Design thinking

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When researchers combine their expertise in various disciplines to solve a problem, they find more practical answers than if they work alone. Their solutions transcend any one field, and the team of problem solvers can adapt to industry needs. UNT is at the forefront of collaboration — looking at the world in new ways, and pushing progress beyond invention to innovation.

By Matthew Zabel

Today's successful innovators must examine problems from multiple angles. They must be practical, rational, creative and empathetic. They must employ expertise from fields outside their own. They must be "design thinkers."

Design thinking fosters practical, creative problem solving that offers multiple applications. It is a form of solutions-based, or solutions-focused, thinking with the broad goal of creating a better future, instead of solving one specific problem. By considering the present and future together, problem solvers can explore the parameters of the problem and possible solutions simultaneously.

General Electric demonstrated this dynamic well in a recent advertising campaign pointing out that its workforce is increasingly shifting from manual labor to technical skilled labor. The company emphasized that it has moved beyond looking for ways to improve — or invent — single products for a world where its innovations could yield a myriad of new and improved products and technologies. The world abounds with products that are the result of this new thinking.

Ford Motor Company also embraced the idea over the years, partnering with companies like Proctor & Gamble, Nike, Heinz and Coca-Cola. These research collaborations have led to new soy-based products and many new bioplastic materials that are now used in many aspects of the company's vehicles.

"Design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success," writes Tim Brown, president and CEO of Ideo, an international design and consulting firm.

This type of creativity requires a new mindset.

Science and humanities

Reaching a mindset that leverages the design thinking process begins with education.

In his book, *Designerly Ways of Knowing,* Nigel Cross describes the three cultures of education: first, a science culture, second, a humanities culture — both of which have been generally accepted. But a third, a design culture (and for a time, technology) — was largely ignored and undefined for many years.

While the sciences bring objectivity, rationality and neutrality, the humanities offer subjectivity, imagination and commitment.

Cross, in his work, describes the lesser known, "design culture" as one of practicality, ingenuity, empathy and a concern for appropriateness.

"This 'material culture' of design is, after all, the culture…of the designer, doer and maker," Cross writes.

Design thinking isn't limited to the physical sciences. Many social sciences and services benefit from this same layered, multifaceted approach to research. Design thinking connects science and design — including technology — to human response and engagement, and social outcomes.

For example, ever-evolving social media sites and applications are rapidly changing human interactions in dating and people's self-esteem.

To better understand these changes, University of North Texas researchers Jessica Strubel, an assistant professor of merchandising, and Trent Petrie, a professor of psychology, found their diverse expertise, yet similar interest in body image, highly valuable in their collaborative study of the social application, Tinder, and its effects on men and women.

"Consumer behavior includes the consumption of social media such as mobile dating sites," Strubel says. "Trent brings his counseling background to the research, and I bring the consumer behavior component, which gives us a well-rounded approach."

Another collaborative effort example that employed a design thinking approach was led by Laura Siebeneck, an associate professor of emergency management. Siebeneck studies the human response to hazards and disasters and seeks to learn how to help people respond and recover effectively after natural disasters.

Beginning in early 2017, she will work with civil engineers, computer scientists and communications experts to understand people's decisions to return home and rebuild after a hurricane.

"In disaster response and recovery, evacuation and return is complex. Issues faced include those related to shelter, food, infrastructure and lingering hazards. Support must be coordinated across multiple disciplines to create the most effective, efficient and human response," Siebeneck says. "Multiple perspectives increase the base of knowledge from which a credible solution can be created."

Places and spaces

Design thinking drives collaboration. Working in silos — literally or figuratively — reduces the higher output that can be generated through shared spaces.

Chicago-based Gensler, a company known for its architecture, design and other services, offers a shining example of design thinking at work. The company looks for ways to design spaces that encourage collaboration.

To model Gensler's example, UNT facilities designers created one such space with flexible labs in the recently remodeled Science Research Building. This space is used by the university's BioDiscovery Institute (BDI), one of four Institutes of Research Excellence launched in 2015 to bring together key researchers from multiple fields. The modular labs allow for flexibility, and by their proximity to each other, allow researchers to move easily between labs to consult with each other and expand their work — and thinking.

At UNT's Discovery Park, the North Texas region's largest research park, researchers from an array of engineering disciplines collaboratively test ideas in shared lab spaces like the Materials Research Facility (MRF).

"Researchers are continually pressed harder to work together, and they simply can't do this effectively when they work in their own labs, spread out across a large campus," says Rajiv Mishra, director of UNT's Advanced Materials and Manufacturing Processes Institute (AMMPI). "No researcher has all the equipment needed. When you have a larger space with different types of equipment, you can share both resources and ideas to improve your results."

As researchers model this culture for their students, the university offers up unique spaces to its students to encourage them to apply the same thought processes and explore these methods to better prepare them for their future careers.

The Factory, part of UNT's Willis Library, is made for design thinkers and makers. In this UNT space, students of all levels have the opportunity to work together and innovate. With equipment like 3-D printers, 3-D scanners, photography, die cutting and dozens of other tools, The Factory helps students put their ideas to work.

UNT is embracing design thinking and bringing it into its everyday culture — invigorating faculty, students and staff. UNT is planning to open Collab Lab, an environment designed for students from different disciplines to come together and create — innovate. This type of space and support of collaboration, innovation and design thinking, will keep UNT students competitive in a dynamic marketplace. Co-working spaces, industry mentoring and state-of-the-art technology will be combined to allow students to create "impact" ideas. Having a space in which to innovate is only a part of this design thinking strategy, because real innovation — and innovators — exhibit creativity in "how" they create, how they work and how they think.

Beyond spaces

Bringing science, humanities, design and technology together to inform ideas is key to unleashing anyone's true potential. The intersection of collaboration and the growing do-it-yourself culture creates opportunities for new ideas, methods and solutions in our diverse, creative and tech-savvy generation.

A new generation of innovators is reimagining everything from health care to human services, transportation to defense, and using cloud computing, personal devices, behavioral analysis, personalized market surveying, and analytics — together.

A design thinking approach coupled with collaboration in a high-demand, high-touch world is required in today's competitive marketplace. Attaching these same methodologies is a different, and more comprehensive way of thinking about customers and launching products and services, and it is a different way of working.

The "cloud" offers a new innovative space. Today's "smart" devices can share, analyze and process massive amounts of data from almost anywhere. Cars can communicate with each other to avoid collisions. Thermostats, lights and door locks can be controlled from thousands of miles away with a smartphone, and Internet-connected trash bins can help optimize collection routes.

To support the educational needs of busy students and professionals in the North Texas region, UNT has established a network of off-site instructional locations throughout the region. Offerings at each location are tailored to the workforce needs of the surrounding area. For example, at the New College at Frisco, students can study marketing analytics, business and game development in classrooms equipped with state-of-the-art technology. Or, they can prepare for a career in sport or recreation management just a short distance away from the headquarters of five different professional sports teams. A unique platform for collaboration is created across multiple disciplines. This is what industry is seeking.

"UNT's New College concept of 'learning beyond walls' builds on the partnership principle by infusing higher education with industry engagement," says Dave Quinn, vice president of the Frisco Economic Development Corporation. "Making that connection creates graduates who know how to collaborate, innovate and become the problem-solvers of tomorrow. This path to success also is an asset when recruiting new companies to Frisco."

Case study: Diverse applications

UNT chemist Guido Verbeck holds multiple patents for mass spectrometry instruments. He is working across multiple disciplines at UNT, supporting innovation in areas including environmental science and arts technology.

"When you investigate what others are doing, you often find out somebody has a problem that you solved a long time ago — they just don't know it," says Verbeck, who was recently awarded UNT's inaugural Faculty Innovator Award for 2016. "Cross-discipline communication and collaboration is a catalyst for more, and improved solutions."

Verbeck reconfigured a mass spectrometer that he originally developed to detect vacuum leaks in industrial environments. In doing so, he is able to detect air particles, hazardous materials, cancer cells, illegal drug factories and more.

"Often in research you have a problem and you work toward a solution," he says. "As a tool builder, you have to look at it the other way, too. People created a hammer to drive a nail. But once they built the hammer, they figured out more things to do with it than just drive a nail."

Case study: Collaborative treatment

The Texas Center for Performing Arts Health was created in 1999 and re-established in 2014. UNT and UNT Health Science Center at Fort Worth wanted to work together to address occupational health problems that plague performing artists.

At the center, UNT researchers — in music, arts and medicine — partner to continuously seek out, treat and prevent injuries that plague musicians and dancers. Bringing together disciplines like music, medicine, engineering, psychology and public health has led to treatments for focal dystonia, tendonitis, shoulder injuries, muscle pain, hearing loss and other injuries. Many artists have been able to continue performing without causing further injury.

"Idea integration across disciplines creates amazing opportunities for solving problems and for conducting applied research," says Kris Chesky, a UNT professor of music and co-director of the center.

Constructivism: The apprentice

There is an emerging and growing maker culture. It leans heavily on the idea of "constructivism"— learning through doing, with a great deal of discovery through the tangible creation of products. Craftsmen once used this teaching style to ensure that their craft continued by recruiting apprentices.

Today's apprentice takes this "method" approach even further. With the maker culture movement relying heavily on openness and a spirit of sharing, any one apprentice may in fact be gaining cross-purpose skills. Sharing and open source work is accelerating the learning process and each maker's progress. These innovative makers learn through the process. They create. They test. They analyze their work, and they repeat the process, seeking to learn from each failure as much as they learn from success.

Design thinking: Transdisciplinary study

Michael Gibson, a faculty researcher for the Design Research Collaborative in UNT's College of Visual Arts and Design, says that research in and around design thinking moves beyond interdisciplinary study to an even more robust, transdisciplinary study.

"Interdisciplinary study means people from different disciplines are working together and sharing their skills and expertise with each other," he says. "Transdisciplinary study means that your knowledge has changed in that process because you gained some understandings from outside your discipline you didn't have before."

Gibson recently led a team that included experts from information technology, anthropology, psychology and design to revamp the design and functionality of the Texas Veterans Portal website to improve services and information for veterans.

He indicated that input from veterans and experts from all those different disciplines proved critical. The collaborative process isn't always comfortable, he says, but "it forces you to get to a point of common language and common understanding."

Ideas by design survive

It is widely accepted that collaborative research projects generally produce better outcomes than solo efforts. Industry leaders often have relied upon university researchers for the basic discoveries that serve as the foundation for many types of innovation and product development. With universities working more collaboratively with internal and external partners, researchers working with them have assumed more significant roles in applied research.

Interaction between disciplines such as engineering and design, computer science and logistics, biology and geography, political science and economics, helps people consider different ideas and perspectives in ways that can lead to better, more sustainable solutions for the future.

According to Gibson, design thinking is easily misunderstood.

"There is no special kind of barbecue sauce that you can just pour over a situation — design thinking does not operate according to any pre-set formulas, and its outcomes are not predictable," he says. "Design research begins by examining situations as they might evolve in the future rather than situations that have already transpired. It's a future-focused way to connect creativity and innovation."

Design thinking: The future

Gibson also says that design thinking relies on researchers' abilities to learn from each other and to remain open to change as the research evolves.

"We're interested in trying to transform situations in social issues or public policy or economics or technology that involve real situations that affect real people in the real world," he says.

Academia can contribute to this dynamic and innovative approach to problem solving and help shape an outcome-based, idea-driven generation. Through evolving research and education methodologies — and by fully embracing it internally — universities are becoming laboratories for innovation.

Collaboration is the key. UNT is embracing discovery and innovation through interdisciplinary collaboration. By design, UNT is driving new projects, programs and solutions.