joint venture between PSU's Schools of Architecture and Engineering. In addition, these projects were also supported by the University's Office of Innovation and Intellectual Property (IIP), a resource found in most universities. IIP uses the tools of intellectual property in the form of patents and copyrights to support faculty and students in their research, help foster external partnerships and seek commercialization for appropriate innovations.

1000 HOMES FOR HAITI

The first project to be discussed was developed through a public/private partnership between PSU and PGI, a Portland green building materials distribution company. The company approached PSU's School of Architecture to partner in the construction, on campus, of a demonstration home for Haiti in response to the tragic earthquake in 2009. The company was hoping to build 1000 homes for Haiti using a promising building panel material made from recycled paper. SwissCell, a product made in Germany, is a lightweight panel with a honeycomb interior structure made of resin impregnated recycled paper sandwiched between two thin sheets of a proprietary magnesium substrate. The panels are bound with adhesives using a wooden spline and can be used for floors, walls and roofs. The homes were said to be buildable by 4 people in 4 days and thus could serve to house those made homeless by the earthquake quickly and cheaply with homes that could be permanent. The material was touted as hurricane and earthquake resistant. Furthermore, the product could be made in Haiti and provide jobs for locals using the equipment that the company would ship to Haiti.

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The house was built on the University campus with significant media attention and spurring much curiosity among the public. To further the goals of the project, the University's Schools of Architecture and Engineering agreed to test the material for performance. The GBRL holds equipment that can be used to test the performance of buildings in a variety of ways. In particular, two environmental chambers at the Lab are capable of replicating the air temperature and humidity of any climate on the planet. These were useful tools for exploring the durability of the SwissCell panels and to understand their ultimate performance in the specific environment of Haiti. The panels were exposed to the high temperatures and humidity common to Haiti for the duration of six weeks. It was discovered that the magnesium substrate panels did not hold up well to the humidity and began "spalling." This, of course, caused great concern that while

Figure 1: SwissCell core.

Figure 2: Demonstration Haiti Home on PSU Campus.

the promising ease and low cost of the homes could provide rapid relief for the many homeless, it also represented a potential future disaster in terms of durability over the long term. Since this project, the German SwissCell company has gone out of business. However, PGI has gone on to do work in Haiti with what they claim is an improved product.

The hoped for outcome for this project was the creation of a continuing public/private partnership that would involve the university in the design of other variations on the house model as well as versions that could be honed for other climates with the hope of delivering, with PGI, affordable, green, disaster relief housing to countries in need. While disappointing in its outcome, this research also exposes the role that we, as architects, academics, and researchers can have in innovating to protect the common good. Success is measured in many ways and failure has its value as well.

SAGE GREEN MODULAR CLASSROOM[2]

Another project at PSU, the SAGE Green Modular Classroom Project, has had greater success in the marketplace and was the recipient of a 2013 international SEED award and other local civic engagement awards. In addition to addressing the concerns of school communities regarding the health and wellbeing of students in poorly designed modular classrooms, this project provided a range of lessons for architecture students that expand on the traditional curriculum, including becoming partners in a copyrighted product that returns royalties to the university to support further research, as well as contributes potential downstream profits to project partners including the students themselves. The project was initiated at PSU by two faculty members whose daughter was about to begin the 5th grade in her school's newly installed modular classroom amid much community concern over the healthfulness and appropriateness of these kinds of spaces. As faculty members in the School of Architecture, Margarette Leite and Sergio Palleroni used the University setting as a forum to begin a community wide conversation over what could be done to understand the phenomena of modular classrooms and to find solutions to the issues associated with them.

They convened a symposium on Activism in Architecture in partnership with AIA Portland, bringing public figures in the field of public interest design to discuss the role of architects in spurring social change. One day of the symposium was dedicated to a community charrette with school administrators, modular manufacturers, students, faculty and local professionals coming together to brainstorm ideas for making modular classrooms better. This activity led to exposure that caught the attention of government officials. In 2011, the Green Modular Classroom Project was designated an official "Oregon Solution"[3] a designation which allows it to receive project management support from the state government leading to the formation of a larger taskforce of stakeholders that could contribute to the actual design of a classroom prototype. The team was made up of PSU faculty and students, modular manufacturers and distributors, school administrators, state and local code officials, local energy experts, non-profit green business consultants, engineers and lighting consultants. This project team met regularly for just over one year. Their goal was to design a modular classroom for Oregon schools that was energy efficient, healthy and affordable. The focus was to be on the health and performance of students but affordability was also key. The green modular classroom alternatives that are currently available on the market are good products but their costs limit their application to too few

schools across the country. In order to have any real impact, we needed to reach as many students as possible which meant that the classroom had to be available at a price point that could compete with the current inexpensive options. This was the most challenging aspect of the goal and to achieve it, the participation of the modular industry was critical. Blazer Industries, one of the country's leading modular manufacturers is headquartered in Aumsville, Oregon and was committed to being an active participant in the project. Their experience helped to direct design solutions in ways that met our goals efficiently and economically. The classroom was invited to be exhibited at the 2012 USGBC GreenBuild conference in San Francisco. Fortunately, Pacific Mobile Structures, a modular building distributor from Washington State, stepped up to sponsor the classroom. They paid for the structure which was manufactured at Blazer Industries.

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Figure 3: SAGE Classroom Interior rendering.

Since then, PSU and the SAGE team has worked with distributors across the country to arrange contract situations that help to respect the copyright of the classroom while promoting its availability around the country. In order to maintain the affordability of the classroom while maintaining control over its design, a nominal fee is paid by the distributor to the University for each classroom sold. The copyright agreements that bind these partnerships must include wording that describes what changes are allowable that do not compromise the overall performance of the classroom without requiring approval from the design team, what changes do require approval, as well as how sales are reported and how royalties are paid. A portion of the royalties are paid to the University itself while the remainder is distributed among the team members. This includes the students directly involved in the design of the classroom. In our case, all members agreed to reinvest the royalties toward the continued research and development of the project. Payments are made according to an agreed upon time frame.

There are a number of other ways in which academics, researchers and their universities can protect their copyrights and further their inventions/innovations. Patents may be filed. This is more common for new products that are more technologically complex. In other cases, independent business entities are spurred

that have unique and sometimes independent relationships with the university. In our case, we chose to remain a university entity, preferring to act as a catalyst for the green modular classroom industry as a whole rather than create a separate business entity that promotes the SAGE classroom.

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BETTER RAIL

A third project at PSU is underway with similar goals but using a different path. In an Advanced Architectural Materials class, students have partnered with a local business to create market ready building products made from landfill-bound materials that also provide job creation for disabled individuals. In this case, the partnership was initiated by the local business partner, Rebright Industries, who approached the school of architecture with the idea of joining forces to harness the research and design expertise of the architecture school with their own marketing experience and industry relationships. The overall goal is to create a platform where large scale waste producers can be matched with potential market opportunities for their materials and avoid the land fill option which is both costly to the industry and to the environment.

In the one particular class, the students were tasked with creating building products from decommissioned escalator handrail. The Port of Portland, which owns the Portland Airport, is saddled with miles of escalator handrail that has to be replaced on a regular basis. While the rubber portion that is in contact with user's hand remains in good condition, the internal canvas backing that contacts the conveyor system wears quickly. The students designed and fabricated building component prototypes that include interior and exterior siding, flooring and decking, stationary handrail connections and details, public benches, bike racks and planters.

Once again, the GBRL was critical in supporting research and testing of both the material and the products made from it. With the help of students from the mechanical engineering department, the students in the class were able to test their prototypes for qualities such as durability, reflectivity, insulating capacity etc. The products could be produced by the students themselves, or outsourced to other manufacturers, but packaging and shipping would be done by Exceed Enterprises, a Portland company that creates work opportunities for disabled Oregonians. In the spring of 2014, the students pitched their ideas at a competitive "Clean Tech Challenge" event with the hopes of securing venture capital to

Figure 4: The SAGE prototype at the Greenbuild Conference in San Francisco.

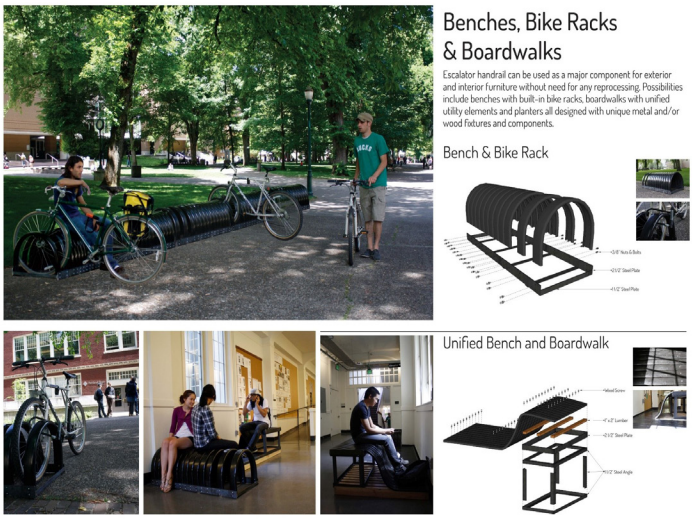

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Figure 5: Student proposals for green building products from decommissioned escalator handrail.

develop some of their products and move them towards marketing. While their attempt was not successful, another recent class was more fortunate. The students in this group were tasked with finding a second use for waxed cardboard, a material used by grocery stores all over the world to carry produce. Because of the wax coating, this material is not recyclable. In Portland, Oregon, however, waxed cardboard has traditionally been accepted into the city's composting system. Due to problems with the amount of fiber introduced into the composting stream, it will no longer be accepted and this has grocery stores concerned about the amount of material they will soon be sending to landfills. This time the student pitch was successful and the group was awarded monies for research and development of some very innovative green building products made from waxed cardboard. The monies will help them prototype their designs and create a business plan for their products. They will be eligible for a grand prize and university assistance in garnering real venture capital and Industry support. The University's School of Business sponsors this Cleantech Challenge event. The school also offers a certificate in Social Entrepreneurship as well as a Social Innovation Incubator (SII) program which "assists early-stage social entrepreneurs and intrapreneurs in launching market-based innovations that generate systemic social and environmental benefits."[4]

These projects serve as models for how architecture schools can bridge the gap between social goals, pedagogical reform and financial viability through the development of marketable innovations.

ENDNOTES

1. The Center for Public Interest Design at was established at PSU's School of Architecture in the Fall of 2013. It's mission is to "... serve communities in need worldwide by researching and promoting design and building practices that are socially conscious, environmentally sustainable and economically accessible to all and by so doing elevate the civic role of these professions as agents of change." www.pdx.edu/public-interest-design.
2. The SAGE Green Modular Classroom design is a copyright of Portland State University, Portland, Oregon. For more information see www.sageclassroom.org.
3. Oregon Solutions is an initiative begun by Oregon Governer John Kitzhaber to help communities develop sustainable solutions to community-based problems through collaborations between businesses, government, and non-profit organizations.
4. Goals statement of PSU Social Innovations Incubator, http://sba.pdx.edu/sii/who.html.