

Silicon Flatirons



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*Roundtable Series on Entrepreneurship, Innovation,
and Public Policy**

Boundary Jumping: *Understanding the Value of Modest Anarchy in Entrepreneurial Networks*

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Executive Summary

Matt Cutter, CEO and Founder of Upslope Brewing in Boulder, Colorado, had a problem. His upstart craft brewery needed a technology to enable faster and more efficient canning of small batches of beer. Finding a dearth of satisfactory solutions on the market, Cutter did something that might seem curious. He engaged an engineering firm collocated in his building, Wild Goose Engineering, that knew nothing about beer or canning. Wild Goose's expertise was instead in engineering, manufacturing, and fabricating products ranging from firefighter safety gear to airplane parts. In its collaboration with Upslope, Wild Goose nonetheless drew upon its diverse experience to design a new filling system that enabled far faster canning. The results were remarkable. So successful, in fact, that Wild Goose now exclusively manufactures craft brewing canning systems.¹

Wild Goose's innovation in working with Upslope is an example of *boundary jumping*. Boundary jumping involves the exchange of information and knowledge between people across different industry sectors and disparate intellectual disciplines. Searching for new insights across boundaries might appear to be a recipe for inefficient and wasteful exploration. Mounting evidence, to the contrary, suggests the powerful effects of combining knowledge and experience across industries and disciplinary domains. Indeed, a better understanding of boundary jumping may be a key that unlocks greater creativity for startups in Colorado's Front Range.

On November 15, 2013, the Silicon Flatirons Center convened a roundtable (the "Roundtable") featuring entrepreneurial leaders from a diverse range of industries. The Roundtable analyzed how boundary jumping works and, additionally, where it already occurs among startups in the Front Range. Roundtable participants discussed their own experiences with boundary jumping and opined on structures and skills that facilitate increased opportunities for innovation. As this report details, boundary jumping occurs where the "modest anarchy" of Boulder's Pearl Street facilitates interactions between entrepreneurs, where serendipitous conversations between different companies arise as designed by the architects of Denver's Galvanize, and where digital messages in a bottle are broadcast as "problems" for unknown others to solve via the Internet.

A growing body of literature suggests that boundary jumping enhances the innovative capacity of companies. This is because creativity and innovative problem solving are best understood as collective activities that are "always the result of new combinations of pre-existing know-how, skills, ideas, processes and artifacts."² Consistent with the academic literature, Roundtable participants overwhelmingly agreed that boundary jumping engendered unexpected and positive innovations for their businesses. They further underscored that a better understanding of boundary jumping could provide insight about how startups can better innovate.

While boundary jumping is an important part of creativity, it often fails to occur. Boundary jumping cannot occur or will not be productive if individuals or organizations: (1) do not have the opportunity to interact, and/or (2) cannot process or understand the information they are receiving

¹ This innovation has expanded the number of small microbreweries that can their own beer, allowing for a significant expansion of the industry in Colorado and the United States. Alicia Wallace, *Boulder-Area Firms Benefit from Craft Beer's Ripple Effect*, *dailycamera.com* (May 15, 2012) available at http://www.dailycamera.com/business_old/ci_20632132/boulder-area-firms-benefit-from-craft-beers-ripple.

² Pierre Desrochers and Samuli Leppälä, Opening up the 'Jacobs Spillovers' black box: local diversity, creativity and the processes underlying new combinations, 11 *JOUR. ECON GEOG* 843, 846 (2011).

from their boundary jumping counterpart. Importantly, individuals must be spatially *and* cognitively proximate to one another in order for successful boundary jumping to occur.

Spatial proximity refers to convening – or at least bridging – participants across industry sectors and intellectual domains. Urban architecture, problem solving websites, and cross-industry social groups are each examples of structures that increase spatial proximity. Desired interactions can be intentional or serendipitous and moreover, structures that facilitate spatial proximity can be physical or virtual. Effective structures for innovation are those that enable more frequent and productive interactions across boundaries than would otherwise occur in the absence of such structures.

Boundary jumping further requires that individuals be *cognitively proximate* to one another. Cognitive proximity determines whether people involved in an interaction can understand, process, and use the information exchanged across industry and intellectual boundaries. If concepts are not accessible, such as when terminology and jargon makes communication mutually unintelligible, then boundary jumping fails. The ability to make useful associations across boundaries is predicated on cognitive proximity.

Significantly, an individual's cognitive proximity and ability to effectively boundary jump is not fixed. This insight has important implications for education. Particularly as computers and machines assume work that can be routinized and automated, the uniquely human role in creativity will become even more important to prospective employers and competitive organizations. In order to produce individuals who are creative and capable of innovation, education would be well served to focus on teaching skills that facilitate boundary jumping and increase an individual's cognitive capacity to reach across borders in mutually intelligible ways.

Of course, this may be easier said than done. For example, specialization poses distinct challenges to boundary jumping. The type of deep expertise required to access the insights of a specialized discipline can create cognitive boundaries in an individual that are difficult to span. Generalist skills, concomitantly, are difficult to cultivate due to the time demands associated with specialization. Despite these challenges, this puzzle may be worth solving. This is because creativity and innovative problem solving are best understood as collective enterprises that involve reaching across boundaries to change existing domains and ways of thinking or to produce new innovations. The Roundtable participants agreed that cultivating these boundary jumping skills will be increasingly important even as specialization proliferates in the workplace.

As part of its mission to architect conditions that make innovation more likely to occur, the Silicon Flatirons Center produced this report (the "Report") to summarize and expand the Roundtable discussion. By connecting the Roundtable discussion to relevant research in the areas of creativity and entrepreneurial networks, this Report illuminates the structures and cognitive skills that enable productive boundary jumping. It proceeds in three parts. Part I elaborates upon the concept of boundary jumping and provides examples of the innovations that occur when boundary jumping takes place. The Report then turns to examining how boundary jumping can be promoted. Part II surveys different types of structures that facilitate boundary jumping by bridging spatial proximities. These structures range from city architectures to organizational cultures within companies. Part III then describes the cognitive skills that aid individuals in boundary jumping. Namely, these skills reduce the cognitive distances between individuals, making them more cognitively proximate to one another.

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Part I. The Promise of Boundary Jumping

The more we learn about innovation and creativity, the more boundary jumping emerges as a prominent enabling feature. Research by Pierre Desrochers and Samuli Leppälä, for example, finds that cross-industry innovation happens through three processes: (1) adding to or exporting specific know-how to different industries, (2) importing information to a new industry or discipline, and (3) formal or informal collaboration with those from different intellectual disciplines.³ In essence, creativity is a process in which information is transferred across boundaries and combined in novel ways.⁴ Increasingly, organizations and businesses take heed of the promise of boundary jumping and seek to engage with firms and individuals across industries in productive and useful ways.

InnoCentive.com illustrates the power of applying information from one industry to seemingly unrelated areas. InnoCentive is a crowdsourcing innovation platform that broadcasts difficult and unsolved scientific problems to a wide range of potential problem solvers. Potential solvers come from nearly 200 countries and are trained in a diverse number of disciplines. Client companies pay problem solvers if they provide an acceptable solution.

Notably, since 2001, 85% of the problems posted on InnoCentive.com have been solved. Problems that client companies had spent decades working on internally have been solved on the InnoCentive website within two weeks and at a fraction of the price of traditional research and development.⁵ Researcher Karim Lekhani inquired about InnoCentive's success. Lekhani found that the heterogeneity of scientific disciplines represented by solvers on the website was the key to problem solving success. Specifically, Lekhani found that the "further the focal problem was from the solver's expertise, the more likely they were to solve it."⁶

Normally, scientists within an organization are trained in a specific scientific discipline. They are trained to problem solve within a certain set of parameters. The broadcast problem solving that occurs on InnoCentive.com, on the other hand, presents the problem to solvers from heterogeneous scientific backgrounds. A solver from a different background can approach the problem by applying knowledge that is commonplace in one discipline to an unfamiliar discipline in unique and novel ways. This demonstrates the power of bringing "outside" expertise to a problem.

Broadcast problem solving also provides insight into the motivations of those who problem solve within this structure. While organizations that post their problems to InnoCentive.com offer financial rewards for successful solutions, Lekhani found that successful solvers were more strongly driven by enjoyment-based intrinsic motivations than they were by pecuniary reward. This research suggests that when architecting challenge-based boundary jumping structures, organizers may not need to offer pecuniary reward to adequately incentivize the boundary jumping to occur. In fact,

³ Pierre Desrochers and Samuli Leppälä, Opening up the 'Jacobs Spillovers' black box: local diversity, creativity and the processes underlying new combinations, 11 JOUR. ECON GEOG 843, 846 (2011).

⁴ *Id.*

⁵ Karim R. Lekhani, *The Value of Openness in Scientific Problem Solving*, HBS Working Paper No. 07-050, available at <http://www.hbs.edu/research/pdf/07-050.pdf>.

⁶ Indeed 72.5% of successful solvers worked from solutions previously developed in other domains. Karim R. Lekhani, *The Value of Openness in Scientific Problem Solving*, HBS Working Paper No. 07-050, available at <http://www.hbs.edu/research/pdf/07-050.pdf>.

research suggests that under certain problem solving scenarios, an individual's intrinsic interest in problem solving may actually be reduced if pecuniary reward is present.⁷

While the success of InnoCentive.com illustrates the promise of boundary jumping, the fact remains that boundary jumping does not occur often enough. This highlights the need for a deeper understanding of boundary jumping. In particular, two trends – hyperspecialization and organization's need for innovation – underscore the urgency to better understand boundary jumping. Each of these is addressed in turn.

A. Boundary Jumping in an Age of Hyperspecialization

Knowledge exchange across boundaries, as InnoCentive illustrates, is often identified as a key to innovation. The larger the distances between the knowledge of the parties or disciplines interacting, the greater potential there is for material innovation to occur. At some point, however, parties intending to share information may have too great a cognitive distance between them to make the interaction productive. This is because individuals have an *absorptive capacity* to understand, interpret, and evaluate the world that is framed by their physical, social, and institutional environments.⁸ At some point, differences in absorptive capacity will be so great, and the cognitive distance between the two so large, that they will be unable to communicate effectively.⁹ Where this occurs, boundary jumping fails.

Specialization has been touted as a model for the division of labor since Adam Smith's *Wealth of Nations*. But some economists and organizational theorists assert that the current state of technology is enabling us to enter into an age of hyperspecialization.¹⁰ Trends towards hyperspecialization are accelerated by policymakers who assert that a focus on specialized skills will make students more employable.¹¹ While there is evidence that there is more demand for technically skilled workers than there is a supply, one downside of hyperspecialization is that it potentially leads to greater cognitive distances between individuals and industries, thereby making useful knowledge exchange more difficult.

This highlights the need for organizations and individuals to facilitate more effective boundary jumping. Hyperspecialization of course makes boundary jumping more difficult. But it need not be a barrier to productive boundary jumping. Many organizations and individuals have found effective ways of bridging or reducing the spatial and cognitive distances between hyperspecialists to facilitate boundary jumping innovations.

The design firm IDEO, for example, illustrates how individuals can position themselves to bridge the cognitive distances between disparate groups of hyperspecialists. IDEO is a product

⁷ Edward L. Deci, *Intrinsic Motivation, Extrinsic Reinforcement, and Inequity*, 22 JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY 119 (1972).

⁸ Bart Nooteboom, *Learning by Interaction: Absorptive Capacity, Cognitive Distance and Governance*, 4 JOURNAL OF MANAGEMENT AND GOVERNANCE 69, 73 (2000).

⁹ Bart Nooteboom, *Learning by Interaction: Absorptive Capacity, Cognitive Distance and Governance*, 4 JOURNAL OF MANAGEMENT AND GOVERNANCE 69, 73 (2000).

¹⁰ Thomas W. Malone, Robert J. Laubacher & Tammy Johns, *The Age of Hyperspecialization*, HARVARD BUSINESS REVIEW 56 (July/August 2011).

¹¹ Dylan Scott, *Should Universities Move Away From a Liberal Arts Education?*, *Governing.com* (April, 29 2013), available at <http://www.governing.com/blogs/view/gov-should-universities-move-away-from-liberal-arts-education.html>.

design consulting firm that works in over 50 industries. Strong connections spanning diverse industries enable IDEO's engineers to create innovative products that combine technologies from different sectors in novel ways.¹² Specifically, the engineers at IDEO are trained and encouraged to find novel associations between seemingly unrelated pieces of information. IDEO is successful in boundary jumping because it has ensured that its engineers have mechanisms by which to capture good ideas, keep them alive, and test promising concepts in novel ways.¹³ These processes allow IDEO engineers to bridge cognitive distances between unrelated fields and disciplines that are rife with hyperspecialists.

B. “Search and Reapply”: Organizations That Value Boundary Jumping

Many businesses have traditionally been organized as autarkic, proprietary, and insular. In a stable and slow changing marketplace, a strategy of closed firm boundaries can help protect intellectual property, while a strategy of separate units within an organization can enhance accountability and facilitate specialization. Increasing evidence, however, suggests that these structures are antithetical to rapid innovation. Looking outside of one's own firm for novel innovations has proven successful for many companies. Accordingly, firms increasingly adopt organizational cultures that value boundary jumping interactions both within and outside the company. Pixar, Modular Robotics, and Proctor & Gamble are each examples of organizations that have embraced structures that reduce the spatial and cognitive distance between individuals.

Pixar illustrates how an organization's physical structures can be architected with the intention to bring hyperspecialists together.¹⁴ As Pixar Chief Creative Officer John Lasseter says, “Technology inspires art, and art challenges the technology.”¹⁵ Collaboration between computer scientists and animators has been at the core of Pixar's success from the beginning. Pixar eschewed housing their programmers and artists in different departments and locating them in different buildings as many production companies do. Pixar instead forces the two disciplines to collaborate on a daily basis by physically convening different hyperspecialists and forcing them to learn to communicate in mutually intelligible ways. Many believe it is the intersection between technology and liberal arts that have allowed Pixar to push technological boundaries while making each one of its movies a significant commercial success, grossing on average \$555 million internationally.

Roundtable participant Erik Schweikardt, the CEO and Founder of Modular Robotics, a company that produces robotic construction kits for kids, also underscored power of having scientists and artists collaborate. Modular Robotics achieved success with its first product, Cubelets. Despite this success, Schweikardt was concerned that the product only appealed to a narrow subset of young boys. In designing their second product, known as Moss, Modular Robotics set out to create a design that appealed to a wider audience. The Modular Robotics team, however, realized that they lacked the storytelling skills to create the type of product they were looking for. Inspired by another local company, KidRobot, which produces designer vinyl toys, Schweikardt brought in a group of local street artists to collaborate with the Modular Robotics engineers. The result is a Moss

¹² See IDEO Fact Sheet, available at http://www.ideo.com/images/uploads/home/IDEO_Fact_Sheet.pdf.

¹³ Andrew Hargadon, *The Best Practices of Technology Brokers*, HBS Working Knowledge Archives, Aug. 4, 2003, available at <http://hbswk.hbs.edu/archive/3613.html>.

¹⁴ Jonah Lehrer, *Steve Jobs: “Technology Alone Is Not Enough”*, THE NEW YORKER.COM, Oct. 7, 2011, available at <http://newyorker.com/online/blogs/newsdesk/2011/10/steve-jobs-pixar.html>

¹⁵ Jonah Lehrer, *Steve Jobs: “Technology Alone Is Not Enough”*, THE NEW YORKER.COM, Oct. 7, 2011, available at <http://newyorker.com/online/blogs/newsdesk/2011/10/steve-jobs-pixar.html>

design that includes all the technical robotic complexity of the Cubelets product, along with the playfulness and aesthetics of hand-painted KidRobot toys. Schweikardt believes the company crafted a product that was greater than the sum of its parts.

Roundtable participant Kirk Holland, a venture capitalist with Access Venture Partners, highlighted that Proctor & Gamble, where he started his career, created an institutional culture that encouraged looking outward for innovation. P&G refers to this technique as “search and reapply.” By investing money in business activities that look outside the firm and outside the industry, P&G established a culture in which boundary jumping is systemically encouraged. Today, in his role as venture capitalist, Holland encourages the *search and reapply* culture. When portfolio companies are dealing with a certain challenge or problem, Holland encourages them to consider who best deals with this challenge that is not in the startup’s category. He challenges startups to look outside of their industry and to boundary jump as a method for problem solving. Holland noted that technology such as LinkedIn has made finding and connecting innovators in other industries easier than ever. Hence, these cultures and technologies make unrelated industries more spatially proximate to one another, meaning innovation is more likely to occur.

Overall, the success of firms that embrace boundary jumping strategies illustrate the value of bridging or reducing the spatial and cognitive distances between specialists. This is increasingly important as industries continue to fragment and universities focus increasingly on teaching specialized skills. But how are spatial and cognitive distances reduced or bridged? Parts II and III next turn to these issues.

Part II. Modest Anarchy: Structures To Reduce Spatial Distance

A common sense strategy to reduce the spatial distance between individuals is to design architecture that facilitate opportunities for boundary jumping to occur. The Roundtable identified at least four different types of structures that facilitate spatial proximity and engender boundary jumping: (A) physical architecture, (B) broadcast mechanisms using open platforms, (C) removing labels to better leverage user generated content, and (D) cross-industry social networks. Each of these structures is described below.

A. Physical Architecture of the Space in Which We Work and Live

The corner office and quiet cubicle are a thing of the past in many modern workspaces. This is because the myth of the lone genius innovating in a quiet locked office has been debunked. Increasingly, what we know about the way that humans learn, interact, and innovate tells us that our physical spaces need to be open and shared. This insight can be applied across a spectrum of physical spaces ranging from the landscape of a city to the set up of a single office, all of which are structures that help facilitate boundary jumping by increasing spatial proximity.

Cities have long been an important focus of economic geography, and by architecting certain urban spaces, boundary jumping interactions can be accelerated. Urban theorist Jane Jacobs asserted that dense city spaces that force interactions across boundaries are the most successful in driving innovation.¹⁶ Moreover, Jacobs argued that knowledge spillovers in a dense city space are most productive economically when the local economic base is made up of diverse industries. Jacobs’

¹⁶ Jane Jacobs, *The Economy of Cities*, New York: Random House (1969)

claims about dense urban spaces is supported by evidence that shows that cross-industry boundary jumping leads to more productive results when the individuals involved can have face-to-face interactions.¹⁷ Urban spaces allow diverse individuals, who would otherwise be unlikely to interact, to connect in face-to-face interactions which allow for unexpected connections and inspiration.¹⁸

Roundtable participant Clif Harald agreed with Jacobs' theories. Harald cited the failure of many urban redevelopment plans of the 1970's and 1980's as evidence that dispersed city spaces are less productive than dense ones. In contrast, Harald pointed to Boulder's Pearl Street Mall as an example of a dense urban space in which unplanned interactions occur. When a diverse set of businesses are located in a small geographical area, serendipitous boundary jumping interactions occur in the streets, in coffee shops, and in restaurants. Borrowing lexicon from another Roundtable participant, Alicia Gibb, Harald suggested that urban spaces are sufficiently dense for boundary jumping when they facilitate "modest anarchy." When the space allows for modest anarchy, unplanned but productive boundary jumping collisions can occur.

Moving inward from the cityscape, another physical structure that can be reworked to facilitate boundary jumping is the workspace. Creating an open and shared space where people are not physically separated is an important way to facilitate unplanned interactions. This was the goal of the massive Pixar Atrium – initially chided as a waste of space – that Steve Jobs envisioned as a space where serendipitous collisions would occur between Pixar employees with different specialties and working on disparate projects.

Similarly, creating an open and collaborative workspace that encourages boundary jumping interactions is something that Roundtable participant Jim Deters focused on in co-founding Galvanize, a coworking space for startups. In planning the space, Deters said it was important to find a space that was not too large – 30,000 square feet at most – so that it could remain open, communal, and mostly single story. The space also includes a bar and coffee shop designed to create more opportunities for unplanned interactions. This aligns with research about workplace habits which finds that 80% of workplace communications are informal and that workers are highly unlikely to communicate if they are not visible to one another.¹⁹ Finally, Deters spoke about mindfully designing the Galvanize space to engender a sense of community and trust. The importance of creating a space in which people from diverse backgrounds feel comfortable to interact and share is supported by research that shows that building mutual trust is important in bridging the cognitive distance between individuals who are attempting to boundary jump.²⁰

Caution is warranted, however, insofar as human behavior does not always flow in the way that planners hope. While Pixar and Galvanize are examples of workspaces successfully architected to facilitate boundary jumping, well intentioned communal workspaces can fail to bring diverse groups together as planned. Roundtable participant Charisse Bowen spoke about the experience of

¹⁷ Pierre Desrochers and Samuli Leppälä, Opening up the 'Jacobs Spillovers' black box: local diversity, creativity and the processes underlying new combinations, 11 JOUR. ECON GEOG 843, 857 (2011).

¹⁸ Pierre Desrochers and Samuli Leppälä, Opening up the 'Jacobs Spillovers' black box: local diversity, creativity and the processes underlying new combinations, 11 JOUR. ECON GEOG 843, 857 (2011).

¹⁹ Backhouse A. & Drew P., *The design implications of social interaction in a workplace setting*, 19 ENVIRONMENT AND PLANNING B: PLANNING AND DESIGN 573-584 (1992).

²⁰ Pierre Desrochers and Samuli Leppälä, Opening up the 'Jacobs Spillovers' black box: local diversity, creativity and the processes underlying new combinations, 11 JOUR. ECON GEOG 843, 857 (2011).

the Rocky Mountain Innosphere, a non-profit business incubator, and their new facility constructed in 2011 which was funded primarily by the City of Fort Collins. The Rocky Mountain Innosphere was a well-intentioned project meant to provide flexible workspace for entrepreneurs in Northern Colorado. The developers of the building did not take into full consideration functional communal workspace needs and space proximity options to encourage boundary jumping behavior. As a result, the Rocky Mountain Innosphere created a space that was poorly designed to facilitate spatial proximity. Where Galvanize created a space that is wide open, the Rocky Mountain Innosphere building features multiple levels that physically separate tenants. The Rocky Mountain Innosphere thus stands as an example of how physical space can unintentionally impede useful interactions across boundaries.

B. Broadcasting Problems Across Industries on an Open Platform

One structure that has been notably successful in facilitating boundary jumping is the use of technology to broadcast problems out to a wide range of audiences. Broadcasting a problem to the world is not something that was easily facilitated before the Internet, nor does it fit with traditional business customs that heavily guard intellectual property and proprietary business practices. The rise of the free and open source software communities, however, has furthered the norms of openness in information sharing, and an increasing number of companies are sharing their problems with outsiders through the internet. As such, the broadcasting of problems over the Internet is a structure that virtually makes individuals more spatially proximate; driving innovation at a startling rate.

InnoCentive, as highlighted in Part I *supra*, illustrates the innovative results of boundary jumping in broadcast problem solving. Broadcast search makes disciplines or individuals more spatially proximate to one another by convening diverse disciplines in a virtual platform and creating the opportunity for boundary jumping. “Broadcast search leverages pre-existing knowledge and the creative recombination and transformation of knowledge in solution generating processes.”²¹ Often, this importation and recombination of information from one domain to another reduces computation time significantly.

The insights of Lekhani’s research of the InnoCentive.com website were echoed by Roundtable participant Nathan Seidle, the CEO and Founder of SparkFun Electronics. As a business that is built on open source hardware, SparkFun operates within an environment where openness and access to information is built into every product they put on the market. This has allowed SparkFun to tap into the knowledge and resources of the open source community around the world. For example, SparkFun was interested in purchasing a laser scanner that was a close sourced item, i.e. the SparkFun engineers could not figure out how to “talk to” the scanner and the company that produced the scanner would not provide SparkFun with the source code necessary to interface with the scanner. In response, SparkFun posted what they knew about the scanner on their website and within two days, someone in France had reverse engineered the code. Seidle explained that in the open source world, individuals are motivated by giving back to the community and collective problem solving. Hence, by broadcasting its problem and by being a prominent part of the open source community, SparkFun has been able to tap into the shared resources of individuals all over the world. In essence, SparkFun has architected a structure in which it can effortlessly interface

²¹ Karim R. Lekhani, *The Value of Openness in Scientific Problem Solving*, HBS Working Paper No. 07-050 at 9, available at <http://www.hbs.edu/research/pdf/07-050.pdf>.

and boundary jump with individuals from other domains all over the world, reducing the spatial distances between them.

C. Removal of Labels and Credentials In User Generated Content

A recurring theme of the Roundtable was that boundary jumping structures, whatever their form, are most effective when they lack hierarchy or labels and when they allow for a certain amount of “modest anarchy.” The Roundtable participants anecdotal evidence all seemed to point to the fact that boundary jumping was most successful and led to innovation most often when it occurred in environments that evolved organically. This is due to the fact that spatial proximity occurs more often within environments where organic interactions are allowed to develop.

Alicia Gibb, who founded and runs the Open Source Hardware Association, introduced the concept of anarchic spaces to the Roundtable discussion. Gibb offered hacking spaces as examples of “platforms of anarchy” where boundary jumping interactions occur with modest direction. Specifically, people from diverse backgrounds come together to share tools and knowledge and collaborate creatively without being told what to work on. By convening diverse disciplines and allowing individuals to create for the sake of creation, hacker spaces and other environments of “modest anarchy” facilitate the spatial proximity necessary for boundary jumping.

The freedom that hacker spaces give to those who work in them and the creative interactions that freedom engenders is similar to the boundary jumping interactions that occur in House of Genius sessions. The House of Genius, founded by Roundtable participant Toma Bedolla, is a boundary jumping platform with the goal of bringing a diverse group of people together to engage in disruptive and creative problem solving. During a House of Genius session, participants who are typically strangers, convene for a 2-3 hour session. Participants do not reveal their experience, credentials, or titles. Two or so businesses will present a problem they are facing. The full group, then collectively “hacks” the companies’ problems. In Bedolla’s experience, the anonymity among participants allows good ideas to rise to the top without fear of being dismissed for their lack of experience. On the other hand, poor ideas are not overvalued because they come from someone who is experienced and *should* have good ideas.

The importance of removing credentials was echoed by Nathan Seidle of SparkFun. Unlike the *actual* credentials that are removed in the House of Genius sessions, however, Seidle highlighted the importance of removing structures that create the illusion of credentials. After expanding the SparkFun office to include a second floor, SparkFun employees immediately began to call themselves “carpet walkers” or “cement walkers,” referring to the different types of flooring on the two levels. In addition to making his workers less spatially proximate to one another, Seidle realized that the company had inadvertently created separate “classes” of employees, who were perhaps less likely to collaborate. If firms hope to facilitate boundary jumping, Seidle underscored that it is important to be aware of the hierarchies, apparent and unapparent, that might be barriers to productive interactions.

Related to the concept of removing labels or credentials, which can inhibit imagination based upon assumptions and expectations, is the idea that boundary jumping is facilitated by creating *generative* structures. *Generativity*, as the term is used by Professor Jonathan Zittrain, refers to any technology that allows users to make new things. Generative devices invite user innovations and

production that the designer of the generative device never intended or imagined.²² Zittrain argues that generative products are good for society because they provide tools for humans to innovate.

SparkFun, recognizing the value of generative platforms, no longer labels its products as having certain “uses.” This arose from an unexpected experience. SparkFun initially labeled one of its circuit boards as being capable of “measuring tilt.” Later SparkFun learned that a group of medical researchers at Mt. Sinai was using their product to measure gait in patients with limps. It had never occurred to SparkFun that medical researchers would use the product nor that it would be used to measure gait. After recognizing that Sparkfun may be inhibiting other boundary jumping innovations from unexpected uses, the company stopped labeling products for specified uses. By not limiting the potential uses of SparkFun products, they become generative tools that are applicable in a limitless number of disciplines, making them tools that easily facilitate boundary jumping.

D. Cross-Industry Social Networks

Entrepreneurs can often become overly entrenched in their own business, industry, and routine ways of thinking. This makes entrepreneurs more spatially distant from other industries, which can be a barrier to innovation. One relatively simple way for individuals to avoid becoming siloed in their own experience is to form or join cross-industry social networks. By moving outside of one’s own industry, individuals are better able to expand both their spatial and cognitive proximity as well as their absorptive capacities. Roundtable participants, Matt Cutter of Upslope Brewing and Don Martin, founder and CEO of Bloomin’, belong to a cross-industry group of CEOs called the Insomniacs. The Insomniacs group is comprised of CEOs from diverse industries who meet regularly with the aim of disrupting one another’s standard ways of thinking. The group shares ideas for business methods and practices, financial models, market opportunities, and more. By convening, these CEOs learn about other industries, expanding their cognitive proximities and making them better able to identify innovative solutions in their businesses.

It was noted by Martin however, that these social networks lose their usefulness if the distances between the businesses are too great. While the Insomniacs group is diverse, it is limited to businesses that make over one million dollars in revenues and that are in the consumer products space. At some point, Martin felt that the cognitive distances between industries would make interaction unhelpful and that the knowledge gained could not be effectively put to use in novel ways.

The structures discussed above are useful in creating more spatial proximity between individuals, industries, and intellectual disciplines. However, productive boundary jumping also requires cognitive proximity. Although the structures explored above can also help bridge cognitive distances, the skills and processes that follow are key to expanding cognitive proximity and absorptive capacity.

Part III. Skills Necessary to Facilitate Boundary Jumping

An individual’s absorptive capacity and ability to understand and communicate with others is framed by physical, social, and institutional environments. An important insight from the

²² Jonathan Zittrain, *The Future of the Internet and How to Stop It* (2008).

Roundtable, significantly, is that an individual's absorptive capacity is not fixed. Rather, Roundtable participant Devon Tivona opined that there are skills that can be learned, practiced, and honed that can expand an individual's absorptive capacity or bridge their cognitive distance from others. This has educational implications. The fact that these skills and capabilities are not fixed quantities is also important when considering the age of specialization in which we live today. An individual's ability to foster these skills will be increasingly important as we become more and more specialized and therein cognitively distant from one another.

A. Processes for Cognitive Proximity: Acquisition, Capture, and Retrieval of Good Ideas

Researcher Andrew Hargadon refers to those who boundary jump as *technology brokers*: those who have learned to “bridge the disparate worlds they move among outside their boundaries . . . building new ventures from technologies and people they come across.”²³ Put another way, these technology brokers have learned to bridge the cognitive distances between themselves and other disciplines. Hargadon has studied the design firm IDEO, discussed in Part I *supra*, in order to gain insight into how technology brokers bridge these cognitive distances. The processes used by IDEO engineers suggest that in order to bridge disparate worlds, those who boundary jump must have some sort of internal or external mechanism to: (1) capture good ideas, (2) keep those good ideas alive, and (3) put promising concepts and ideas to the test in novel ways.²⁴ Ideas that are shared during a boundary jumping interaction will not lead to new innovations if the parties involved do not have a the organizational memory to acquire, retain, and retrieve the new combinations of information that they have obtained through boundary jumping.²⁵ By implementing these processes, an individual is able to bridge the cognitive distances between himself and others, allowing for the productive exchange of ideas that would otherwise be too unfamiliar to use. Notably, acquisition, retention, and retrieval of ideas are necessary skills in boundary jumping that do not exist in a vacuum. They can be bolstered and enhanced by training and practice.

B. Design Thinking and Empathy Based Problem Solving

Design thinking is a repeatable, iterative problem solving protocol that emphasizes the importance of human-centered observation and empathy. Design thinking teaches that individuals must first meaningfully observe the world outside of one's own domain and then translate that observation through empathy (the effort to see the world through the eyes of others) into innovations that will improve the status quo.²⁶ By emphasizing human-centered empathy, design thinking helps individuals to expand their cognitive absorptive capacities. As such, it has been at the center of how boundary jumping firms think about problem solving.

The three phases of design thinking can be conceptualized as *inspiration*, *ideation*, and *implementation*. Each of these rely deeply upon empathy. Empathy that makes design thinking a powerful tool to facilitate boundary jumping. By attempting to see the world through the eyes of others, we are able to expand our cognitive proximity to others, making boundary jumping more

²³ Andrew Hargadon, *The Best Practices of Technology Brokers*, HBS Working Knowledge Archives, Aug. 4, 2003, available at <http://hbswk.hbs.edu/archive/3613.html>.

²⁴ Andrew Hargadon, *The Best Practices of Technology Brokers*, HBS Working Knowledge Archives, Aug. 4, 2003, available at <http://hbswk.hbs.edu/archive/3613.html>.

²⁵ Andrew Hargadon & Robert I. Sutton, *Technology Brokering and Innovation in a Product Development Firm*, 42 ADMIN. SCIENCE QUARTERLY 716, 717 (1997).

²⁶ Tim Brown, *Change By Design: How Design Thinking Transforms Organizations and Inspires Innovation* 49 (2009).

likely to occur. As such, design thinking is a technique that organizations or individuals should consider practicing if they wish to facilitate boundary jumping innovations.

C. “T-Shaped Individuals”

An individual must be comfortable in interdisciplinary environments to excel in boundary jumping innovations. McKinsey & Company identifies these people – those who excel at boundary jumping – as being “t-shaped.”²⁷ On the vertical axis, they possess a core competency or deep expertise that allows them to substantively contribute to certain types of problems. This can be, for example, an expertise in computer science, botany, or architecture. On the horizontal axis, the t-shaped individual has a cultural range that gives them a disposition for collaboration across disciplines. This takes them from being “multidisciplinary...to truly interdisciplinary.”²⁸ This second axis, which makes the individual capable of collaborating across disciplines, is where individuals have been able to expand their cognitive proximity to others. They have learned techniques or communication skills that have made them capable of empathizing and thereby understanding concepts that are foreign to them.

Both the design firm IDEO and the Stanford d.school spend significant time finding and cultivating this horizontal axis in individuals. Having t-shaped individuals at IDEO is of particular importance because IDEO engineers engage in boundary jumping every day. Although they may be industrial designers or architects by training, IDEO engineers do not apply their skills in any one industry. Hence, they must have the ability to collaborate with and produce innovations for diverse clients ranging from financial institutions to consumer products companies like Coca-Cola to the Centers for Disease Control. IDEO CEO Tim Brown states that this type of radical boundary jumping is only possible when everyone in his organization is t-shaped.

An important dimension to boundary jumping that relates to the concept of the t-shaped individual is cultural range. Roundtable participant Eva Yao, a Professor of Management and Entrepreneurship at the University of Colorado and an expatriate from China, suggested that the promise of boundary jumping is often limited because certain groups of people are rarely brought into the boundary jumping interaction. In Eva’s experience, boundary jumping interactions often exclude women, immigrants, and racial minorities. Because these groups have unique perspectives, boundary jumping innovations are limited without them. Hence, to optimize innovation, organizations need to be mindful to both cultivate the t-shaped individual and ensure they are interacting with a sufficiently diverse range of constituencies.

Related to the concept of t-shaped individuals, and perhaps a characteristic that many t-shaped individuals exhibit, is an ability to be comfortable and excel in situations of uncertainty or those that lack structure. If environments of modest anarchy facilitate the most innovation, then individuals must be able to function within those environments.

One way of thinking about this skill is confidence. Specifically, a person who can successfully boundary jump must be sufficiently confident in their own capabilities and experience that they are comfortable moving beyond that experience to explore new domains. Hargadon has

²⁷ Tim Brown, *Change By Design: How Design Thinking Transforms Organizations and Inspires Innovation* 27 (2009).

²⁸ Tim Brown, *Change By Design: How Design Thinking Transforms Organizations and Inspires Innovation* 27 (2009).

termed this creative confidence as an “attitude of wisdom.”²⁹ Those with an “attitude of wisdom” are able to bridge cognitive distances between themselves and others because “they are neither too arrogant nor too insecure to ask others for help and because they treat what they know with humility and what others know with respect.”³⁰ Hence, an “attitude of wisdom” gives individuals the skills to interact with others in ways that reduce the cognitive distances between them. As such, it is a skill that facilitates boundary jumping.

D. Observational Skills and Associational Thinking

Boundary jumping innovations occur when pre-existing knowledge is combined in novel ways. Hence, the ability to look at problems and observe the world in nonstandard ways is a skill that facilitates boundary jumping. However, these observational skills must also be paired with what researchers refer to as associational thinking. Associational thinking is a skill that allows individuals to associate ideas that are previously unconnected to create something new.³¹

Roundtable participant John Goldsmith, an independent investor, suggested that observational skills could be fostered by cultivating an awareness that solutions likely exist in other domains. Tom Kelley, the founder of IDEO refers to these deep observational skills as “vuja de:” the ability to observe items we have seen so many times we fail to notice them. More specifically, Kelley argues that innovations occur when individuals learn to observe the novel in the everyday.

For example, this could include an ability to look beyond the common uses of products. Such observations and associations were made by Jorge Odon, an Argentinean car mechanic, after he watched a video on YouTube of a cork being extracted from a wine bottle using nothing but a plastic bag. Odon realized that a similar technique might be used remove a baby stuck in the birthing canal. Although it seems unlikely that a mechanic would invent a new birthing technique based on a party trick, Odon’s technique has received praise from the World Health Organization and has been licensed by an American medical company.³²

Part IV. Conclusion

Although many businesses might seek to innovate by looking outside of their own industries, boundary jumping requires more than a decision to collaborate with others. Boundary jumping innovations require both spatial and cognitive proximity between the firms, industries, or individuals interacting across boundaries. Fortunately, spatial and cognitive proximities are not fixed quantities. Rather, they can be fostered and expanded through the architecting of certain structures and the cultivation of certain skills.

²⁹ Andrew Hargadon & Robert I. Sutton, *Technology Brokering and Innovation in a Product Development Firm*, 42 ADMIN. SCIENCE QUARTERLY 716, 742 (1997).

³⁰ Id.

³¹ Farnam Street, *Five Skills of Disruptive Innovators*, Businessinsider.com, http://www.businessinsider.com/5-skills-of-disruptive-innovators-2013-12?nr_email_referer=1&utm_source=Triggermail&utm_medium=email&utm_term=Business%20Insider%20Select&utm_campaign=BI%20Select%20Mondays%202013-12-09&utm_content=emailshare.

³² Donald G. McNeil, *Car Mechanic Dreams Up Tool to Ease Births*, NYTimes.com (Nov. 13, 2013) http://www.nytimes.com/2013/11/14/health/new-tool-to-ease-difficult-births-a-plastic-bag.html?_r=0.

Understanding these structures and skills is important for facilitating boundary jumping but will become increasingly crucial in industries where hyperspecialization occurs. Although hyperspecialization is a useful model for the efficient division of labor, it tends to increase the spatial and cognitive distances between individuals, making boundary jumping less likely to occur. Therefore, it will be important that businesses and individuals pay special attention to boundary jumping if game-changing boundary jumping innovations are to continue.

Appendix A
List of Roundtable Participants

Toma Bedolla, Co-founder, House of Genius
Brad Bernthal, Associate Professor of Law, Colorado Law
Charisse Bowen, Director, Institute of Entrepreneurship, Colorado State University
Hanna Boyd, Senior, Finance, Entrepreneurship and Digital Art, University of Colorado at Boulder
Matt Cutter, Founder, Upslope Brewing Company
Jim Deters, Co-Founder and CEO, Galvanize
Dave DuPont, President and CEO, TeamSnap
Bret Fund, Assistant Professor of Management and Entrepreneurship,
University of Colorado at Boulder
Alicia Gibb, Executive Director, Open Source Hardware Association
John Goldsmith, Independent Investor
Trish Groom, VP of Sales and Founder, Splick-it
Clif Harald, Executive Director, Boulder Economic Council
Kirk Holland, Managing Director, Access Venture Partners
Lane Hornung, CEO and Founder, 8z Real Estate
Peter Johnson, Networking Czar, Van Heyst Group, Inc. and Co-Founder, Startup Phenomenon
Matthew Kaufman, Partner, Hathaway & Kunz, P.C.
Don R. Martin, President, Bloomin
Monisha Merchant, Sr. Advisor for Business Affairs, Office of U.S. Senator Michael Bennet
Mystery Murphy, Research Fellow, Silicon Flatirons Center
Anna Noschese, Program Director, Silicon Flatirons Center
Anthony Santopolo, Entrepreneurial Law LLM Student, Colorado Law
Carrie Schiff, Partner, Sage Law Group
Jamie Schuster, Second Year Law Student, Colorado Law
Eric Schweikardt, CEO and Design Director, Modular Robotics
Nathan Seidle, Founder and CEO, SparkFun Electronics
Devon Tivona, Senior, Computer Science, University of Colorado at Boulder and Student
Consultant, Leeds School of Business
Eva Yao, Assistant Professor of Management and Entrepreneurship,
University of Colorado at Boulder