INNOVATE

UIC Innovation Center sees old challenges in new ways

By Steve Hendershot

Images courtesy of UIC Innovation Center

Students enrolled in programs at the UIC Innovation Center help generate product and service ideas for clients such as Caterpillar, BMW, Baxter International and Wilson Sporting Goods.

The CAT Lab within the UIC Innovation Center—so named for Caterpillar, its corporate sponsor—exhibits a unique combination of gleam and grit. The gleam comes from the whiteboards and foam core that ring the room; the grit is evident in the many construction photos taken by student teams during site visits. The lab's students perform primary research to gain an understanding of the challenges faced by heavy machinery operators and other construction professionals. They will gain insights into the types of new products that could make construction work easier, safer and more efficient. These team visits are much more than typical school field trips; within her first few months of working in the lab, graduate business student Lavanya Santhanakrishnan visited six different quarries and aggregate yards nationwide.

"This is a place where you learn everything by doing," she says. "We literally get down and dirty."

Deep, immersive field research is a cornerstone of the Innovation Center's approach, which aims to train students in what Peter Pfanner, the Center's founding executive director, calls a "needs-based" approach to product development. Consequently, the student researchers pilot solutions only after conducting extensive analysis to uncover and understand the root causes of a problem. Resulting products and services are designed to solve those problems within an industry's existing parameters, rather than to explore new technologies.

"We're about needs first, not tech. That's the difference between innovation and invention," Pfanner explains.

His methods helped the Innovation Center gain significant momentum when he came to UIC in 2011 from Motorola, where he was a design executive. The Center's original offering was an undergraduate course called Interdisciplinary Product Development (IPD)—a class that has been taught since 2002, involving students from various disciplines within UIC's engineering, design and business departments. The number of IPD classes has grown under Pfanner's leadership, and this year will enroll about 200 under-

As part of their coursework, students learn how to conduct immersive, in-depth field research. Here, Beini Yang, Tracie Thompson and Lavanya Santhanakrishnan visit an aggregate yard to better understand the challenges faced by heavy machinery operators.

grads. Now, the courses are tailored to reflect the support of high-profile corporate sponsors such as Wilson Sporting Goods, BMW and health-care giant Baxter International. Baxter, for example, has challenged its IPD class to develop new medical devices.

Pfanner's biggest enhancement, however, has been establishing several graduate-level labs that last longer and are more immersive than the Center's year-long undergraduate program. This allows graduate students to build on their output and develop viable, real-world solutions. (The resulting products and ideas generally are subject to intellectual property agreements with their sponsoring companies, and therefore cannot be disclosed.)

The first of these was a urology lab—called the UR*Lab—that launched in 2012, followed by similar labs specializing in ophthalmology and medical-device development. But the biggest leap forward came in 2016, when Pfanner partnered with UIC alumna and Caterpillar executive, Samantha Melchiori, '05 ENG, to create the CAT Lab, the Innovation Center's first graduate-level lab aligned with a single, dedicated corporate sponsor. Caterpillar had already sponsored one of the undergraduate IPD classes, and Pfanner and Melchiori saw an opportunity to take the rough designs hatched there and get them ready for prime time.

"There were good ideas that just needed a higher level of fidelity before we could have a realistic conversation about whether or not they should be 'productized,'" explains Melchiori, Caterpillar's global marketing manager of CAT Solutions.

The CAT Lab was an instant hit, and now Pfanner is working to replicate its formula. A similarly designed Innovation Center lab sponsored by Peoria, Ill.-based OSF HealthCare debuted this year, and several other brand-name projects are in the works.

"It's all about the impact," Pfanner says. "We'll continue to add more classes and more partners and more labs, and we're also working to see if there are ways to apply the way we work here to bigger problems or to other types of problems."

CRACKING THE INNOVATION CODE

The Innovation Center owes its impact not only to Pfanner's lab model, but also to his talent for deal-making with corporate partners.

Peter Pfanner, executive director, UIC Innovation Center, and Don Bergh, faculty co-director of the UIC CAT Lab.

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—Peter Pfanner

"He's very versatile, and he has the knowledge and experience to know how to work with these companies, as well as with the students and faculty," observes Dr. Susan Poser, UIC provost and vice chancellor for academic affairs.

But the Center's growing reputation is based on more than its impressive list of partners. It also excels in training would-be innovators in a powerful, three-pronged approach to problem solving: Its methods are needs-based; interdisciplinary and collaborative; and highly iterative.

Needs-based: This criterion requires a thorough assessment of the people, circumstances and problems that might benefit from a new product before any solutions are proposed. It's a simple idea that often is difficult to master, since would-be designers and engineers typically want to start creating prototypes right away. Instead, the Innovation Center preaches a methodical approach to the information-gathering stage of product development. For example, during its first few months of operation, OSF HealthCare's lab team has focused on interviewing underserved residents in three locations within the system's downstate service area, analyzing the lifestyle factors that might impede patients' access to care.

OSF is sponsoring the lab in hopes that the UIC student team will bring both disciplined design thinking and fresh eyes to long-frustrating challenges. By working with the lab, "We gain unique perspectives and ideas from outside the sphere of health care that can lead to brand-new ways of serving our most vulnerable populations," explains Sarah de Ramirez, chief medical officer and vice president of clinical innovation at OSF HealthCare.

So far, there's been no solving, just listening—and both OSF and the lab team are fine with that.

"These rural communities are pretty foreign to a lot of us from Chicagoland," says Robert Zolna, UIC clinical associate professor of design research and director of the OSF HealthCare Lab. "We can't make any hypotheses until we understand the communities themselves."

Interdisciplinary and collaborative: All of the Innovation Center's lab teams include representatives from a variety of disciplines, including computer science, mechanical and industrial engineering, graphic design, industrial design, public health and business. Team members are selected to provide coverage across fields specifically relevant to each project. The OSF lab, for instance, includes a former public radio producer and storyteller whose interviewing skills have proved useful in speaking with OSF's patient population.

As another example, a leadership meeting of the UR*Lab, which primarially consists of practicing urologists and medical faculty team members, also includes Charles Frisbie, '07 CBA, MBA '17, an adjunct lecturer at the UIC Liautaud Graduate School of Business. His insight into patent activity helped shape a product idea by shifting the team's focus away from an area where several companies had already staked intellectual property claims toward a different innovation for storing sperm samples for in vitro fertilization—and for which there is less competitive activity.

The Center's collaborative ethos extends beyond each team's composition, however. Lab teams from different disciplines also seek one another's counsel. For example, on a day when the UR*Lab was discussing process limitations for measuring bladder pressure, a group of visiting hydraulics engineers from Caterpillar shared a method for measuring fluid pressure non-invasively, providing a new angle from which the urology team could approach the problem.

Within the Innovation Center's undergraduate courses, this cross-pollination is a key tenet, as students learn early on to not only embrace the lens of their particular discipline, but also to appreciate other viewpoints.

"It is critical for the success of a project to be open-minded and to get past those barriers," says Kim Moon, who has taught marketing and new product development at UIC since 2008. "This course allows students to have that empathy—engineers thinking like marketers or vice versa—but it doesn't happen naturally."

Highly iterative: Pfanner's iterative approach to innovation is a hallmark of the Center, which is outfitted with an array of 3-D printers and prototyping tools. Rapid prototyping, with its incremental changes and micro-experiments, is fundamental to innovation, and Pfanner is making sure it's used throughout the Center.

For instance, a breakthrough in one UR*Lab meeting came when Kimberlee Wilkens, MFA '10 CADA, assistant professor, industrial design at UIC, shared product prototypes of a sperm-storage container she had 3-D printed that morning. The plastic container elicited feedback that a sketch or computer-aided design drawing likely would not have, informing changes to the prototype she made the following week.

"The prototyping piece is a really important part because you really have to do this no matter what you're building," says Michael Scott, director of the Center's Interdisciplinary Product Development program. "It's about creating very little pieces of what a solution might be and letting users interact with that so you can see what needs to be done next."

Interdisciplinary teamwork is a critical element of the Innovation Center's programs and helps students appreciate other viewpoints.

COURTESY OF LAVANYA SANTHANAKRISHNAN

The 3-D printers allow lab teams to make incremental changes and conduct the micro-experiments necessary for rapid prototyping.

Rapid prototyping is an essential part of the Innovation Center, which is outfitted with an array of 3-D printers and prototyping tools.

CAT LAB CULTURE

It is noteworthy that Peoria, Ill.-based Caterpillar—a multinational manufacturer of construction equipment—already has a large, internal innovation team. The company isn't looking to the Center to develop its next multi-ton earthmover. Instead, it hopes that a team of young outsiders will see old challenges in new ways and perhaps apply the kinds of new-tech solutions that are second nature to millennials.

"What happens to all of us when we've been in our careers for awhile is that our focus begins to narrow, and we develop very specific areas of expertise. Here in the lab, we don't have that problem," says Beth Ladd, analytics research and development manager for Caterpillar and director of the CAT Lab. Caterpillar uses the lab for "low-cost, low-risk projects that provide answers about whether we perhaps could apply consumer-based technologies to our problems, and that show relatively quickly whether there's applicability and scalability or not," Ladd explains.

If the description "low-cost, low-risk projects" makes the CAT Lab's work seem less significant, it's important to realize that Caterpillar's internal product development operations are, by the nature of its size, focused on massive, big-budget projects. It's usually difficult for major corporations to devise creative solutions to real, but sometimes secondary challenges—the traditional role of a startup.

And that's precisely the role the Innovation Center's CAT Lab hopes to play—that of the plucky startup devising breakthrough industry solutions. The biggest difference between the UIC CAT Lab and a Silicon Valley technology company is that the CAT Lab works on behalf of, rather than competing with, industry leaders.

There is accountability attached to the CAT Lab's projects, both from its faculty co-directors Donald Bergh and Ugo Buy and from Caterpillar itself. At the same time, the UIC team also has the time and budget to pursue extensive field research and experiment freely as it works toward creating functional prototypes.

"You have the freedom to create and innovate stuff that is very raw and to do it in a very open, innovative and productive space," says Karan Patel, MIS '17, who worked in the CAT Lab last year as a graduate student and now works for Caterpillar as a data analyst. "Now that I'm out of it, I realize how beautiful it is."

There's also more freedom to change a project's direction based on the results of initial research than is typical of larger corporate projects.

"If we take a radical right turn, Caterpillar usually responds, 'Okay, that's cool—that's not what we expected, but it's really interesting,'" Bergh says.

Ultimately, the CAT Lab team operates in an integrated space between college and the professional world, its members traveling to far-flung construction sites and taking on

The multidisciplinary lab teams include students majoring in business, computer science, graphic design, industrial design, public health, and mechanical and industrial engineering.

urgent, real-world problems, but also working unburdened by rigid specifications.

It's a rare opportunity in many senses. Students must survive an arduous and highly selective interview process to join the CAT Lab—the same is true for all of the Innovation Center labs—but once they're accepted, they know they're part of something exceptional.

"It's like a balloon that we don't want to let fall to the ground," Santhanakrishnan says. "We all just keep tapping it to keep it afloat."

Although the specifics of the CAT Lab team's projects for its corporate sponsor are confidential, its outcomes have openly impressed Caterpillar executives. None of the team's products have yet made it into production, but its work has provided valuable new insights into previously intractable problems, and has begun to affect Caterpillar's approach to the issues it has addressed.

Ladd affirms that influence bubbles up to Caterpillar's internal innovation team from the work that's being done in this lab. "The thinking, experimentation and approach of the student team in the lab is influencing what's happening in our products," she says.

THE NEXT HORIZON

Last fall, Illinois Gov. Bruce Rauner and Chicago Mayor Rahm Emanuel announced plans for a $1.2 billion research facility in Chicago's South Loop, part of a massive real-estate development project known as "The 78." The area is slated to include the Discovery Partners Institute (DPI), an interdisciplinary innovation center that will involve multiple academic institutions, including UIC, UIUC, Northwestern University and Tel Aviv University in Israel. Plans for the DPI are still in development, but its focus on collaboration and innovation, as well as its oversight by the University of Illinois System, indicates that there likely will be strong ties to the UIC Innovation Center.

Indeed, Poser says, "The Innovation Center is a great model for the DPI because the intention for the program is to marry research, student involvement, economic development and workforce development, and that's very much what the Innovation Center is already doing."

The DPI's first offering's run by the UIC Innovation Center: a course sponsored by OSF HealthCare that will include a diverse student team drawn from both UIC and UIUC. The Innovation Center and the DPI also share a multidisciplinary focus, a further indication that their relationship and offerings are likely to complement one another.

"One of the ways that the Innovation Center is so inspirational to the DPI is the idea of students [from different disciplines] all integrated into a team to work on a specific problem," says T.J. Augustine, associate vice president in the Office of Economic Development and Innovation with the UI System and one of the DPI's leaders. "That's at the core of what we want with the DPI."

Pfanner says the DPI will add energy and excitement to the momentum that already drives the Innovation Center. The Center boasts a growing list of successful case examples—and not just from corporate partners such as Caterpillar and OSF, but also from alumni such as Melchiori, who credits the Innovation Center with helping to shape her professional identity. She took the UIC Interdisciplinary Product Design course as an undergraduate and describes it as "instrumental in my educational experience."

Now she sees a broader canvas for success, as the CAT Lab demonstrates the Innovation Center's potential for far-reaching impact.

"This started out as a really creative and fun idea and then became very important over time as it matured and materialized into something that people within the University and inside of Caterpillar believed was providing value," she says.

If that sounds like the story of a plucky startup that's set to make it big, it's not a coincidence. Pfanner and his Innovation Center colleagues are simply following their own formula for success.