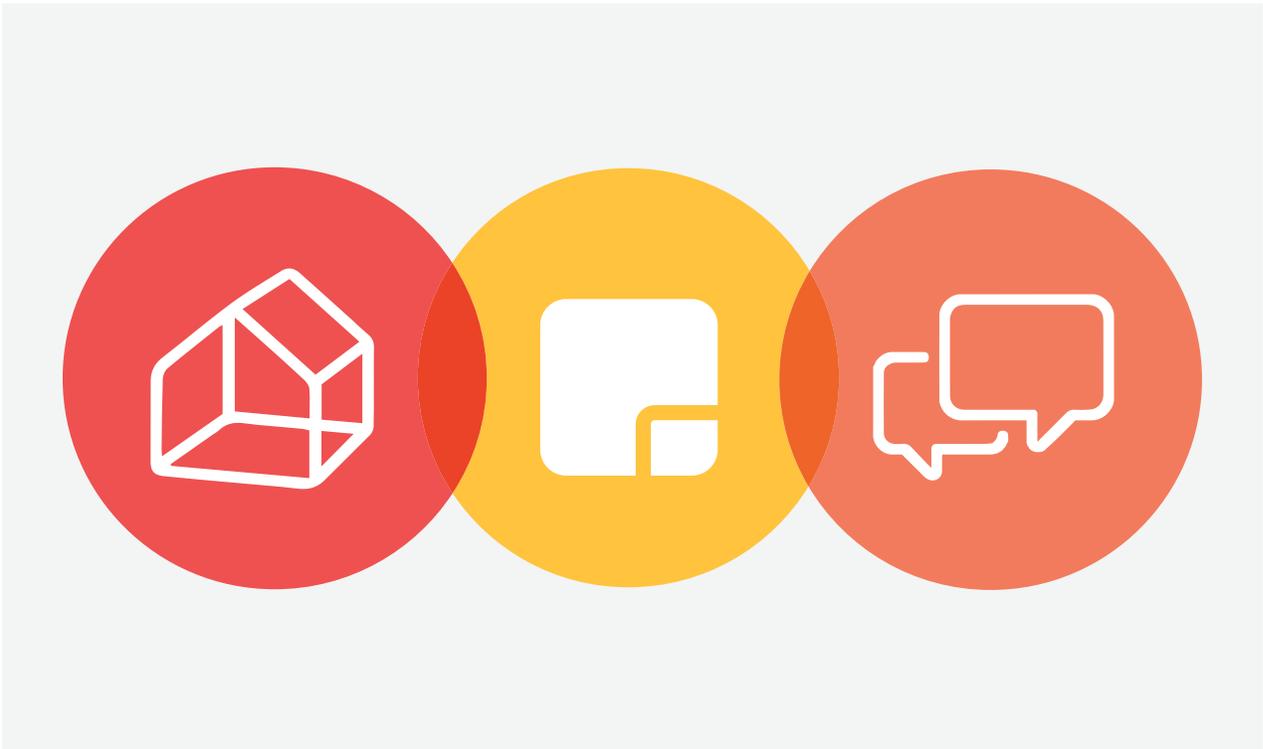# Innovation Through Experience
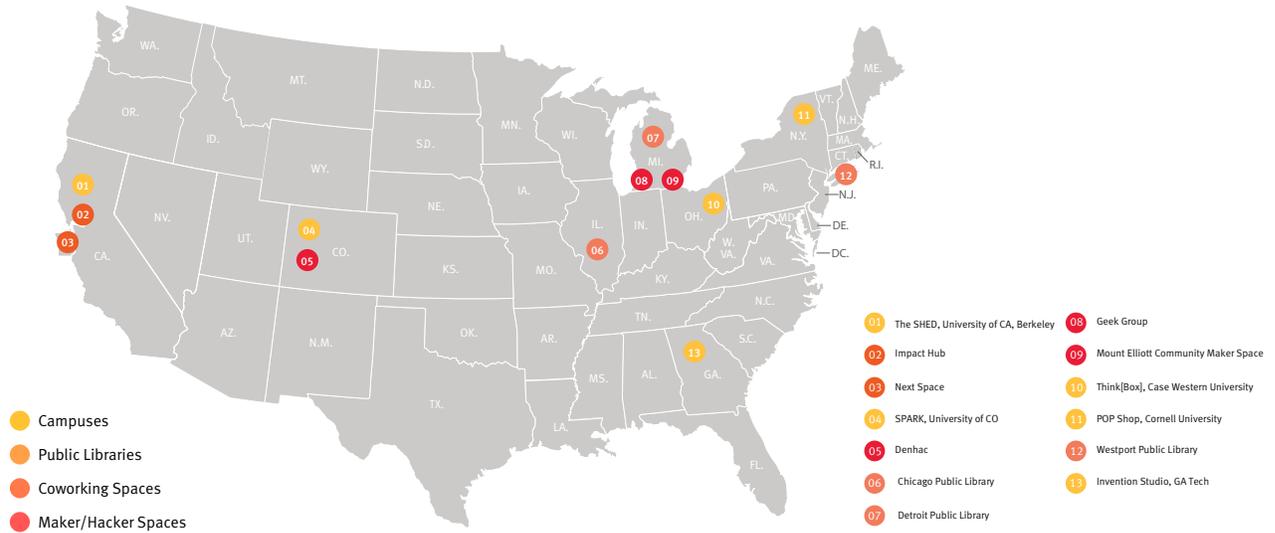## Reshaping Learning Spaces for Makers, Hackers, and Coworkers

Key Insights

- **Universal access to the Internet and breakthroughs in manufacturing have democratized innovation, creating a new driver for the economy.**

- **To thrive in this economy, people need opportunities to tinker (make), deconstruct (hack), and network (cowork).**

- **Academic institutions have an opportunity to prepare the next generation of innovators by designating learning spaces for making, hacking, and coworking.**

- **The most effective innovation spaces combine all three activities in one centrally located site that's approachable to everyone.**

How do people become innovators? In today's economy, it's often a hands-on approach. A growing community of makers, hackers, and coworkers are creating an emerging culture of "learning by doing" that is shifting how future workers learn to innovate.

As schools prepare the next generation to engage in this maker economy, they're creating a new kind of learning space where students can engage in a combination of hands-on processes and networking to bring their ideas to life. To better understand this shift, Herman Miller researchers leveraged insights from prior Herman Miller research on the Future of Learning, toured university campuses, and interviewed education and business thought leaders.

Research Summary

Map of participating sites

01	The SHED, University of CA, Berkeley
02	Impact Hub
03	Next Space
04	SPARK, University of CO
05	Denhac
06	Chicago Public Library
07	Detroit Public Library
08	Geek Group
09	Mount Elliott Community Maker Space
10	Think[Box], Case Western University
11	POP Shop, Cornell University
12	Westport Public Library
13	Invention Studio, GA Tech

- Campuses
- Public Libraries
- Coworking Spaces
- Maker/Hacker Spaces

We studied 13 maker, hacker, and coworking spaces across the United States.

While our focus was on education, the trends we noted extend into other organizations with an interest in innovation, including public libraries, museums, and corporate campuses.

The Ingredients of Innovation

Our preliminary explorations revealed that learners are seeking spaces that support a new user/learner experience. Makerspaces and hackerspaces were popping up on academic campuses, providing opportunities for empowered users to engage in a range of activities from tinkering to sharing ideas to designing, building, and developing prototypes for new products. Later in the exploration, it became evident that coworking activities share attributes with maker and hacker activities, so coworking spaces were added to the study.

Makers innovate through tinkering. The activity of making combines the Internet model of innovation with desktop manufacturing tools, resulting in much wider access to the tools needed to make things. This opens tinkering, designing, and prototyping to the novice creative and budding innovator.

With a computer, laser cutter, and 3D printer, anyone can learn to make a product in a relatively short period of time with minimal resources. The tools and activities available in makerspaces empower users to expand their creative horizons, try new projects, and build new skills in a safe environment that supports failure.

Hackers innovate through deconstruction. Hacking is a form of tinkering with a goal of understanding how something works. In today's hackerspaces, individuals with similar interests can gather to work on projects; deconstruct and rebuild computers, electronics, and equipment; share knowledge; and collaborate on ideas, which leads to better inventions and innovations. Hackerspaces could be considered as pre-models of today's coworking spaces.

Coworkers innovate through networking. Coworking spaces provide a shared working environment for people from different backgrounds and areas of expertise. The value of the coworking movement is in the community that is formed within shared working environments where learners and creatives work alongside each other, learn from each other, and build strong networks of knowledge and creativity.

Research Summary

What Are the Connections to Learning Theory?

Learning Theory literature tells us that thriving in a maker economy requires a capacity for lifelong learning characterized by cross-disciplinary dispositions of curiosity, resiliency, problem solving, self-direction, and self-evaluation. We also know there is a direct correlation between effective learning and the experience of constructing a meaningful product. Furthermore, it's been shown that encounters with tools can promote self-discovery and new thinking, which support social and technological innovation.

The maker, hacker, and coworking spaces we studied support these concepts in several important ways. First, they were created specifically for hands-on learning, with tools and mentors available within the space. Secondly, they provide opportunities for like-minded and diverse people to build a community of learners. Finally, they create an environment where the teacher can become the learner and the learner can become the teacher.

We also noted some important gaps between Learning Theory and innovation spaces. While theorists suggest that the process of making is a "gateway to deeper engagement" between users from a variety of disciplines, none of the spaces we studied were located in the center of campus, where they would be accessible and approachable to students from all disciplines. At the moment, there is no established framework for planning a centrally located, on-campus innovation space that could benefit all students, and a lack of empirical evidence to support the benefits of on-campus innovation spaces may create roadblocks to future projects.

What Did the Innovation Spaces We Studied Have in Common?

In fact, each site had its own unique approach. Our findings revealed many considerations for serving the users of various maker, hacker and coworking spaces—but notably, no established framework for what maker, hacker, or coworking spaces should be.

We noted these characteristics of the spaces we studied:

- Makerspaces in public libraries had similar tools in spaces designed to attract both novices and experts. Learning the new and different were key themes in all of the makerspaces

- Stand-alone hackerspaces had a range of equipment types, but the general focus of the spaces was on enhancement of skills through learning by doing, collaborating, and exchange of ideas

- The coworking spaces in the study both aimed to build a community of like-minded, yet diverse people who shared ideas and learned from one another

Why Should We Care About Innovation Spaces?

Missed opportunities for disruptive innovation exist within many campus communities, whether the campus is higher education or corporate. Disruptive changes in technologies and global markets during the first decade of the 21st century are part of a social transformation that begins to reshape the way we think about the relationships between material production, technology, innovation, and society (Mancuso and Niessen 2014).

The opportunity to innovate is in the hands of anyone who has an interest in making, hacking, and coworking. New opportunities are emerging for academic and corporate institutions to develop models for places of innovation where an interdisciplinary community of learners and innovators can engage in and lead in a new manufacturing economy and a sustainable culture of innovation. To do this, it is important to understand how elements of maker, hacker, and coworking spaces can come together to inform a true innovation space.

Research Summary

What Does an Innovation Space Look Like?

A true innovation space demands:

1. Resources,

2. An interdisciplinary perspective,

3. Support for a variety of activities, and

4. Ideally, shared space for making, hacking, and coworking in one centrally located site

Each of the sites in our study offered some combination of those traits. The paragraphs below note what worked in five of the innovation spaces we studied, along with areas that could be improved for greater utilization.

The Invention Studio at GeorgiaTech

Characteristics

- Makerspaces empower students to tinker, explore, and make anything they can imagine

- Hackerspaces invite deconstruction of computers/ equipment and provide more sophisticated tools to explore the sciences, engineering, and arts

- A coworking-like space supports ideation, project development discussions, collaboration on homework assignments, and the occasional chess match

Challenges

- Space limits growth potential

- Location in an Engineering building limits the approachability of the space for other disciplines

The Think[Box] at Case Western Reserve University

Characteristics

- Serving as a pilot for a new 50,000 square foot Think[Box] Innovation Center

Challenges

- Current location in an Engineering building limits the approachability of the space for other disciplines

- No evidence of a space intentionally designed for coworking

SPARK at the University of Colorado, Boulder POP Shop at Cornell University

Characteristics

- Undergraduate-developed and managed coworking space

- Space is located adjacent to campus

Challenges

- Space has limited support for product development beyond rapid prototyping

The SHED at the University of California, Berkeley

Characteristics

- An undergraduate-developed and managed maker/hacker space serving as an inspiration for the new Jacobs Institute for Design Innovation

Challenges

- Incorporating spaces that support tinkering and coworking into the new building

For those academic and corporate institutions that have little or no exposure to innovation spaces, harvesting great ideas within the institution is a place to start. Like all of the participants in the study, students, faculty, and employees have creative and constructive ideas about attributes of spaces that help them learn, create, and innovate. Studying how these ideas were developed and implemented on a small scale within a community will help leaders and planners understand how the activities might be planned, implemented, operationalized, and scaled to reach maximum potential.

Research Summary

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