

Innovations That Make It Out of the Classroom

At Portland State University's School of Architecture, students and faculty experiment with 'social entrepreneurship' as a new model for practice. This model encourages students to address social issues in their communities using financial models more typical of science, engineering and business.

MARGARETTE LEITE
Portland State University

INNOVATION AND ENTREPRENEURSHIP

The buzzword these days in higher education around the country is entrepreneurship. Universities in all states are promoting programs that attract and encourage student entrepreneurs to launch ideas, products and innovations (the other buzz word) that look promising from a marketability standpoint. And why not? Universities are looking for new funding models and successful innovations, properly copyrighted or patented through that institution, can generate ongoing revenue for both the creators and the institution.

These entrepreneurial innovations are often the products of business and technology partnerships, the research and technological innovations generally hailing from science and engineering programs, who then partner with business entities either inside or outside of the university with the hopes of achieving some degree of market success. While financial gain is one part of the equation, many programs have particular focuses. At Portland State University (PSU), Oregon, for instance, an important focus is on social entrepreneurship, an area of business that promotes innovations that address environmental and social problems. The University's School of 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."¹

Architecture programs are not normally at the forefronts of these types of entrepreneurial endeavors as their primary pedagogical purpose is to educate a service sector profession not primarily engaged in research or product development. However, I believe that more recent movements in architectural education which seek to expand the role of design to engage greater societal issues, often referred to as public interest design, has given rise to opportunities for engaging in social entrepreneurship.

Public Interest Design is aimed at creating new roles for architects that put them at

the forefronts of addressing human need on a larger scale and for the greater good. Portland State University has recently created one of the first Centers for Public Interest Design in order to provide just those kinds of opportunities for students of architecture. These opportunities often include designing and building shelters and support systems for communities in need and those affected by disaster as well as work closer to home that builds community capacity and works to address some type of societal problem. This is, without question, a worthy endeavor, but one that is generally challenged at all fronts by the lack of resources generally available to these types of clients.

This paper looks at ways in which students and faculty at Portland State University's School of Architecture have been able to marry the seemingly disparate aims of addressing social concerns while also creating innovative and marketable products that have the potential to yield financial returns.

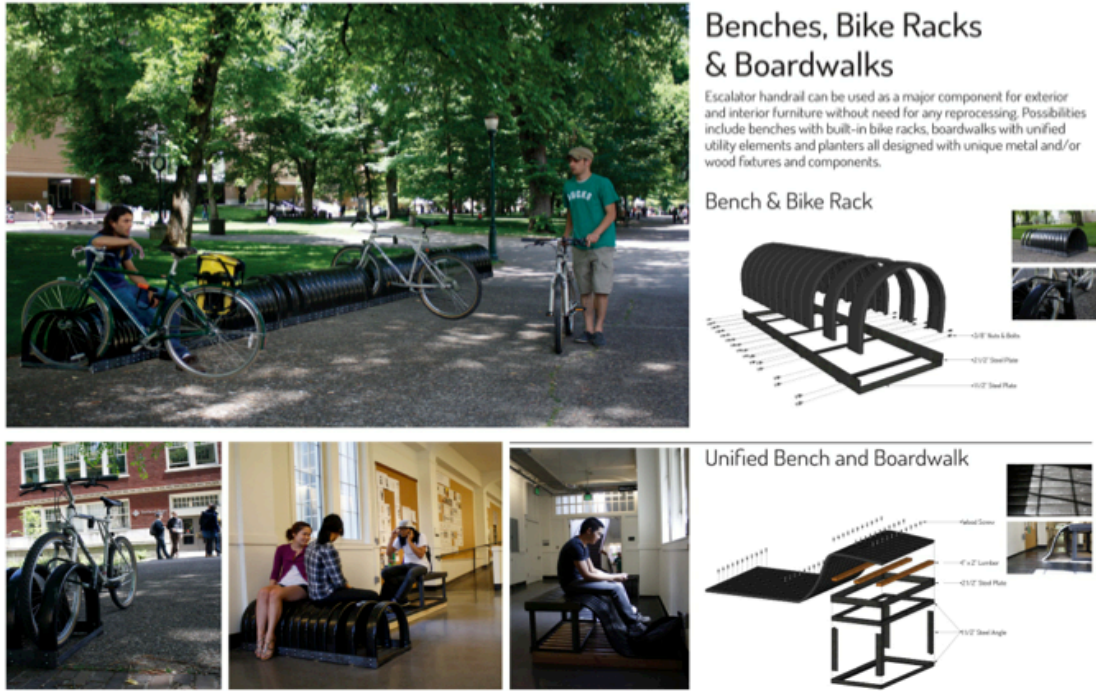
INNOVATION IN GREEN BUILDING PRODUCTS

In a course entitled Advanced Architectural Materials, students are challenged to look closely at materials reuse as an important avenue for sustainability in architectural design and building construction. They partner with local companies to address waste diversion issues by creating green building products from typically discarded materials. This becomes an exercise through which students can address real life issues that impact their communities while also considering the development of potential business opportunities that can help to support their missions. Students who feel their proposals have viability in the marketplace can enter their ideas in the Cleantech Challenge, an event sponsored by PSU and Wells Fargo where student and faculty teams are encouraged to pitch their innovative ideas associated with clean technology, and compete for development grant monies that can help propel their products to the next level, as either prototypes or final products. The chosen teams then present their products and business ideas at Oregon BEST FEST², an event where clean technology products are exhibited to the community of business, industry leaders and potential investors.

BETTER RAIL

One group of students in the Advanced Architectural Materials class 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 Industries³, who approached the School of Architecture with the idea of joining forces to harness the research and design expertise of the architecture school and pair it with their own marketing experience and industry relationships. The overall goal was 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.

Rebright Industries tasked the students 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. These products could be packaged through EXCEED, an organization that offers disabled members of the community work in the packaging and shipping of products.



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The Green Building Research Lab, a federally funded lab at PSU, 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 that might affect the viability of their products; qualities such as durability, reflectivity, insulating capacity etc. In the spring of 2013, the students pitched their ideas at the Cleantech Challenge Event with the hopes of securing venture capital to develop some of their products and move them towards marketing.

SHREDDIT

While the Better Rail project wasn't selected, a succeeding groups of students met with greater success. In the following year, students paired with local grocery stores to find potential solutions to an upcoming challenge. Three counties in Oregon will soon desist in accepting waxed cardboard for commercial composting. Waxed cardboard is also not a recyclable material because of the wax coating. The material is used in the production of the crates that grocery stores and food industries all over the country use to carry produce. The inability to compost it mean that stores will incur the high cost of disposal which is considerable, not to mention the detrimental impacts on the environment of greater waste and the burden on landfills. A single medium grocery store in Portland, disposes of approximately 600 tons of this material each year, over 500,000 boxes.

Students in the class were tasked with coming up with potential green building solutions that used discarded waxed cardboard. Several solutions involved the use of waxed cardboard as an insulating material, and others considered siding as well as bales for building walls. Once again, the students competed in the Cleantech Challenge and this time were selected as one of the six teams to move forward with development grant monies. These monies were to be used over the next three months to support research and generate prototypes, after which the teams would compete amongst one another at the Oregon BEST FEST for a grand prize. Three

Figure 1: Green building products from decommissioned escalator handrail.

students worked to develop the material as insulation in three different forms. One student shredded the material for use as loose insulation. Another shredded the material and placed it within a flame retardant fabric as panelized insulation and yet another created bales that could compete with straw bale construction.

Once again, the Green Building Research Lab proved critical to the necessary research. The students were particularly concerned with researching the properties imparted to the material by the wax. They compared their findings with those of cellulose insulation which is made from recycled and shredded paper. Students were able to test a number of properties including the insulative value, or R-value, of the shredded waxed cardboard. Surprisingly, it was discovered that this material actually provided higher insulation value than either cellulose or conventional fiberglass batt insulation. The R-value of the waxed cardboard was found to be 4.0 while that of cellulose and batt are 3.2 and 3.0, respectively. Students also carried out flame testing to compare the flammability of the material with other insulations. While the waxed cardboard took longer to catch fire, it maintained a significant flame until all the material was reduced to ash. However, using a non-toxic, all natural, flame retardant, they were able to find comparable protection with the other insulations. These findings sparked the interest of a consortium of grocers in the area working to find solutions for their composting dilemma and the team has been asked to prepare a business plan for commercialization of the product to the consortium for potential support.

SAGE GREEN MODULAR CLASSROOM4

A project at PSU that has made it to the marketplace is the SAGE (Smart Academic Green Environment) green modular classroom project. 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."⁵ A designation which allows it to receive project management support from the 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

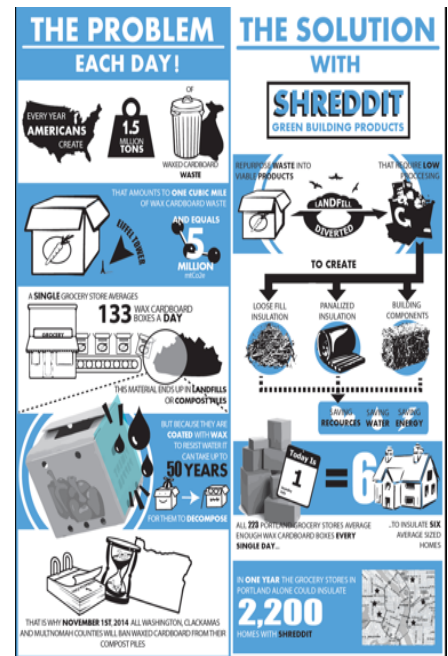


Figure 2: Product poster for Shreddit, green building materials from waxed cardboard.

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 reach 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 but could be done efficiently and economically.



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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. 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

Figure 3: New SAGE Classroom in Lynwood, WA.

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 relationship 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. At the beginning of the 2014 school, twelve SAGE classrooms were opened in six schools in Oregon and Washington with three more slated to open in December of the same year.

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. Goals statement of PSU Social Innovations Incubator, <http://sba.pdx.edu/sii/who.html>.
2. Oregon BEST is a nonprofit organization that "...nurtures clean technology innovation by transforming new ideas, research, and products into green collar jobs, greater sustainability, and economic prosperity for Oregon", <http://oregonbest.org>.
3. Rebright Industries is an Oregon-based group that matches companies that generate large amounts of waste with those that create potential second use opportunities.
4. The SAGE Green Modular Classroom design is a copyright of Portland State University. For more information see www.sage-classroom.com.
5. Oregon Solutions is an initiative begun by Oregon Governor John Kitzhaber to help communities develop sustainable solutions to community based problems through collaboration between business, government and non-profit organizations.