Exploring Innovation Frontiers Initiative

Venture.

Midwestern Regional Dialogue

Washington University in St. Louis
St. Louis, MO
June 8, 2017

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EIFI SOUTHWEST REGIONAL DIALOGUE

Letter from the President

On behalf of the Council on Competitiveness (Council), I am pleased to release findings from the Midwest Regional Dialogue of the Exploring Innovation Frontiers Initiative, held June 8, 2017 at Washington University in St. Louis; the fourth in a series of dialogues as part of the Exploring Innovation Frontiers Initiative (EIFI).

EIFI is a national, public-private effort to accelerate the over-the-horizon, transformative innovation models that will drive U.S. competitiveness in the coming decades. Sponsored by the National Science Foundation (NSF) Directorate of Engineering, Office of Emerging Frontiers of Research and Innovation (EFRI)—EIFI is a qualitative analysis that will collect, synthesize and disseminate broadly the experiential knowledge of active innovation practitioners. This information will be used to provide academicians with direction for future research in innovation, business leaders and strategists with insights to inform future business models, and policymakers with knowledge to enact public policies that create a supportive environment for sustained innovation-driven growth.

I would like to extend a special thank you to Dr. Mark Wrighton, Council member and Chancellor of Washington University in St. Louis, for co-hosting and leading this strategically important meeting for our country's future—with more than three dozen leaders from industry, academia, and government gathered to share best practices in spurring regional-based entrepreneurship.

Contained within this report is a summary and synthesis of the conversations of the Midwestern Regional Dialogue at Washington University in St. Louis, building on the outcomes of the EIFI launch and initial dialogue at the Georgia Tech Global

Learning Center in Atlanta, GA on June 9, 2015, Southwestern Regional Dialogue at the ARTSblock at the University of California, Riverside on November 23, 2015, and the Southern Regional Dialogue held at the Mays at CityCentre campus of Texas A&M University on November 23, 2016. Focused attention on the constituent elements of the innovation ecosystem have time and time again highlighted the importance of diversity in thought and perspective. This again surfaced in St. Louis as a primary need for entrepreneurs, adding the significance of relationships as the connective tissue facilitating a productive innovation ecosystem.

The Council looks forward to sharing these findings across the entire Exploring Innovation Frontiers Initiative in a cross-cutting policy document with national relevance leveraging U.S. innovation and ingenuity later in 2017.

Sincerely,

Deborah L. Wince-Smith

The Honorable Deborah L. Wince-Smith
President & CEO
Council on Competitiveness

EIFI SOUTHWEST REGIONAL DIALOGUE

Participants

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Chancellor
Washington University in St. Louis

Deborah L. Wince-Smith
President & CEO
Council on Competitiveness

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BioSTL

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Senior Policy Director
Council on Competitiveness

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Co-Founder
Sparo Labs

Dedric Carter
Vice Chancellor for Operations and Technology Transfer
Washington University in St. Louis

Maxine Clark
Founder
Build-A-Bear

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Director
National Science Foundation

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Epharmix

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Washington University in St. Louis

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Brian Stone
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Provost
Washington University in St. Louis

Emre Toker
Director, Skandalaris Center
Washington University in St. Louis

Nancy Tye-Murray
Co-Founder
cLEAR

Dwaun Warmack
President
Harris Stowe State University

Dana Watt
Co-Founder
Pro-Arc Diagnostics

EIFI SOUTHWEST REGIONAL DIALOGUE

Agenda

MORNING

7:30 Breakfast with Director Córdova and NSF Career Awardees

8:30 Registration and Continental Breakfast—Conference Attendees

9:00 Welcome: Exploring Innovation Frontiers Initiative

Mark Wrighton
Chancellor and Professor of Chemistry
Washington University in St. Louis

The Honorable France A. Córdova
Director
National Science Foundation

The Honorable Deborah L. Wince-Smith
President & CEO
Council on Competitiveness

9:30 Exploring Innovation Frontiers Initiative: Vision, Goals, and Objectives

Chad Evans
Executive Vice President
Council on Competitiveness

9:40 Introduction of Director France A. Córdova

Dedric Carter
Vice Chancellor for Operations and Technology Transfer
Washington University in St. Louis

9:45 Perspectives from the NSF

The Honorable France A. Córdova
Director
National Science Foundation

10:15 Cultivating Entrepreneurship

Discussants will explore the traits often exhibited by successful entrepreneurs and means of cultivating those traits where they may be not be innate. Discussants will also delve into methods of identifying future individuals primed for building new businesses.

Discussants will explore the necessary ingredients leading to centers of innovative startup organizations in the United States, how to support so many new businesses and enable the creativity they bring to the region, balanced by common challenges and potential solutions.

Moderator

Holden Thorp
Provost and Executive Vice Chancellor for Academic Affairs
Rita Levi-Montalcini Distinguished University Professor
Washington University in St. Louis

Discussants

Paul J. Corson
Advisor
Technology and Venture Commercialization University of Utah

Mary Jo Gorman
Managing Partner
Prosper

Emre Toker
Director, Skandalaris Center
Washington University in St. Louis

Next Generation Innovators 15- minute Spotlight: SlingHealth (formerly known as IdeaLabs)

Ramin Lalezari
Senior Vice President

Ian Schillebeeckx
Former President at Sling Health
Entrepreneur in Residence

11:15 Coffee & Networking Break

11:45 Barriers to Business Building

The number of new businesses started in America per year are largely unchanged since the turn of the century, but the number of jobs created by each new business and the survival rates of new companies have fallen precipitously pushing bulk of employment in America to large firms. Recently named as one of the top innovation districts[1] and best startup city in America[2], St. Louis is an opportunity to examine a model of success. Discussants will explore the conditions leading to the decline of new businesses, job growth, and the efforts of Midwestern states the country at large to encourage new business growth.

Moderator

Dedric Carter
Vice Chancellor Operations and Technology Transfer
Washington University in St. Louis

Discussants

Mike Krupka
Managing Director
Bain Capital

David Karandish
Former CEO
Answers Corp

Dougan Sherwood
Co-Founder
Cambridge Innovation Center, St. Louis

Next Generation Innovator 15-minute Spotlight: Epharmix

Blake Marggraff
CEO

AFTERNOON

12:45 Lunch

1:45 Enabling Entrepreneurial Ecosystems

The future economic productivity and prosperity of the United States is inextricably tied to fueling America's local, state and regional innovation ecosystems, each of which have different appetites for risk. Discussants will explore the key elements that need to exist in a region for a thriving innovation ecosystem and the steps to developing those elements if they do not already exist.

Moderator

Barry Johnson
Acting Assistant Director, Engineering Directorate IIP Division
Director, National Science Foundation

Discussants

Harry Arader
Director
BioSTL

Michael Kinch
Center for Research Innovation in Business
Washington University in St. Louis

Patty Hagen
Executive Director
T-REX

Ken Harrington
Innovation Ecosystem Expert and Entrepreneur's Guide

Next Generation Innovator 15-minute Spotlight: Sparo Labs

Andrew Brimer
Co-founder

2:45 Coffee & Networking Break

1 The Brookings Institution.

2 *Popular Mechanics.*

3:00 Regions as Magnets for Talent

Population centers in regions around the country develop personalities that successfully attract like-minded individuals, resulting in certain industries dominating regions. Discussants will explore how these pockets develop and how to identify the natural attributes of a region that can be used to draw industry and talent.

Moderator

Jennifer Lodge
Vice Chancellor for Research
Washington University in St. Louis

Discussant

Maxine Clark
Founder
Build-A-Bear

Stephanie Leffler
CEO
OneSpace

Chris Motley
Founder
Better Weekdays

Chad Steining
CEO
KYPHA

Nancy Tye-Murray
Co-Founder
cLEAR

Next Generation Innovator 15- minute Spotlight: Pro-Arc Diagnostics

Dana Watt
Co-Founder

4:00 The Path Forward and Closing Remarks

Mark S. Wrighton
Chancellor and Professor of Chemistry
Washington University in St. Louis

The Honorable Deborah L. Wince-Smith
President and CEO
Council on Competitiveness

4:30 Reception

5:00 Reception Concludes

Findings from the EIFI Midwestern Regional Dialogue

FINDINGS FROM THE EIFI MIDWESTERN REGIONAL DIALOGUE

Executive Summary

The St. Louis region has emerged as a national leader in fostering entrepreneurship and advancing technology. At the heart of St. Louis and an epicenter of innovation in the United States, Washington University in St. Louis served as the ideal setting for the Midwest Dialogue of the Exploring Innovation Frontiers Initiative (EIFI). On June 8, 2017, Dr. Mark S. Wrighton, Council on Competitiveness member and Chancellor of the Washington University in St. Louis, hosted a wide ranging and robust dialogue bringing together leaders from across business, academia and government.

The Dialogue took place over the course of a single day, with panel discussions, student presentations and keynote remarks focused on how universities and the private sector, with public sector collaboration, can build a dynamic ecosystem in which entrepreneurs have the tools they need to enhance regional economic competitiveness. These conversations were preceded by opening keynotes from National Science Foundation (NSF) Director, France A. Córdova and NSF Acting Assistant Director, and Engineering Directorate IIP Division Director Barry Johnson, provided updates on NSF's activities and its work in advancing small business and entrepreneurship. Conversation over the course of the day built on these comments, reflecting the steps the St. Louis region has taken to overcome common challenges to entrepreneurism still affecting the rest of the country.

Entrepreneurs represent a crucial element of America's competitiveness for their role moving invention and innovations to market through startups and new business ventures, creating value from long-term investments in research and development. These new ventures provide a path for America's economy to be more productive, increasing the standard of living for America's citizens. The country has faced a few challenges in this regard over the past several decades, experiencing a significant decline in U.S. productivity growth over the past 30 years. The St. Louis region has reversed this trend, showing their position ahead of the curve in creating new industries and businesses.

Chad Evans, Executive Vice President, Council on Competitiveness; Mark Wrighton, Chancellor and Professor of Chemistry, Washington University in St. Louis; Deborah L. Wince-Smith, President & CEO, Council on Competitiveness; Holden Thorp, Provost and Executive Vice Chancellor for Academic Affairs, Rita Levi-Montalcini Distinguished University Professor, Washington University in St. Louis; France Córdova, Director, National Science Foundation; Dedric Carter, Vice Chancellor for Operations and Technology Transfer, Washington University in St. Louis; Brian Stone, Chief of Staff to the Director, National Science Foundation.

Discussions focused on the challenges establishing a robust entrepreneurial ecosystem and how the St. Louis region has lowered barriers for startups, catalyzing growth at a rate higher than the national average. Many undercurrents throughout the day touched on the different skills needed to enable startups to flourish—noting these skills change

over time as the company and market in which it competes evolve—and stressing the importance of quickly recognizing the core value of an organization so they may succeed or fail fast to avoid burning resources. The primary overarching theme raised in each panel was the impact of forming relationships and the contribution of a tightly-knit community to establishing a path to success for entrepreneurs—whether venturing out on their own or engaging in entrepreneurial activities within larger organizations. These relationships open access to the collective wisdom of the region, working together to benefit the community and further enhancing the economic prosperity and well-being of the region.

Entrepreneurship is a critical aspect to America's future competitiveness. The United States relies on entrepreneurs to deliver new innovations to the market. Therefore, the nation also relies on universities to train these leaders, and policymakers to create a supporting ecosystem. However, there are further challenges to attracting investment, executing technology transfer and overcoming regulatory burden. All of the panels stressed the need for collaboration to overcome these obstacles, and regionally focused incubators and institutions, invested in growing the communities in which they serve.

Panel Synopsis—Cultivating Entrepreneurship

The day's first panel focused on opportunities and challenges to: cultivating entrepreneurship in the United States; showcasing St. Louis as prime example of an economic region that successfully fosters entrepreneurship; and exploring how its environment engenders entrepreneurial spirit. Panelists spoke about how industry, academic and public sectors play a crucial role in creating a space where entrepreneurs feel sufficiently secure in their well-being and confident enough to invest in new projects.

Understanding how to cultivate entrepreneurial skills and effectively deploying this knowledge is critical to improving the prosperity for the United States at a time in which new business establishment growth has declined. Entrepreneurs bring innovative ideas to the marketplace, creating new opportunities to enhance America's productivity and value-creation potential. Panelists were quick to agree robust new business growth created investment opportunities in the United States, which panelists noted drove further innovation and investment in the United States. Discussion surfaced a fear that a lack of business growth would drive investment capital toward markets outside the United States, dampening entrepreneur's enthusiasm for creating new business in America.

With regard to the qualities found in individual entrepreneurs, panelists debated as to whether the characteristics of successful entrepreneurs were innate or learned. Conversation resolved that there is no single defining attribute signaling success for entrepreneurs. Rather, Dialogue participants emphasized that the overall environment surrounding and supporting the entrepreneur was extremely important—whether the entrepreneur was a "natural" or educated formally in entrepreneurship. Through discussion panelists surfaced three challenges to cultivating entrepreneurs: accessibility to resources for entrepreneurs from underserved communities, supportive institutions able to guide entrepreneurs toward market opportunities, and the ability of entrepreneurs to understand and dynamically respond to the needs of their customers. Panelists noted, however, that the current generation of entrepreneurs cycle through new businesses faster than previous generations and are discarding potentially successful businesses.

The St. Louis region has overcome many of these challenges by dedicating specific resources to support startups and address common pain points for local entrepreneurs. Washington University in St. Louis recently created a blanket intellectual property agreement for its university-sponsored research to enable staff and faculty to pursue quickly new ventures based on successful efforts in the laboratory without the drawn out procedure of bespoke contracts. This approach facilitates a quicker on-ramping of technology to the marketplace, with greater incentives for the entrepreneur. In addition, local organizations are engaging with underrepresented communities to broaden access to entrepreneurial support systems across the region's communities. These resources

have communicated to the St. Louis community a deep level of support and encouragement as they pursue their entrepreneurial goals.

Panel Synopsis—Barriers to Business Building

The Dialogue's second panel focused on the challenges startups and entrepreneurs face when growing their businesses—an especially topical conversation against the backdrop of slowed new business creation across the United States. While businesses faces distinctive challenges within their industries, participants examined common hurdles entrepreneurs most often encounter when building and scaling their enterprise. Panelists agreed that in regard to common challenges, the businesses in the St. Louis region face many of the same barriers as other regions of the country (outside major metropolitan and industry hubs on the East and West coasts of the United States), such as attracting investment capital and talent. However, panelists noted the St. Louis region has a nascent but strong platform off of which to prosper, because of critical elements present in the community such as available capital and large organizations interested both in supporting startups as well as offering to validate new businesses in the broader marketplace by acting as early customers.

Panelists delved into specific aspects of how businesses navigate their environment, settling on three major obstacles against which new businesses must contend: the risk and challenge of starting a new venture, inability to determine proper success metrics where selecting the wrong metric may steer the organization to chase the wrong goal, and finding the right talent to fit an organization's needs. A common undercurrent throughout the conversation was the recognition that barriers to growth change for organizations in response to market developments and organizational maturation, which often require different skillsets for an organization's leaders.

The St. Louis region has experienced success in lowering the barriers to business building through the intervention of public and private organizations which have facilitated partnerships across the community for funding, talent, mentorship and the de-risking of businesses. As companies overcome early challenges they increase their ability to compete for quality hires, clients, and possible acquisitions. Sustained efforts to build these networks and partnerships has led to significant returns, as successful startups and growing businesses expand the resource base within the region and further lower existing barriers for entrepreneurs.

Panel Synopsis—Enabling Entrepreneurial Ecosystems

The focus of the Dialogue's third panel centered on developing America's entrepreneurship cornerstone—an ecosystem that empowers innovators and entrepreneurs to thrive, drive value and create economic growth. Understanding how to unleash the potential of entrepreneurs within an ecosystem requires a strong grasp of the ecosystem's constituent elements. However, discussion quickly determined the range and responsibilities of stakeholders in the entrepreneurial ecosystem were sufficiently broad that an in-depth analysis of any individual stakeholder group would be a fruitless effort as the prominence and strength of stakeholder groups vary across the country.

Through conversation, panelists elevated focus from the stakeholder level to the relationships developed between stakeholders within the ecosystem. Panelists determined this point ultimately to be more important, as the value provided by stakeholders in different domains rarely fall into easy categorization across regions. Panelists found it was the relationships, and the patience required for these relationships to mature, that are the most important elements of enabling an entrepreneurial ecosystem. This emphasis on relationships and healthy networks to build momentum and develop talent was continually emphasized during the discussion as a way to accelerate the growth of entrepreneurs, as well as create opportunities for growth within larger organizations. The power of building relationships can be

catalyzed by finding an honest broker able to match the skills needed by one organization and the capabilities or training offered by another.

St. Louis has been successful in leveraging its innovation and entrepreneurship ecosystem. The focus on relationships and building partnerships requires few resources to implement, works independently of domain or business function, and is a highly exportable effort in that it is an effort easy to replicate elsewhere. However, this focus on relationships is uniquely suited to and successful in St. Louis because local business leaders have exhibited an interest in mentoring entrepreneurs and supporting new enterprises—beyond the level of willingness shown in other regions. Still, St. Louis and entrepreneurs must have access to some capital to create their business. St. Louis has the participation of local industry and a local venture community present to provide a vehicle for funding startups. In areas where this is not present, participants emphasized the need for the public sector to engage with the market. The Missouri Technology Corporation (MTC) is an example of a public-private partnership aimed at establishing and growing emerging high-tech companies. Funding from the public sector serves as a signal of the validation of technology and business plans for these companies. The panel participants shared a fear that if public support in this area were to be reduced, it would represent a loss of core funding for the entrepreneurship taking place in the St. Louis region and slow economic growth in the region.

Panel Synopsis—Regions as Magnets for Talent

The final panel of the day focused on a what it takes for a region to attract and retain innovators and entrepreneurs. Participants were straightforward in noting that every region faces challenges in attracting and managing talent—whether the challenges come from outside or inside a region.

One of the greatest challenges panelists spent time discussing revolved around the competition posed by the major metropolitan innovation clusters to attract and retain the nation's—and the world's—best and brightest talent. Dialogue participants made the case that regions must invest in qualities that distinguish themselves from existing hubs and showcase the business, leisure and personal opportunities available to residents. In essence, regions must build on their existing strengths and assets. And regional leaders must work with their community to build the stakeholder base to ensure the legacy of any reforms and to cultivate long-term, compelling reasons for individuals and organizations to invest.

A key element to drawing and retaining talent is the need to communicate clearly the region's available resources. Efforts to communicate personal and professional opportunities provide potential residents with the information necessary to be secure in their decision to settle in the region permanently.

Finally, panelists observed that regional co-development can be an effective strategy in a climate of resource constraint, and one needing deeper stakeholder engagement and support. Drawing talent to a region requires the innovation ecosystem to be sufficiently flexible, robust, and resourceful to maximize its innovation resources.

FINDINGS FROM THE EIFI MIDWESTERN REGIONAL DIALOGUE

Innovation Keynote

Dr. France A Córdova
Director
National Science Foundation

Dr. Córdova opened the Dialogue by reflecting upon her comments at the Exploring Innovation Frontiers Initiative (EIFI) National Launch Dialogue at the Georgia Institute of Technology in 2015 in Atlanta, highlighting the continued shared mission of the Council on Competitiveness and the National Science Foundation, noting the timeliness of the EIFI Dialogues as the country's ongoing efforts to work its way out of the Great Recession of 2008-2009 and looks for avenues of robust growth. She highlighted the importance of this Dialogue in particular for commercializing the results of NSF-supported work and its alignment with NSF's goals, emphasizing a line in the meeting briefing materials that "entrepreneurs are essential to moving innovations out of the lab and into the marketplace, creating societal value from long-term investments and research development in people who drive innovation."

Recognizing the role entrepreneurs play in the innovation ecosystem has drawn NSF into new programs such as the Innovation Corps (I-Corps™) Program, which is increasingly investing in entrepreneurs and affecting the way students and faculty work together to drive innovation. Dr. Córdova foreshadowed the Dialogue's conversation and outcomes by stating that building the structures around which people form relationships is the spark that ignites entrepreneurship and robust growth.

Brian Stone, Chief of Staff to the Director, National Science Foundation; France Córdova, Director, National Science Foundation; Mark Wrighton, Chancellor and Professor of Chemistry, Washington University in St. Louis; Deborah L. Wince-Smith, President & CEO, Council on Competitiveness.

Appropriately, as the final dialogue in the EIFI series, Dr. Córdova summed up the results of the preceding Dialogues each looking at discreet elements in the innovation ecosystem: diversity and talent at UC Riverside, technologies that would drive innovation in the coming decades at Texas A&M, and now entrepreneurs creating value by moving innovations from the lab to the marketplace in Washington University in St. Louis, which is in the heart of the St. Louis innovation ecosystem. Understanding the issues found within each of these elements is critical for the NSF as their wherewithal to provide funds are further constrained, forcing NSF and recipient organizations to be efficient and productive in their use of resources.[1] Even so, Dr. Córdova and the National Science Foundation are increasingly looking to deepen partnerships within and with outside groups, with Dr. Córdova articulating that:

1 At the time of this writing, the NSF budget faced a proposed reduction of 11 percent.

"We have always had partnerships with academia and industry. But we want to figure out ways really to deepen those partnerships, and ways in which the federal government, namely our agency, can be a better partner. There are all sorts of constraints, intellectual property and the like, and we do not always have the reputation for being the best partner; but we do our best to leverage the dollars that we do have and implement the types of programs that lead to more effective partnerships. I think this is a whole new world for furthering great research."

The importance of partnerships extends beyond bridging groups of people. Innovation thrives when technologies are partnered to create value. What innovation really means, explained Dr. Córdova, is to bring discovery and invention to a collection of bright, creative people who may not have created anything themselves but can put everything together in novel and useful ways. For more than two centuries, our nation has consistently encouraged pioneers in innovation. Innovators like Thomas Edison and Steve Jobs were heralded for their ability to assemble, from discovery and invention, new tools or approaches to improve the quality of life. iPhones are often used as a prime example of all the different basic research that went into the technologies that the iPhone makes use of, without which they would not be functional. GPS, touchscreens, the internet and many other technologies that make our smartphones as useful as they are can be traced back to government-funded research. Some agency of the federal government funded a researcher, like a researcher at Washington University in St. Louis, who was able to develop a product that helped catalyze or revolutionize an industry.

NSF has been at the forefront of creating models in which innovation is encouraged across science and engineering. The NSF Engineering Research Centers (ERC) program, for example, recently celebrated its 30th anniversary. NSF now has centers all over the country to integrate engineering research and education with technological innovation to transform national prosperity, health, and security. NSF also runs an accelerating innovation program, an Industry-University Cooperative Research Centers (I/UCRC) program and a Small Business Research (SBIR/STTR) Program. A recent development from the NSF is the "10 Big Ideas for Future Investment" effort, which identifies six big research areas and four process or infrastructure ideas to transform the landscape of what the United States does well.

Dr. Córdova emphasized that each of the many programs operated by the NSF was developed to meet the needs of the time in which it was initiated. Each met with discernible success because they attracted a range of creative and innovative leaders and participants. The United States pioneered these programs, and their success has seen them replicated in states across the country and nations around the world. Just recently, the 6th annual Global Research Council meeting held in Ottawa, Canada affirmed a statement of principles supporting the concept that promoting fundamental research and innovation leads to scientific breakthroughs and economic growth. While heartening to see the countries represented adopting common principles about how important discovery and invention are at producing innovative ends, this public recognition on an international stage of innovation's building blocks underscores the urgency of EIFI's mission to maintain America's leadership in this space or risk falling behind international peers. These principles are at the core of the EIFI program and the core of economic growth, creating the foundation for future competitiveness. As Dr. Córdova explained, the findings from the conversation around entrepreneurship, and the EIFI program as a whole, will hone NSF's efforts to promote the progress of science and the arts, and capitalize on America's hallmark innovation capacity.

10 Big Ideas for Future NSF Investments

1. NSF INCLUDES (inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science): Enhancing Science and Engineering through Diversity
2. NSF 2026: The Integrative Foundational Fund
3. Understanding the Rules of Life: Predicting Phenotype
4. Work at the Human-Technology Frontier: Shaping the Future
5. Mid-scale Research Infrastructure
6. Windows on the Universe: The Era of Multi-messenger Astrophysics
7. Navigating the New Arctic
8. Harnessing Data for the 21st Century Science and Engineering
9. The Quantum Leap: Leading the Next Quantum Revolution
10. Growing Convergent Research at NSF

To learn more, visit: https://www.nsf.gov/about/congress/reports/nsf_big_ideas.pdf

Barry Johnson, Acting Assistant Director, Engineering Directorate and IIP Division Director, National Science Foundation.

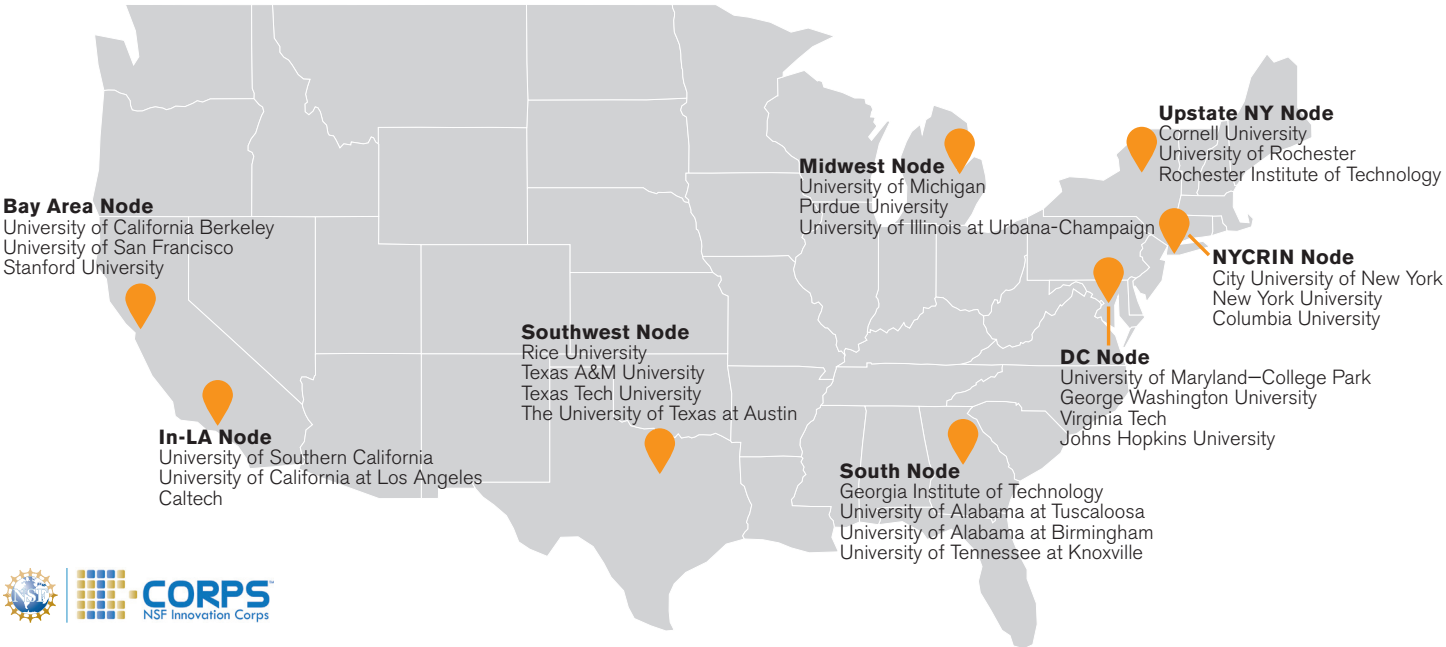
Barry Johnson
Acting Assistant Director, Engineering Directorate IIP Division Director
National Science Foundation

Whereas Dr. Córdova presented an overview of NSF programs amid the broader context of the changing nature of innovation in the United States and globally—and the impacts on society and the economy—Dr. Johnson's comments delved deeper into the impact of these initiatives on America's innovation ecosystem. To properly understand how NSF leverages its portfolio to make an impact on innovation activities, Dr. Johnson defined sharply the concepts of invention, innovation and entrepreneurship to draw distinctions between them and articulate how their meanings drive NSF activities. "Invention" is the creation or discovery of new knowledge—it the result of fundamental research and central to any innovation ecosystem. "Innovation" is aligning the results of invention with a need in the commercial space or the development of a product that solves a societal problem. "Entrepreneurship" is building an organization that can deliver an innovation to the marketplace. Dr. Johnson was quick to note neither of these exist in a vacuum nor sprout spontaneously. Underpinning invention, innovation and entrepreneurship,

according to Dr. Johnson, are education and training. With these definitions in place, Dr. Johnson provided updates on NSF's portfolio of initiatives, highlighting how these programs have led to many advanced technologies in the market today.

Starting with the most recent program, I-Corps™, Dr. Johnson outlined its creation in 2011 and how it has been the avenue through which the NSF built the National Innovation Network (NIN), an effort to grow and sustain the national innovation ecosystem. To date, there are eight nodes that involve 27 universities and 67 sites involving another 70 universities (Figure 1). This total of almost 100 universities across the NIN enables a number of opportunities. This network stimulates the formation of teams that are interested in commercializing new technology and NSF can train those teams on recognizing commercial viability, aligning with the market need, and determining what is needed to build a business. NSF began funding teams to operate through the network in 2013, with the thousandth team having already passing through entrepreneurship training through the network in the summer of 2017. From these teams 400 startups have been created and have begun to raise money from private investors. Four startups have already been acquired. Importantly, these are all built within the framework of universities focused on invention and the discovery of fundamental knowledge, which is the foundation needed to stimulate and enable innovation and the creation of new startups. On the impact of this network on the capacity to further entrepreneurship from fundamental research, Dr. Johnson elaborates:

National Science Foundation I-Corps™ Nodes
Source: National Science Foundation



"We want to grow that network, we're looking to grow the number of nodes, grow the number of sites, grow the number of teams, and we now have the Department of Defense and other agencies that are funding teams coming out of their own research to go through this entrepreneurship training. So I-Corps has been a phenomenal success."

NSF also has experience connecting industry and university partners through the Industry University Cooperative Research Centers Program (IUCRC), initiated in 1973. To date the IUCRC has more than 75 centers around the country involving over 200 universities and 1,200 corporate memberships supporting the centers. This program has made capable of defining problems that need to be solved with universities developing solutions through research. There are currently more than 2,300 graduate students involved and supported by those centers working on use-inspired fundamental research.

Attention then shifted to the Small Business Innovation Research (SBIR) program, an effort NSF founded in the 1970s and that has been growing ever since along with the Small Business Technology Transfer (STTR) program. The small businesses involved in these programs are creating innovative solutions using fundamental research with 60 percent of those companies aligned to universities. This program underscores the strength of America's university system, considering so many of these small businesses emerge from the university network capitalizing on inventions from university faculty and graduate students.

Finally, Dr. Johnson shared how NSF's efforts over the past several decades have been shaping America's innovation future. NSF's work accelerating and broadening America's innovation ecosystem combined with increasingly accessible communication technologies has greatly democratized innovation as well. NSF invested in 3D printing the early 1970's, supporting fundamental mathematical modeling that led to the technologies that now form the basis for additive manufacturing. The costs of these tools have dropped dramatically to the extent that individuals can take a hands-on approach to innovation and manufacturing, cultivating a do-it-yourself mentality that has blossomed into the "Maker Movement". This innovation system has the ability for rapid, personalized production of new products and services that have unique characteristics. Describing the confluence of these capabilities, Dr. Johnson concluded with an anecdote about a recent innovation challenge:

"General Electric recently had a competition worldwide to try and redesign the relative components of their jet engines. That design came from an individual; it did not come from an organization. It came from an individual that used the unique properties of 3D printing added to manufacturing to create a design that, if using subtracted manufacturing or so-called traditional manufacturing schemes, would not have been possible. That network of capabilities is bringing new innovative thought contributions and capabilities to the table that simply did not exist previously."

FINDINGS FROM THE EIFI MIDWESTERN REGIONAL DIALOGUE

Cultivating Entrepreneurship

Immediately following the morning keynote, the first panel of the day revolved around opportunities and challenges to cultivate entrepreneurship in the United States, and drilling down into how St. Louis has transformed itself into a beacon for new businesses in the Midwest. Dr. Holden Thorp, Provost and Executive Vice Chancellor for Academic Affairs and Rita Levi-Montalcini Distinguished University Professor Washington University in St. Louis, led the conversation, opening the panel by sharing his perspective as an entrepreneur and from working for academic institutions and private companies. Joining Dr. Thorp on stage were Paul J. Corson, Advisor for Technology and Venture Commercialization at the University of Utah; Mary Jo Gorman, Managing Partner at Prosper; and Emre Toker, Director of the Skandalaris Center at Washington University in St. Louis. The conversation covered the role of academic and commercial institutions in creating an environment supportive of entrepreneurs, as well as how a region can create an ecosystem that gives aspiring entrepreneurs the tools and confidence to embark on a new venture.

Cultivating entrepreneurial spirit is vital to the continued prosperity of the United States. According to the Council on Competitiveness and Gallup report *No Recovery*, the United States as seen a steady decrease of productivity growth over the past five decades (Figure 2), which Dr. Thorp notes impacts not just immediate value creation but our economic well-being in the future. Poor productivity growth means investments will yield low returns, leaving capital to invest in emerging markets, which is not great for America's economic future. For Dialogue participants productivity growth is a signal for value

From left to right: Paul J. Corson, Advisor, Technology and Venture Commercialization, University of Utah; Mary Jo Gorman, Managing partner, Prosper; Emre Toker, Director, Skandalaris Center, Washington University in St. Louis; Holden Thorp; Provost and Executive Vice Chancellor for Academic Affairs, Rita Levi-Montalcini Distinguished University Professor, Washington University in St. Louis.

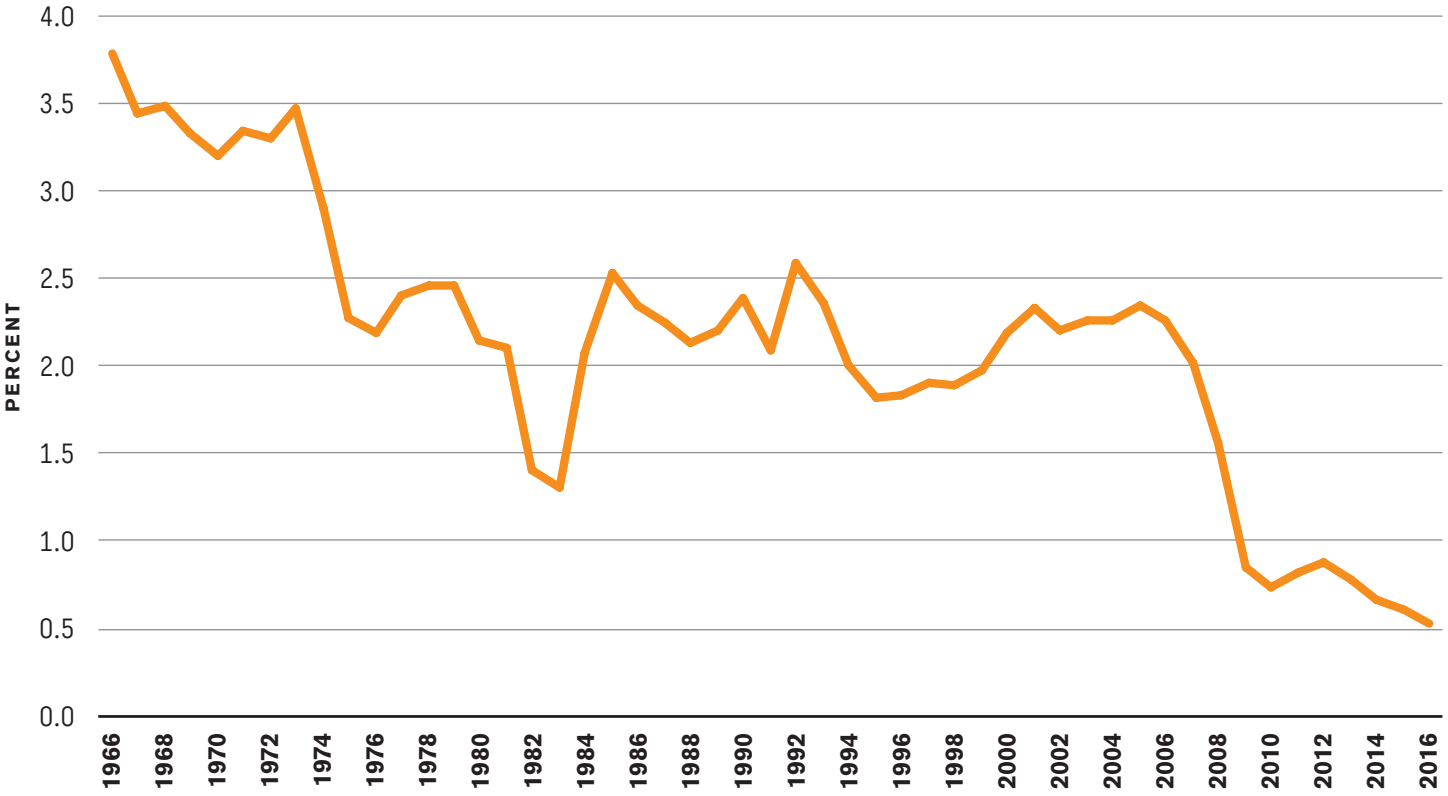
creation, and if as discussant **Mr. Toker observed, "capital goes where value is created,"** then the United States needs to be the most innovative nation. Indeed, America's reigning status as a leader in innovation and home to most of the world's high-tech companies[2] is why many foreign nations invest, acquire and take interest in U.S. startups.

Participants were in some disagreement about whether entrepreneurs can be trained or must already possess traits to be honed. According to **Ms. Gorman, "there are fundamental characteristics you either have or do not have,"** adding that it is not uncommon for smart individuals equate their skill in a particular domain with their success as an entrepreneur. Not all participants felt this way, many noting that there is a range of characteristics that

2 Bloomberg Innovation Index.

Figure 2. The U.S. Productivity Growth Rate is Slowing
Source: U.S. Bureau of Economic Analysis.

Over the past 50 years, the percent annual growth rate in GDP per capita over 10-year periods has trended downward. This is a dangerous direction for the economy, as productivity growth is the only proven path to economic prosperity.



may lead to success given the unique environment in which they operate. However, dialogue from this conversation did surface three primary challenges to cultivating entrepreneurs regardless of innate skill.

The first challenge discussed is the speed at which institutions are capable of change when compared to an entrepreneur. This itself is not surprising. Large commercial and educational institutions have numerous moving components, requirements from legacy modes of operating, as well as accountability and reliability commitments to customer or student constituents. Mr. Corson pulled from his experience, noting universities change at a glacial pace while entrepreneurs change very quickly. This discrepancy between groups regarding their ability to respond quickly to events makes it difficult for entrepreneurs looking to validate a technology or service in the marketplace but are restricted by inflexible intellectual property or licensing issues emanating from large organizations.

The second challenge to cultivating entrepreneurs discussed deals with: (1) the accessibility of entrepreneurial supports such as capital, talent and mentors; and (2) access classes of gender, race, ethnicity, or socioeconomic groups have to these entrepreneurship enablers. Discussion circled around how race creates an additional layer of difficulty for entrepreneurs, shaping how members of these groups think about building business.

The final major challenge to cultivating entrepreneurs surfaced during the discussion about the timeline for building a business. Entrepreneurs must move quickly to hone their business plan, and address changes in their market and the needs of customers. But, success is slow and never guaranteed.

As **Ms. Gorman explained, "The difference between an idea and a business is a very long road and the number of companies that even get to $1 million is less than 1%."** This is especially a problem as younger entrepreneurs are perceived to be moving more quickly into new projects. Mr. Corson described a continuum entrepreneurs experience when founding, running, and in some cases, discarding their business, noting that young entrepreneurs appear to be moving through the continuum at an accelerating pace relative to previous generations. First, entrepreneurs are anxious when building their enterprise, concerned for the success of their new business and about their own abilities. On seeing their business grow, entrepreneurs experience pride in their talents and organization, leading them to feel confident and secure in their abilities. Finally, the continuum ends as entrepreneurs no longer feel challenged by their business; as entrepreneurs either close, sell, or leave the organization they created. Entrepreneurs and businesses find themselves at different points on this continuum. Having already established the long time-horizon for businesses to achieve success, the increasing speed at which entrepreneurs are moving through this continuum limits startup growth as potentially profitable ideas are not fully explored in the market.

Within this challenge around the ever-shortening timeline for building a business is also the importance of failing fast. There is innovation even in this space, as tools are in development to help entrepreneurs quickly assess the probability of their venture's success. Mr. Toker explained that it is possible to use big data to predict which teams and products are most likely to succeed, as well as ways the surround-

ing community can improve a startup's chances of success. Ms. Gorman agreed with this point choosing to focus on validation, explaining that the more **Mr. Toker's analysis is able to validate and learn how a startup's product fits the needs of the buyer, the more the new business is likely to succeed. In addition, market traction attracts futher capital, compounding opportunities for success.**

Washington University in St. Louis and the broader St. Louis region have made concerted efforts to create an ecosystem supportive of new entrepreneurs by finding ways to accelerate market entry for innovators, and connect entrepreneurs with mentors and capital to level-set expectations of success while pointing them to the resources they will need to succeed. For example, Dr. Thorp remarked on how Washington University in St. Louis enables academics to pursue their desires to start a company. Most institutions spend a significant amount of time and resources constructing agreements between the school and individual regarding intellectual property rights. Schools fear losing out on the value of discoveries with market applications, while at the same time attempting to avoid conflicts of interest between the educational institution and professors, researchers, and professional staff looking to build startups. This process is long, expensive and unwieldy, dampening the enthusiasm of energized potential innovators. **Rather, as Dr. Thorp expressed, Washington University created a standard agreement which can be quickly applied, speeding the founding of new businesses from research.**

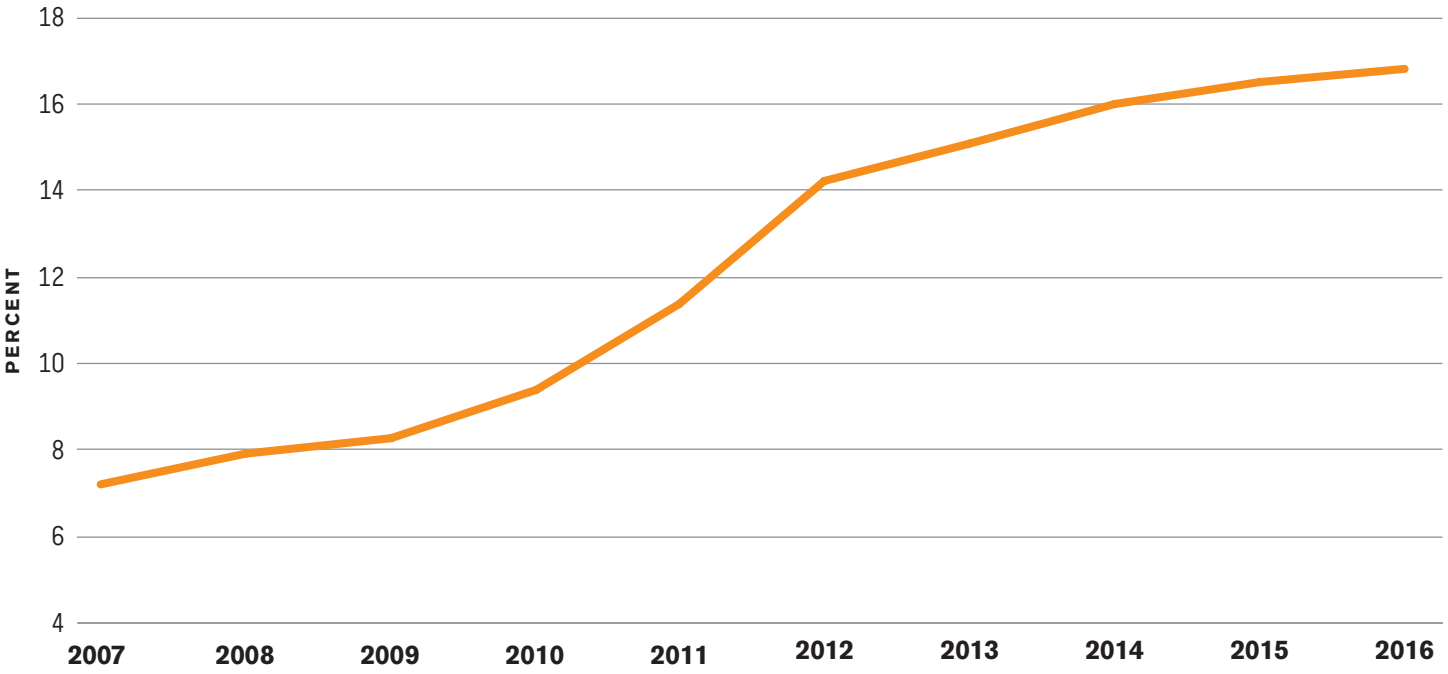
Dr. Thorp noted the strongest indicator as to whether a faculty member would start a venture-backed company: living in the same neighborhood as a venture capitalist. Stanford and MIT have a robust relationship between the local venture and academic community and strengthen this bond with entrepreneur-in-residence programs. Building these same sort of relationships has been a critical factor underpinning the funding of new businesses in the St. Louis region.

However, building these relationships is difficult for a significant portion of the population in the St. Louis region given its radial, economic, and socioeconomic diversity. Regional leaders have recognized this as a missed opportunity for the region, and , accelerators, incubators, and other startup investors are actively engaging underrepresented communities to increase representation from different groups. Ms. Gorman's Prosper, for example, is "focused on increasing women entrepreneurs' access to growth capital and the number of women investing in early stage capital markets."[3] Though venture capitalists are investing in a greater number of female-founded companies, these companies still represent a small portion of companies attracting venture capital (Figure 3). Similar examples for other underrepresented communities abound. These groups also provide guidance and counsel patience, with **Mr. Sherwood noting, "a great part of being in St. Louis is that there are no illusions about how long it takes to achieve success."**

3 Prosper Women Entrepreneurs.

Figure 3. Percentage of U.S. Venture Capital Deals to Companies with a Female Founder
Source: Pitchbook

According to data from Pitchbook, a data collection and analysis service, the percentage of U.S. venture capital deals to companies with a female founder grew by 133 percent in the decade between 2007 and 2016. However, as of 2016, the number was still very low compared to the percentage of VC deals to companies with a male founder.



Overall, these actions have expressed to the St. Louis entrepreneurial community a deep level of support and encouragement, building confidence for those looking to establish themselves as an entrepreneur. **Dr. Thorp punctuated the need for innovative new businesses, "We need the productivity that comes from innovations."**

FINDINGS FROM THE EIFI MIDWESTERN REGIONAL DIALOGUE

Barriers to Business Building

The second panel of the day explored hurdles faced by new and growing businesses, and the steps taken in the St. Louis region to help nascent enterprises overcome these barriers. Dr. Dedric Carter, Vice Chancellor for Operations and Technology Transfer at Washington University in St. Louis moderated the conversation, with Mike Krupka, Managing Director at Bain Capital, David Karandish, Former CEO of Answers Corp, and Dougan Sherwood, Co-Founder at the Cambridge Innovation Center, St. Louis, sharing their perspectives on hurdles entrepreneurs must overcome to build their business. Participants agreed that the barriers faced in the St. Louis region are not unique, but the region benefits from a supportive ecosystem populated by large organizations and patient capital that is not present in many other regions.

From left to right: Mike Krupka, Managing Director, Bain Capital; Dougan Sherwood, Co-Founder, Cambridge Innovation Center, St. Louis; David Karnadish, Former CEO, Answers Corp.; Dedric Carter, Vice Chancellor for Operations and Technology Transfer, Washington University in St. Louis.

Dr. Carter opened the discussion with an assessment of what he viewed as components of a supportive ecosystem and how stakeholders can make a positive impact, which includes access to risk capital, good industrial ties and relationships; strong universities; a favorable regulatory environment at the local, state, and national level; and an active entrepreneurial community. Conversation focused on the point that the existence of each of these components in the environment is not what is important, but how the environment permits or encourages interaction between the components. With this as the discussion's guiding theme, several major challenges to building businesses in the region emerged.

The first challenge surfaced by participants touched on the difficulty and unfamiliarity of embarking on a new initiative. There must be ways to socialize ambiguity so that entrepreneurs are not lost or demoralized when there is no clear path forward. Participants recommended that this socialization should start early in an academic setting where children are exposed to entrepreneurship to grow familiar with challenges associated with executing on an idea and building something new. Current and nascent technologies are a democratizing force in this space, allowing younger generations to envision and build something new fewer initial hurdles than ever before. Even here though, some level of technical training is required to equip students with the foundational tools and resources to set up students for future success.

Once individuals are ready to venture into entrepreneurship, individual innovators and entrepreneurial staff at larger organizations encounter difficulties translating their ideas into a business and determining its viability in the marketplace. **Mr. Karandish observed that many ideas fail because entrepreneurs are so involved in creating the product or service that they are unable to identify the right metric that will signal success**, such as a

customer acquisition trajectory, a growth strategy or another relevant goal. Finding the right success metric is critical to startups who need this feedback to adjust their business plan, to better meet the needs of their customers and attract large organizations willing to be the first customer.

The final, major challenge raised during this panel's discussion focused on locating the right people to grow the company. Seasoned entrepreneurs insightfully recognize that entrepreneurship too often focuses on the founder when the "joiners"—early employees and advisors—are just as important. It is therefore critical to the success of America's entrepreneurial community to create an environment that connects joiners and founders, pairing complementary talents and increasing the likelihood of success for new businesses. Participants cautioned this takes time, which can cause friction among startup stakeholders as 5-10 year plans are balanced against short-term goals, and monthly and annual targets necessary to show growth and attract investment.

As companies approach and surpass tiers of growth, Mr. Krupka noted they encounter the additional challenge of attracting senior managers, both from the risk associated with leading a growing business as well as attracting the right senior management talent to a region with a smaller economic footprint compared to the metropolitan hubs where many large enterprises are headquartered. But bringing in these senior managers with the experience of scaling companies can greatly enhance an innovative organization's chance of success. Mr. Krupka further observed that as these companies grow they also may be acquired, stalling their growth into a large innovative company.

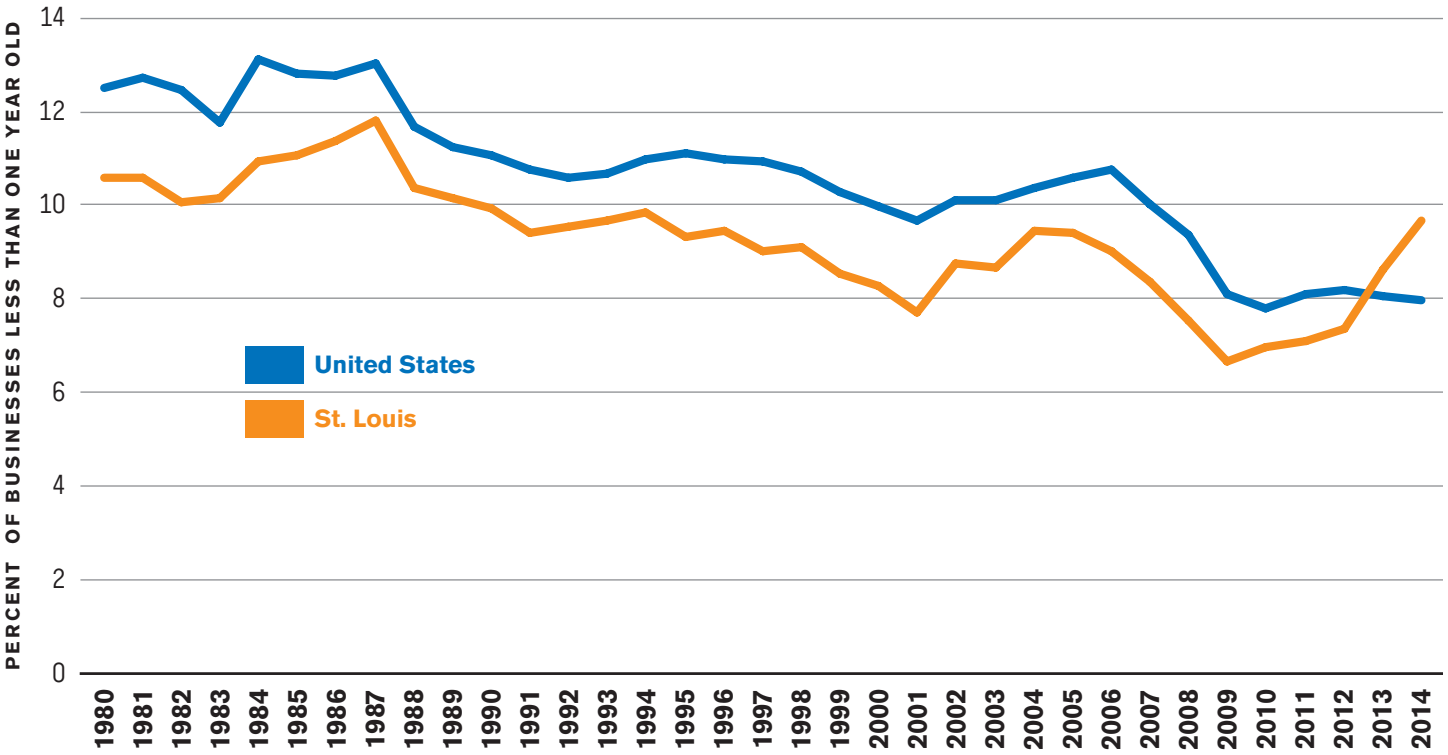
Over the past several decades the St. Louis region resolved to lower the barriers for creating and growing new businesses (Figure 4), taking action of the many challenges that emerged during conversation in three areas: helping entrepreneurs de-risk their product, benefitting from the altruism of experienced individuals and organizations willing to provide guidance without compensation, and building a robust talent pipeline to staff new businesses.

De-risking businesses paves the way for businesses to grow past initial hurdles quickly and makes the business more attractive to quality hires, clients, or for acquisition. Mr. Toker noted in the previous conversation that the Skandalaris Center at Washington University in St. Louis asks new organizations to write down their biggest risks—business, scientific or otherwise—and the Skandalaris Center will connect the new organization with individuals in the Skandalaris network who can de-risk those specific pain points. **Key to the success of this exercise is a "level of wealth that is helpful and experience willing to lend itself to new ideas without a fee early on," according to Dr. Carter.**

The same process is critical for helping businesses grow by finding the right staff—connected through the de-risking exercise or the guidance of aforementioned advisors. Either way, the entrepreneurial development structures in St. Louis are particularly good at finding the right people to suit the needs of a growing organization. This has profound effects on overcoming barriers for new businesses, which in turn grows wealth in the region and catalyzes further innovative businesses to develop. Mr. Sherwood elaborated on how the concentration of startup growth will lead to the region possessing the wealth,

Figure 4. St. Louis Startups Outpacing the United States
Source: U.S. Census Bureau.

The growth of startups in St. Louis relative to the United States is evidence of efforts by St. Louis to ease the burden and incentivize new business growth.



ideas, and talent to keep companies over time, using a technology startup as an example: **"A few years ago an app startup could not stay in St. Louis because of the capital and talent needed for that was only available in California. But that is changing. And St. Louis could soon reasonably hope to retain those companies locally."**

The lowering of these barriers for new businesses empowers entrepreneurs to bring innovations to market, and builds organizations that will support the productivity of the region. Echoing the comments of **Dr. Carter and Mr. Karandish, Ms. Wince-Smith summed up the conversation by noting the importance of equitable growth, diversity and density of the population for growing, retaining, and attracting entrepreneurship.**

FINDINGS FROM THE EIFI MIDWESTERN REGIONAL DIALOGUE

Enabling Entrepreneurial Ecosystems

This panel focused on: (1) the elements of an entrepreneurial ecosystem necessary for innovators and entrepreneurs to thrive, and (2) how to develop those elements if they do not already exist in the ecosystem. Dr. Barry Johnson, Acting Assistant Director of the Engineering Directorate and IIP Division Director at the National Science Foundation led the conversation, joined by: Harry Arader, Director of BioSTL; Michael Kinch, representing the Center for Research Innovation in Business at Washington University in St. Louis; Patty Hagen, Executive Director at T-REX; and Ken Harrington, an innovation ecosystem expert and author of the *Entrepreneur's Guide*.

Echoing themes surfaced throughout the day, these experts highlighted the importance and willingness of local industry leaders to offer guidance and resources to new businesses. The success of entrepreneurs has been a cornerstone of the American economy and key to national competitiveness, though, notably America's long history of new firms outpacing the shuttering of existing firms has been in decline (Figure 5).

Understanding how to enable an entrepreneurial ecosystem requires critically examining the wide and diverse group of stakeholders participating in the ecosystem. Throughout the conversation, participants shared how different stakeholders influenced the entrepreneurial ecosystem: educational institutions, from primary education through trade schools and universities, hone skills and unleash talent within the workforce; small, medium and large organizations invest in new businesses and act as market validators when choosing to be an early customer of a young business; community entrepreneur development organizations that encourage and catalyze growth in new businesses; and public policy and government organizations that push for an environ-

From left to right: Michel Kinch, Center for Research innovation in Business, Washington University in St. Louis; Patty Hagen, Executive Director, T-REX; Harry Arader, Director, BioSTL; Ken Harrington, Innovation Ecosystem Expert and Entrepreneur's Guide; Barry Johnson, Acting Assistant Director, Engineering Directorate and IIP Division Director, National Science Foundation.

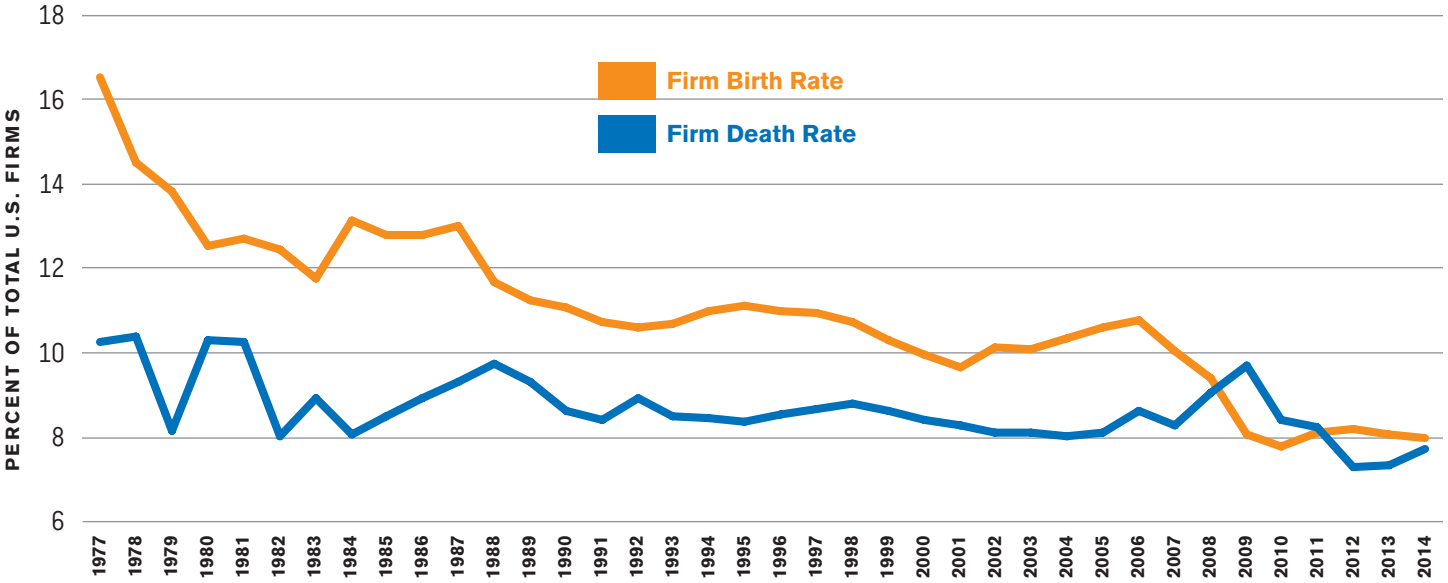
Participants Identified Three Types of Development Necessary for an Entrepreneurial Ecosystem

1. Entrepreneur Development: Creating more and better entrepreneurs and joiners.
2. Venture Development: Funding companies and achieving successful outcomes economically.
3. Economic Development: Putting in place the policies and infrastructure to feed an innovation pipeline that drives economic growth.

Figure 5. Annual Firm Birth and Death Rates Are Converging
America's firm birth rate exceeded its firm death rate from the mid-1970s through the late 2000s, showing consistent new business growth over several decades. Over time, however, the gap between firm birth and death rate had been closing, with firm birth rate falling steadily as a percent of total U.S. firms. The firm death rate first exceeded the birth rate in 2008 and continued to do so until 2012. Though the rate of firm births vs. deaths has been positive for the past several years, firm births relative to firm deaths has yet to recover.

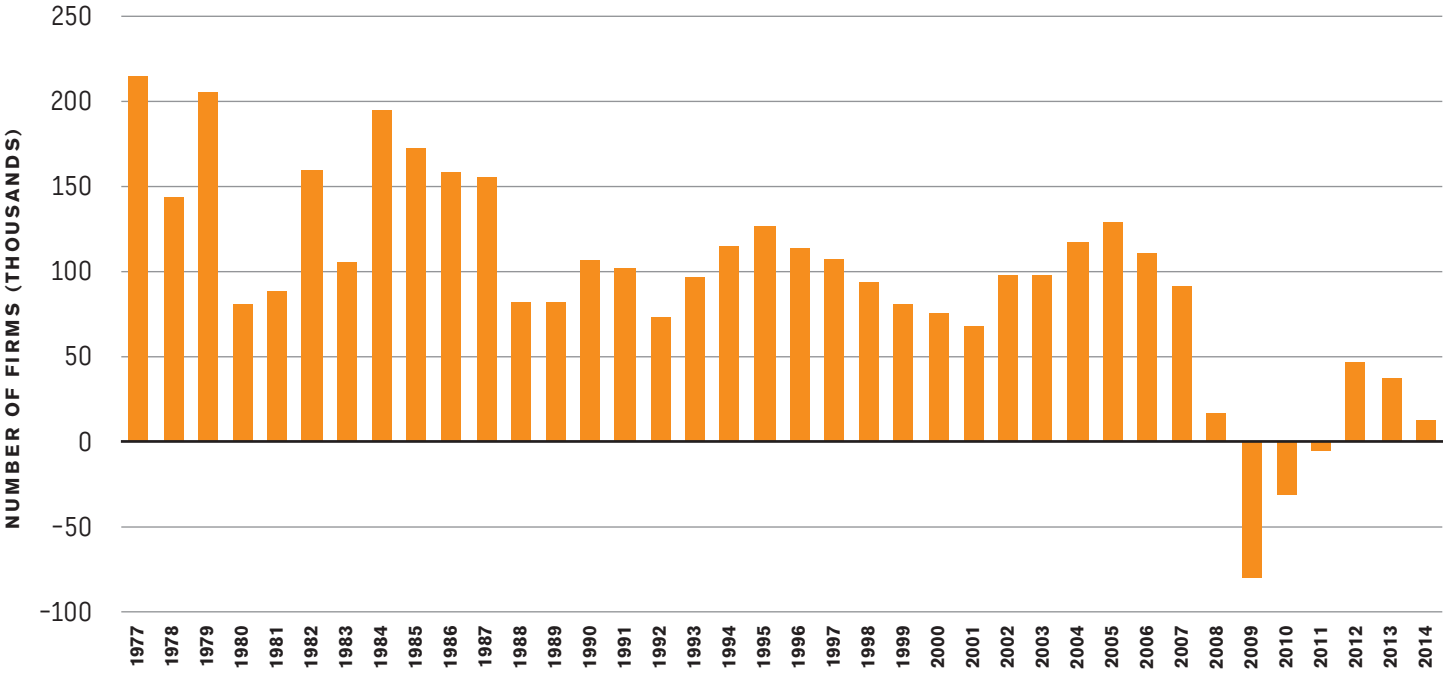
U.S. Firm Birth and Death Rate from 1977–2014

Source: U.S. Census Bureau



Annual Difference Between Firm Births and Deaths in the U.S. Economy

Source: U.S. Census Bureau



ment conducive to entrepreneurial risk takers. Sub-ecosystems exist even within these stakeholder groups, such as technology or biopharmaceutical ecosystems, each with different motivations as a stakeholder within the large entrepreneurial ecosystem. As each group of stakeholders continually fractures into more discrete sub-groups, young and established firms alike are provided fewer opportunities to build relationships and share ideas across domains that may be meaningful to them. Ms. Hagen further elaborated on this concern, noting that corporate partners often have different needs and interests but generally are interested in participating in the innovation ecosystem because they see it as an opportunity for talent development. Her observations are evident from personal experience. T-Rex, which Ms. Hagen leads, now has an emerging relationship with a major telecom firm over open source development. The partnership matured over a year and a half before reaching a point where both companies felt they understood what the other was looking to gain from the relationship. The timeline for building relationships varies widely, but participants stressed patience. **"If long-term relationships are built on trust and transparency, good things will happen," observed Mr. Kinch.**

This focus on relationships remained a key emphasis of the conversation for its potential to have a dramatic impact on the success of any given entrepreneurial ecosystem. Dialogue participants echoed the importance of relationships in building momentum for entrepreneurs, with Mr. Arader sharing his belief that the most important resource community entrepreneur development organizations have is their network. **Mr. Harrington agreed on the importance of networks even in an unstructured environment, sharing enthusiastically, "if we could hold an event where two people with common interests met, we could get 6-12 months of free work. Momentum based around relationships really bubbles up because innovators are provided plenty on which to innovate. You see why it is important to create a serendipitous activity model where people can find those relationships, and there is so much opportunity to make those relationships exist."**

Relationships also played a prominent role in three common traits Dr. Johnson identified in successful Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) participants:

1. Very strong intellectual property, something unique that separates them from others;
2. Very strong relationship with a research institutions; and
3. Strong strategic partnership with a large company—a corporation that has either put their arm around them as a customer or helped them develop the technology ultimately as an acquirer.

Relationships, critical as they are to the success of entrepreneurs and startups, are only one element of an ecosystem. The qualities and characteristics of individuals representing both ends of the relationship are similarly important. Entrepreneurs and individuals contributing to the success of a startup are also necessary elements of the ecosystem. But, participants cautioned that the skillsets needed to found, grow, and operate a business can be very different. Finding

the right mix of skillsets is difficult for entrepreneur development groups as they focus on helping innovators found a company, though they often do not have the resources to help successful entrepreneurs build the skills necessary to lead the next stage of the organization according to Mr. Arader.

St. Louis has been successful in leveraging their strengths to enable an entrepreneurial ecosystem through a mix of exportable programs and characteristics unique to the Midwest. The focus on relationships and building partnerships across sectors, industries and firm sizes are a key element of fostering entrepreneurial success and are highly exportable in that little in the way of hard infrastructure or other resources are required. The guided and rapid momentum building fostered by a robust community of relationships inspires entrepreneurism in its given ecosystem. St. Louis benefits from a local venture community that provides another vehicle for funding startups and the enthusiastic participation of local industry without any expected compensation—a quality difficult to replicate and a value Mr. Hagen termed as the "civic philanthropy of the St. Louis ecosystem."

Participants noted that there is a role for the public sector to provide access to capital or act as a financial backstop to incent private sector activity in regions that do not have a robust financial sector presence.

For example, the state legislature of Missouri—the home state of St. Louis—created the Missouri Technology Corporation (MTC) as a public-private partnership with the mission to promote entrepreneurship and foster the growth of new and emerging high-tech companies. Since its launch in 2011, the MTC's Innovation, Development, and Entrepreneurship Advancement Funds have invested over $30 million with companies receiving investments raising over $350 million in additional private capital.[4]

The participation of the public sector investing in startups signals to the private sector a type of validation in the technologies and business plans of these new organizations. Should these public sector funds disappear, then this validation is lost, potentially leading to declining private sector investment and ultimately reduced entrepreneurial activity. Mr. Arader provided an example from the pharmaceutical industry, assessing that "the pharma industry is facing an unprecedented challenge. We lost half of all companies that have done any research into a new medicine since 2000. The amount of venture capital going into new companies is declining and resources are increasingly directed toward later stage companies. The only thing holding up the industry is federal funding, and it looks like that might be going away soon. We need to be looking into the future and worrying not just about the people, but also about whether we have safety nets in place. Absent those safety nets, this industry could crumble, and we could cede leadership to other parts of the world." The concern over disinvestment on the part of federal and state government in innovation was a fear shared by many of the participants, and represents the potential loss of a core institution boosting entrepreneurship in the St. Louis region.

4 Missouri Technology Corporation.

FINDINGS FROM THE EIFI MIDWESTERN REGIONAL DIALOGUE

Regions as Magnets for Talent

The final panel of the Dialogue centered on a region's ability to attract reinforcing, supportive and similarly-minded individuals to drive industrial and economic growth. Dr. Jennifer Lodge led the discussion, with additional support from Maxine Clark, Founder of Build-A-Bear; Stephanie Leffler, CEO of Onespace; Chris Motley, Founder of Better Weekdays; Chad Steining, CEO of KYPHA; and Nancy Tye-Murray, co-Founder of cLEAR. Discussion was straightforward, noting that talent is drawn to a region primarily based on two factors: (1) the mix of opportunities available to individuals and their families, and (2) the physical characteristics of the region being sufficiently desirable for talent to consider relocating. Dialogue participants agreed this creates different challenges for each region owing to local prominent industry leadership and unique geography, with the only common challenge of needing to foster a supportive environments once talent has arrived. **Dr. Lodge summarized this in her opening comments, stating, " 'talent' is about both drawing talent to a region, pairing it with local needs and managing it once its here."**

Conversation largely focused on common challenges regions face when attracting talent: building industry to attract talent and communicating the region's resources to outside talent. Building industry in a region outside the East and West coasts of the United States or other major metropolitan hubs in the United States can be a difficult problem to solve. Talent is drawn to opportunity, and the industry, capital, and resources tend to be centered on these metropolitan hubs. Therefore, regions must start by making their region more economically competitive by investing locally, developing talent and improving access to resources to cultivate an entrepreneurial ecosystem. These efforts must be co-developed,

From left to right: Stephanie Leffler, CEO, OneSpace; Nancy Tye-Murray, Co-Founder, cLEAR; Chris Motley, Founder, Better Weekdays; Maxine Clark, Founder, Build-A-Bear; Chad Steining, CEO, KYPHA; and Jennifer Lodge, Vice Chancellor for Research, Washington University in St. Louis.

as a region investing in talent alone will see their workforce leave for greater opportunity, and a region investing in innovation infrastructure will lose industry if there is no talent pipeline. **Dr. Lodge articulated this challenge by pointing out that while schools can build facilities, talented staff, faculty and students are needed to make the investment worthwhile.** Similarly, a region can invest in upskilling talent, but it will need resources and opportunities for this.

The second important consideration to establishing a capable talent base is communicating the resources available to students, entrepreneurs small businesses, and industry within the region. Mr. Motley drew on his professional experience, noting that different groups interpret and process information in various ways. **"Students use a completely different language to communicate than business people or academicians."** Regions interested in attracting talent, either to build businesses or catalyze growth within existing organizations, must work to ensure their efforts

are not subdued from a lack of clarity on behalf of the intended audience. This issue was clearly evident in one interaction during the conversation when **Ms. Tye-Murray admitted to not knowing all the resources available to her when she started her business, despite having called St. Louis home for decades. As Mr. Motley noted, the number one driver of talent is awareness.**

Efforts to make known the employment, education, small business support, recreation and entertainment resources available to residents in the region have driven the steady transformation of the St. Louis region as a magnet for talent. Moreover, as **Mr. Steining noted during conversation, as the region develops, available resources grow at an accelerating rate.**

Key to this is how leaders in the St. Louis region take a holistic approach to attracting talent in the region. **As Dr. Lodge noted, bringing talent to a region is not just about one person, it is about opportunities for spouses and partners as well.** Having a robust ecosystem where they can plug in and feel they have opportunities is important.

The St. Louis region is fortunate in that it benefits from a number of geographic, economic, academic and intangible characteristics that are not shared with many other regions in the United States. Discussants highlighted the region's inexpensive real estate, abundant access to recreational activities, entertainment and cultural activities, and high-quality higher education as a potent blend foundational to the region's success. Paramount to capitalizing on the success of these characteristics is promotion and seamless interaction across innovation domains.

Promotion is conceptually straightforward—regions must make known to others the benefits provided within the region. In practice, the process proves more difficult as regions decide what regional characteristics, benefits, and industries to leverage. Mr. Motley noted a discrepancy in how organizations communicate opportunities and resources, and how prospective employees and students come to understand them. For example, individuals may not be interested in bringing their skillset to an new business or large enterprise if the organization's needs and mission are not well understood. Resolving this communication gap through the application of a common language has allowed St. Louis to better pair talent with local needs and connect passionate individuals with mission-driven institutions to drive economic growth. This process is constantly evolving, increasing awareness of opportunities draws talent with related interests, and as more talent relocates to the region their presence accelerates the relocation of more talent to the area interested in participating in a growing intellectual hub.

This highlights the importance of seamless interaction between the commercial and educational innovation domains. As talent increasingly relocates to a region, the skill level of individuals with a desire to participate in a particular field diversifies. High-skill workers are able to find employment and those in the St. Louis region with insufficient skills have access to training and career services that can equip the individual for success in their chosen field. These dense and closeknit industrial and academic communities are invaluable for developing the right talent within a region, but also for developing an educated workforce for local industry.

The prevailing mindset in the St. Louis region is one of patience, with the understanding that creating a lasting and robust innovation ecosystem requires investment and time. Dialogue participants made

multiple references to the innovation ecosystem in the St. Louis region taking decades to build, with every discussant in this conversation sharing an anecdote about how either they or a business partner had an existing or built a relationship with the region before moving to the region full time. On this point, Mr. Motley was clear that even attracting individuals to the region is a process of courtship. Technology enables working remotely, removing some incentive for individuals to move to St. Louis immediately. A slow burn, where individuals visit the region multiple times while working for St. Louis-based organizations, plants the seeds that the region is a place worth relocating to permanently.

Dialogue participants also recognized the important benefit of innovators relocating their families to the area. As Dr. Lodge articulated during the conversation, when a family moves to the area, spouses or partners often possess a similar education level and are able to contribute to the regional economy. The challenge then is how to identify opportunities for each member of the family. Ms. Clark added to Dr. Lodge's comment, sharing that local employers work hard to match talent and employment, applying skills across an organization to create value. This attention to the workforce by employers in the region eases common fears and frustrations to families considering a move to the area.

Building a region as a magnet for talent requires both attracting and retaining that talent. Focusing on the latter, Washington University in St. Louis launched two initiatives to increase the "stickiness" for talent retention of high-value, deeply trained individuals, such as graduate students, who have an interest in entrepreneurship. The Institute of Clinical and Translational Sciences (ICTS) was launched at Washington University to meet the intent of the National Clinical and Translational Science Award (CTSA) program, funded by the National Institute of Health's (NIH) National Center for Advancing Translational Sciences (NCATS), establishing a CTSA consortium of 60 medical research institutions located throughout the nation. Washington University created a post doc in entrepreneurship funded through ICTS to establish new businesses meant to improve human health, ensuring ICTS investigators have access to state-of-the-art research infrastructure, financial support, create relationships with local and regional academic, healthcare, and community partners, and helps move research findings into from the initial discovery phase into new diagnostics, therapeutics and prevention strategies to improve human health.[5] The second is an entrepreneurship-in-residence program launched as part of a student group to keep highly trained graduates in the region at a startup focused on entrepreneurship. Both have been significantly impactful creating incentives to retain skilled talent and building creating value locally.

Panelists clearly expressed the extensive thought and dedication regions must commit to the community-building required to attract, develop and retain talent, keenly aware of the potential for talent to transform the region over time. Focused efforts to make a region a magnet for talent drives growth across the economy as local institutions generate more value and increase productivity, which engenders a stronger draw for talent, organizations and industries to move to the region.

5 Washington University in St. Louis Institute of Clinical and Translational Sciences.

FINDINGS FROM THE EIFI MIDWESTERN REGIONAL DIALOGUE

The Path Forward

The Midwestern Regional Dialogue represented the concluding dialogue in this series of the Exploring Innovation Frontiers Initiative. In the coming months, the Council on Competitiveness will summarize findings from the past dialogues:

- Setting the stage at the launch dialogue in Atlanta, Ga;
- Exploring the impact of gender, ethnic, racial, socioeconomic and geographic diversity in Riverside, CA;
- Examining the trajectories of current technology underpinning the future economy in Houston, TX; and
- Analyzing the components underpinning entrepreneurial growth within an economic region.

About the Council on Competitiveness

Who We Are

The Council on Competitiveness is a nonpartisan leadership group of CEOs, university presidents, labor leaders and national lab directors working to ensure U.S. prosperity. Together, we advance a pro-growth policy agenda and promote public-private partnerships in the emerging "innovation ecosystem" where new technologies are born.

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How We Operate

The Council Operates by:

- Identifying emerging competitive challenges.
- Generating new policy areas to shape the competitiveness debate.
- Forging public-private partnerships to drive consensus.
- Galvanizing stakeholders to translate policy into action and change.

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