

Annual report

2014

U+ LABS

UI LABS is a Chicago-based applied research and commercialization collaborative bringing universities, industry, and government together to define problems, design partnerships, and deliver scalable solutions to tomorrow's most important challenges.

The creation of UI LABS was driven by an understanding of the need to bring together Universities + Industries to research, develop, and apply solutions to critical economic, industrial, and technological challenges, and to attract and retain the best and brightest, enhancing Chicago and the Midwest as a destination for talent and technology.

www.uilabs.org



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Letter from the Chairman of the Board



We are living in an era of unprecedented change, where technological advancements are empowering researchers and entrepreneurs to make breakthrough innovations that span industries and geographies. Despite the impressive progress, certain challenges are simply too big for even the most successful, talented organizations to address on their own. Only by convening the best minds to share knowledge and apply research will we be able to make real progress on such challenges. Collaboration—not on a one-to-one basis but among many organizations—is the critical element in this effort.

UI LABS was established with this truth firmly in mind. By empowering universities, industry, and civic organizations to pursue innovation and applied research in a nurturing environment, UI LABS presents an opportunity to achieve ambitious goals.

Although exploration and discovery are essential elements in UI LABS' philosophy, these ideals are grounded by an industry-led Board of Directors that is firmly focused on results and return on investment. I thank all the members of our Board for their energy and continuing commitment to our success. The most impressive innovations aren't worth much unless they can be brought to market. I strongly believe that by bridging the gap between research and commercialization, UI LABS is positioned to produce impressive innovations in the coming years.

First and foremost, I want to acknowledge the critical support of our founding partners: University of Illinois and its faculty for first recognizing the enormous potential of this endeavor; Argonne National Laboratory, Northwestern University, University of Chicago, and Illinois Institute of Technology for their early contributions; Illinois Science & Technology Coalition and SCRA for their expertise in the innovation space; Accenture and McKinsey & Company for their analysis and counsel; the City of Chicago, State of Illinois, and our elected officials for their unflagging dedication and ability to marshal resources to propel our organization forward; and World Business Chicago, whose board members ensured that industry leaders will continue to play a role in UI LABS' mission.

We are in the midst of an exciting moment: UI LABS and the Digital Manufacturing and Design Innovation Institute (DMDII) have helped to reestablish Chicago as a hub of innovation in the United States. By focusing energy and resources on high-value areas, UI LABS is poised to make a significant contribution to economic development across the region and nation. This increased activity will help to attract the financing and top talent needed to capitalize on the advanced research produced through our partners and programs.

I am confident that UI LABS will be at the forefront of charting the course of innovation in ways that will help shape the world for the better.

Sincerely,

Warren E. Holtsberg

A handwritten signature in cursive script that reads "We Holtsberg".

Letter from the Executive Director



In 2011, a handful of leaders first outlined the concept for UI LABS. They envisioned an independent organization that would serve as a convener and offer a platform for transformational change. The ensuing years have been a flurry of activity. In a very short time frame, we had to define what this organization would be and put the structure and talent in place to pursue our vision. The federal government's announcement of an initiative focused on manufacturing innovation only added to the pace and complexity. When President Obama awarded the Digital Manufacturing and Design Innovation Institute (DMDII) to Chicago in February 2014, we redoubled our efforts.

I would like to acknowledge the many partners that are active participants in DMDII, our first program. In all, more than 500 organizations—40 major corporations, 30 educational institutions and government entities, and hundreds of small and midsize enterprises—are collaborating through DMDII's programs. I am also pleased to mark the launch and rollout of CityWorks, our second program. It brings together a number of leading corporations and universities with the goal of driving innovation in urban infrastructure. As these programs take shape, I look forward to sharing more details.

As I look back, I am humbled by the energy, passion, and dedication of our extended network of stakeholders. The University of Illinois helped conceive of an organization to propel their future and impact on the region, importantly recognizing the powerful nature and need for collaboration among many to turn big ideas into big solutions. A small group of entrepreneurs and business leaders first suggested the name UI LABS to acknowledge the University of Illinois, and the name very quickly evolved to stand for precisely what we are doing—bringing Universities + Industries together.

One of our top priorities in establishing UI LABS was to build a results-focused organization with the knowledge and capabilities to bring innovative applied research to market. We have assembled a passionate, talented team and implemented operational discipline that will enable UI LABS to nurture and expand programs. I am truly grateful for the incredible team that drives UI LABS day to day, without whom we would not be able to keep up with the pace that our mission demands. Their commitment to professionalism and excellence helps us deliver value, a critical element in attracting the best partners to our consortia.

Our work to date has laid a solid and sustainable foundation that will deliver real results. On behalf of my UI LABS colleagues and all of our partners, I am very excited to share our vision and plans in this report.

Sincerely,

Caralynn Nowinski

A handwritten signature in black ink, which appears to read "Caralynn Nowinski". The signature is fluid and cursive, written in a professional style.

Creating the optimal conditions for innovation

Innovation: A new idea, method, or device that represents a significant leap forward

The defining characteristic of the 21st-century economy is change. Existing industries are being reshaped and new ones are being created at an accelerated pace, driven in part by technology advancements that are empowering organizations and individuals as never before. In this dynamic environment, innovation is the lifeblood of a healthy, growing, and sustainable economy and a vital component in taking on the global challenges that we face.

An organization that could harness technology, energy, and resources for this critical phase could have an outsized impact on innovation. UI LABS was established to bring together top talent from universities, industry, and civic organizations to pursue innovation. By creating a platform that promotes collaboration, UI LABS offers its partners an ideal environment to focus on developing, demonstrating, deploying, and commercializing innovations that address the world's most pressing problems.

Several developments in 2011 and early 2012 set the stage for the creation of UI LABS. In Chicago, Mayor Rahm Emanuel recognized that attracting and retaining top technology talent was critical to ensure a globally competitive economy and workforce. At the state level, Illinois Governor Pat Quinn saw an opportunity to connect companies and universities, creating the Illinois Innovation Council. And University of Illinois Board of Trustees Chairman Chris Kennedy touted research universities as the nation's renewable source of economic development. Further, global thought leaders¹ highlighted the critical importance of universities in providing the technology, talent, and innovation necessary to drive sustainable economic development. Collectively, these insights were fundamental to the genesis of UI LABS.

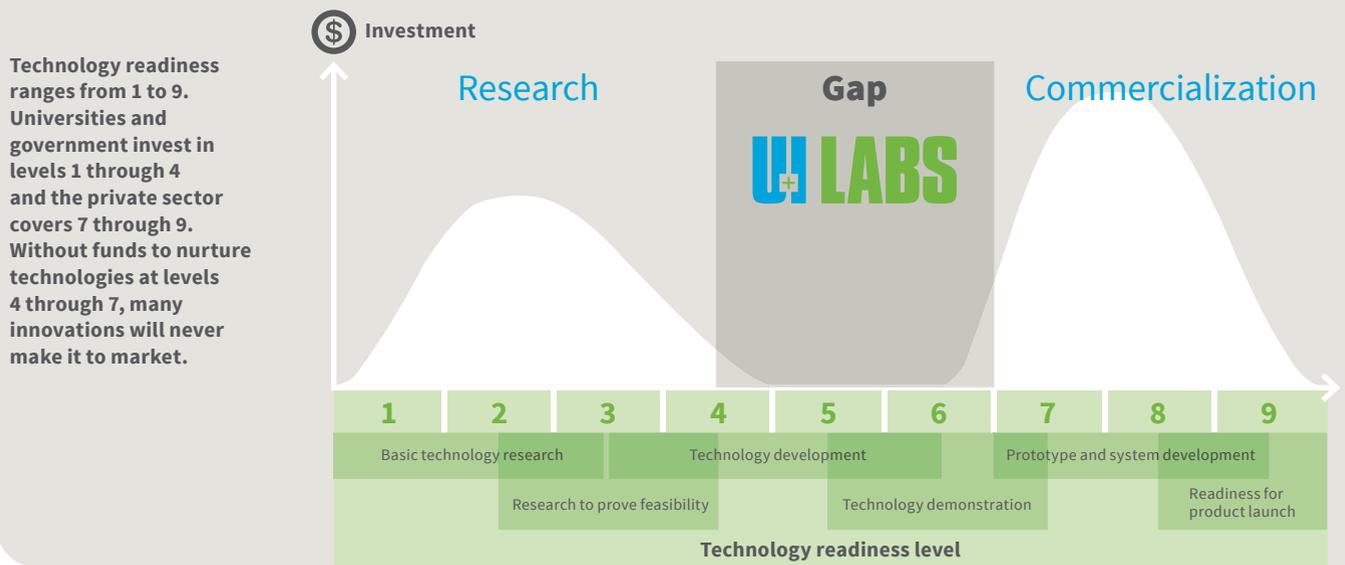
¹ *A Master Plan for Higher Education in the Midwest*, Chicago Council on Global Affairs; *Research Universities and the Future of America*, National Research Council; *Plan for Economic Growth and Jobs*, World Business Chicago; and *Territorial Review for the Chicago Tri-State Metro Region*, Organisation for Economic Co-operation and Development.

Some problems are too big for any one entity to solve. But no problem is too big when you bring together the most innovative, forward-thinking universities, industry partners, researchers, and government.



BRIDGING THE INNOVATION GAP

Innovation doesn't happen in a straight line. Instead, it's a process of sustained incremental progress that can suddenly give way to transformational breakthroughs—when the right pieces fall into place. Even the most promising ideas can fail to reach their potential without the support to bridge the gap between research and commercialization.



THE EVOLUTION OF UI LABS

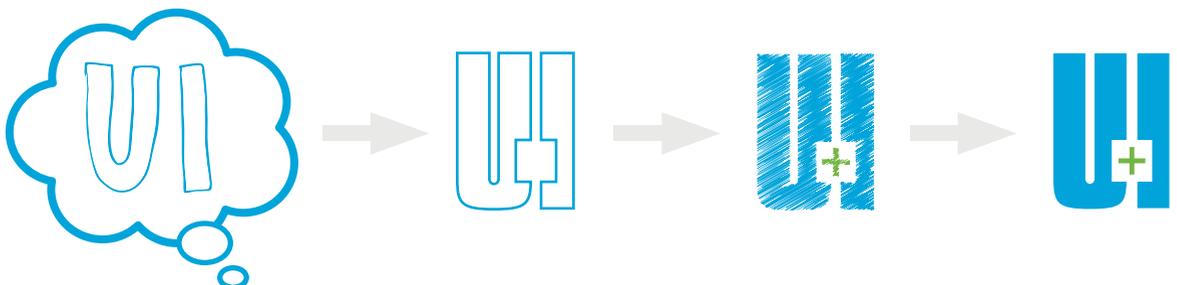
Innovation is in our DNA: The evolution of UI LABS mirrors the stages that a promising idea must follow to get to commercialization: ideation/discovery, proof of concept, go to market, and expansion. Our journey demonstrates what can be achieved by thinking differently, embracing an ambitious vision, taking bold action, and bringing a unique perspective to identifying promising opportunities.

Discovery/ideation
2011–mid 2012

Proof of concept
Mid 2012–2013

Go to market
2014

Expansion
2015 and beyond



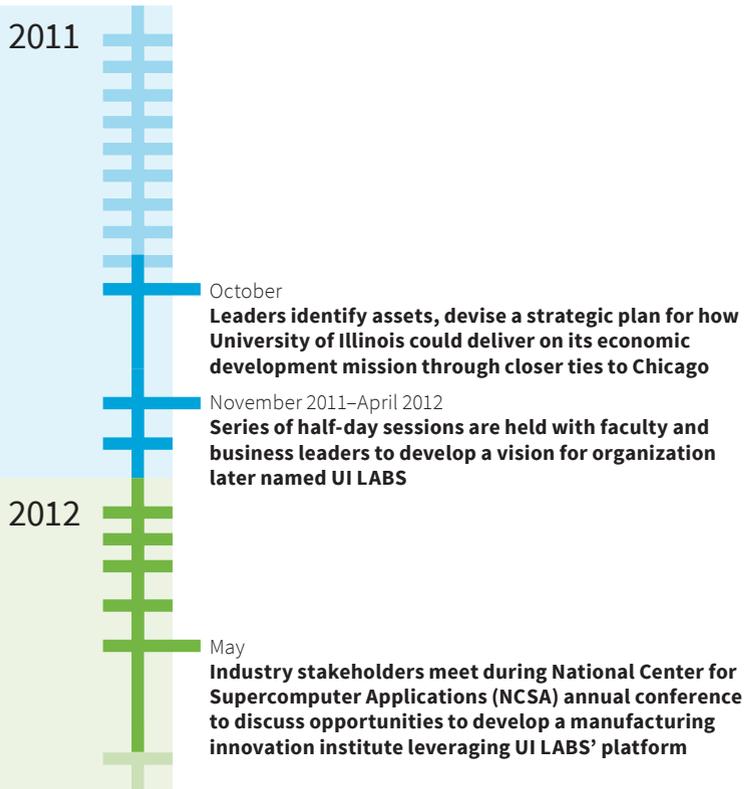


Ideation/discovery

2011–mid 2012

Evaluating an industry or ecosystem to identify high-potential opportunities

Key milestones



The inspiration for UI LABS was born in response to a vexing problem. University of Illinois at Urbana–Champaign (UIUC) is among the top global universities by the caliber and number of engineering and computer science graduates it produces each year. Despite its success in attracting and nurturing talent, the school has seen a large portion of these students leave the state after graduation due at least in part to a lack of a robust technology ecosystem. U of I graduates went on to create some of the world’s top companies such as Netscape, Paypal, and YouTube, among others, but they did so on the West Coast. University of Illinois recognized it could play a role in promoting economic development to retain these individuals in Illinois—and that taking on this challenge required industry and civic partners, as well as other academic anchors and the broader ecosystem.

UI LABS was created at the intersection of university, government, and industry, with an eye toward connecting world-class research institutions with the industry partners that Chicago as a global city could draw on. Chicago was already pursuing a strategic vision to build an ecosystem that could capitalize on its strengths—healthcare, transportation, manufacturing, and food and agriculture—and retain talent. University of Illinois worked closely with leaders from the City of Chicago, State of Illinois, and World Business Chicago to shape the organization’s mission.

UI LABS takes the spark of an idea and turns it into an execution-focused program that can achieve real commercial results.

The special relationship between cities and universities offered the University of Illinois across its three campuses—Urbana-Champaign, Chicago, and Springfield—the opportunity to work with other universities and research labs, including Argonne National Laboratory, Illinois Institute of Technology, Northwestern University, and University of Chicago, to implement an innovation-based plan for economic development.

This group posited that only an independent third party could convene entities and organizations that were working individually on research, technology, and commercialization to achieve the kind of transformational innovation that could address grand challenges. Drawing on the knowledge of universities, industry, and civic organizations, UI LABS would have a unique vantage point to identify promising opportunities and create an unprecedented platform for innovation and collaboration in Illinois.

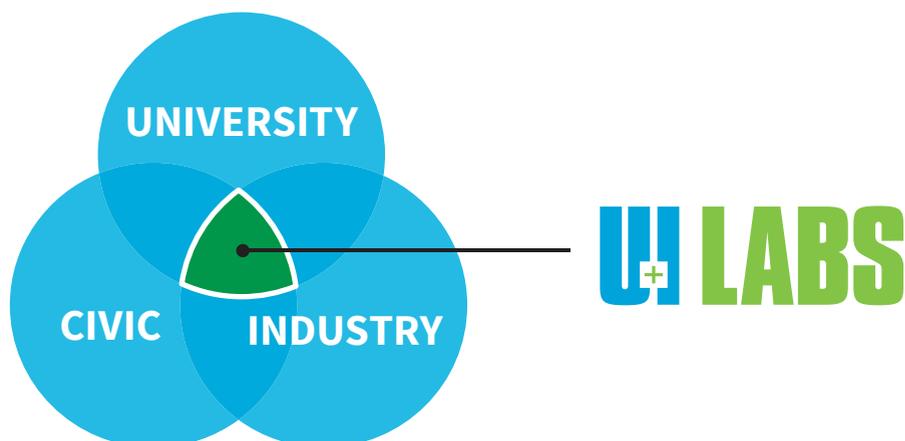


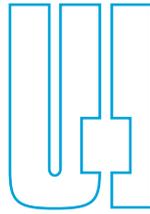
HOW UI LABS HARNESSES INNOVATION

- 1 Tackling** the most critical challenges at the intersection of big data, Internet of Things, and computing
- 2 Fostering** collaboration among universities, industry, and civic organizations to produce the best answers quickly and efficiently
- 3 Shepherding** commercialization and new business creation to bring solutions to market effectively and drive timely return on investment

UI LABS SERVES AS A CONVENER OF THE PUBLIC AND PRIVATE SECTORS

Universities, industry, and civic organizations all have a vested interest in pursuing innovation. UI LABS' platform for collaboration enables the translation of innovation into economic results.





Proof of concept

Mid 2012–2013

Applying strategies and frameworks to test their effectiveness in achieving defined goals

Key milestones

2012

- August
President Obama announces Additive Manufacturing Institute; an Illinois-led consortium submits an unsuccessful bid for the project
- October
University of Illinois translates its efforts on the proposal to create the Illinois Manufacturing Lab World Business Chicago convenes Northwestern University, University of Illinois, and University of Chicago to develop a platform to compete for future manufacturing innovation institutes

2013

- January
Vice President for Research Larry Schook announces UI LABS at the University of Illinois Board of Trustees meeting
- March
UI LABS is established as an independent nonprofit institution
- May
President Obama announces plans to launch three new NNMI institutes
- July
UI LABS hosts Industry Day to build a consortium to establish a Digital Manufacturing and Design Innovation Institute
- August
UI LABS is one of five national teams selected to submit a full proposal to the U.S. Department of Defense for DMDII
- October
UI LABS submits full proposal for DMDII; begins to curate second program on smart and sustainable urban infrastructure
- December
Illinois Manufacturing Lab is launched as a collaboration between UI LABS and University of Illinois with support from the state and Illinois DCEO

Promoting innovation is a combination of art and science, a process of moving to where the market is while remaining committed to a defined vision. The process of adapting to emerging opportunities helped UI LABS to refine the role it could play in driving innovation and convening stakeholders. The organization's leaders identified five guiding principles:

- Serve as a curator of complex R&D and training partnerships
- Design and manage flexible engagement models
- Lower the barriers of collaboration
- Develop a network and infrastructure that can be replicated and scaled
- Minimize operating constraints and optimize efficiencies

In evaluating opportunities to drive innovation and economic development, UI LABS' partners identified the potential to transform manufacturing in the United States—in particular, advanced manufacturing, an industry that World Business Chicago highlighted in its *Plan for Economic Growth and Jobs* as holding tremendous potential given the robust manufacturing base in the Chicago region. What UI LABS needed was the right opportunity to prove its novel approach to innovation could deliver results.

The combination of a well-defined vision and preparation enabled UI LABS to identify an opportunity that could be a catalyst for transformational change.

When President Obama announced his intent to establish the National Network of Manufacturing Innovation in 2012, it provided the right opportunity and reinforced UI LABS' initial focus on advanced manufacturing. An Illinois-led consortium responded with a proposal for an additive manufacturing institute. Although the project was awarded to National Center for Defense Manufacturing and Machining (NCDMM), the process served as a catalyst to accelerate the evolution of UI LABS and the creation of the Illinois Manufacturing Lab (IML), led by UI LABS and the University of Illinois with support from Illinois Department of Commerce and Economic Opportunity (DCEO) and Illinois Science & Technology Coalition. The IML was created to increase the competitiveness, productivity, and profitability of Illinois manufacturers.

In March 2013, President Obama announced the formation of three new manufacturing institutes and solicited bids. UI LABS envisioned a Digital Manufacturing and Design Innovation Institute (DMDII) that would harness the power of technology and data to revolutionize manufacturing.

To develop its proposal, UI LABS, with critical support from the University of Illinois, City of Chicago, State of Illinois, World Business Chicago, Illinois Science & Technology Coalition, SCRA, and Northwestern University, built a consortium of companies, universities, government, and community organizations. This outreach helped to establish a partnership model for stakeholder engagement. The concentration of business leaders ensured that UI LABS' programs would be founded on delivering results and return on investment to its partners. As it developed a proposal for the digital manufacturing and design institute, UI LABS continued to explore other programs and curate additional partnerships.



Launch of Illinois Manufacturing Lab, December 2013; UI LABS Chairman Warren Holtsberg (far left) and Governor Pat Quinn (center, with hat) accompanied by Gold Eagle leadership team.



Senator Dick Durbin, Congresswoman Cheri Bustos, and Larry Schook at Bradley University in Peoria to discuss impact of manufacturing on Illinois.



Go to market

2014

Translating ideas and technologies into goods, services, or production methods to create value

Key milestones

2014	February	UI LABS is awarded DMDII cooperative agreement with Department of Defense at White House ceremony
	March	UI LABS holds workshop to explore smart and sustainable urban infrastructure
	April	UI LABS hires first employees, hosts first DMDII partner meeting
	June	Lease is signed for Goose Island facility; DMDII completes technology roadmap
	July	UI LABS issues first project call for R&D to transition technology originally developed by the Defense Advanced Research Projects Agency (DARPA) as part of its Adaptive Vehicle Make (AVM) program—additional \$10 million in funding
	August	UI LABS hosts first CityWorks partner meeting
	September	DMDII issues second project call
	October	UI LABS breaks ground on facility; DMDII holds first provisional executive board meeting
	December	DMDII finalizes first strategic investment plan; UI LABS releases CityWorks industry membership agreement

In February 2014, UI LABS entered into a cooperative agreement with the Department of Defense for DMDII, setting off a frenzy of activity to bring the winning proposal from vision to reality. UI LABS began work in earnest to expand the organization and continue to put its operational structure in place. In the ensuing months, it convened the full board of directors for the first time, hired 27 people, and broke ground on a permanent facility.

The impact of the award reached far beyond the organization. Chicago's higher profile as a hub of innovation in digital manufacturing and design attracted the interest of entrepreneurs, small and midsize businesses, and educational institutions from across the country. Moreover, UI LABS was recognized as a trusted partner and expert in bringing together leaders from industry and universities to pursue innovation and its commercial application.

This momentum also fueled the development of UI LABS' second program, CityWorks, which focuses on applying technology to create smart and sustainable urban infrastructure. Discussions with industry leaders to crystallize the program's scope and vision kicked off with an exploratory workshop in March. The initial partner meeting was held in August 2014.

UI LABS develops programs that deliver a return on investment for our partner network.



DMDII

DIGITAL MANUFACTURING AND
DESIGN INNOVATION INSTITUTE

Development and launch of DMDII

U.S. manufacturing faces a range of formidable challenges. Globalization and the entry of low-cost manufacturers from emerging markets have altered the business landscape for U.S. manufacturers. At the same time, increasing customer expectations have put a premium on quality, speed, and customization. To survive, manufacturers must have access to tools and solutions to manage this additional complexity. Technology, computing, and the Internet of Things will be crucial to achieving higher performance, greater efficiency, and the agility needed to respond to market shifts.

DMDII was created to shape the future of manufacturing by incorporating digital technology into every facet of design and production. By bringing together an unprecedented breadth of stakeholders, DMDII serves as a platform for cross-functional teams—entrepreneurs, academics, small and midsize enterprises, large corporations, and government agencies—to collaborate on research and innovation. The program, which is a cooperative agreement between UI LABS and the U.S. Department of Defense, combines \$70 million in federal funds with a \$250 million commitment from industry, university, and civic partners.

Over the next five years of the agreement, DMDII will convene partners on a biannual basis to determine where technology is headed, existing gaps in manufacturing capabilities, and steps to addressing them. Discussions will focus on three areas that hold tremendous potential for manufacturing:

1. Advanced manufacturing enterprise

Harnessing the data and information systems that support the life cycle of manufacturing products across the value chain

2. Intelligent machining

Applying technology such as computing, sensors, and data analytics to make production equipment smarter, essentially enabling machines to learn

3. Advanced analysis

Extending computing and technology capabilities to small and midsize enterprises to streamline manufacturing processes, increase agility, and reduce the time it takes to bring products to market



Preliminary artist rendering of the new facility on Goose Island

During 2014, DMDII's team, led by Executive Director Dean Bartles and Chief Technology Officer Bill King, worked with manufacturing leaders to develop a detailed five-year technology roadmap to prioritize research areas and guide how funds would be invested. This process highlighted the biggest value opportunities as well as the obstacles that researchers will need to be overcome. As a result, every single investment is connected to a defined business need.

To drive the formation of diverse teams, DMDII issues project calls for specific research areas, and partners have the opportunity to submit proposals for research. The process provides a natural incentive for universities and industry to collaborate and ensures that the best ideas receive funding. In early 2015, DMDII will roll out its first wave of projects, and these initial offerings will be joined by additional projects that will bring the total to approximately 50 applied research and demonstration projects by year end.



In February 2014, President Obama announced that the Department of Defense awarded DMDII to UI LABS.

"Our first priority is making America a magnet for new jobs and manufacturing."

—President Obama

Benefits

In DMDII, UI LABS and the Department of Defense have created the optimal platform for collaboration that gives partners access to research and technology as well as the tools to apply it in the manufacturing environment. Any intellectual property developed at DMDII will be owned by the project team that invents it. GE has donated a secure portal called the Digital Manufacturing Commons and has made it available to DMDII to support collaboration. This tool will enable members to share digital models and explore ways to improve design, drive innovation, and make the manufacturing process easier.

Key partner benefits include:

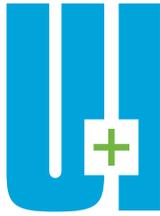
- 1 Greater awareness of current research projects and technology applications
- 2 Knowledge transfer among partners to extend the impact of the latest innovation
- 3 Opportunities for large companies, small and midsize enterprises, and startups to commercialize technologies developed at DMDII

While DMDII's initial funding commitments extend through 2019, UI LABS has laid the foundation for an ongoing, results-driven program that will continue to attract industry and university partners. We anticipate demonstrating enough value to support ongoing research without the aid of the government dollars.



On October 30, 2014, UI LABS was joined by elected officials, partner companies, and an eager public to officially break ground on the new UI LABS and DMDII headquarters. Left to right: Rep. Robin Kelly, Alderman Walter Burnett, Rep. Bill Foster, Rep. Mike Quigley, Sen. Dick Durbin, Gov. Pat Quinn, Mayor Rahm Emanuel, UI LABS Executive Director Caralynn Nowinski.

UI LABS' collective efforts have positioned DMDII to drive advancements in digital manufacturing in a way that no one has done before.



Expansion

2015 and beyond

Scaling existing promising efforts to increase their impact while extending field-tested approaches to new initiatives

UI LABS has laid the groundwork to build an organization and establish programs that will produce sustained innovation in manufacturing and urban infrastructure. In early 2015, we will celebrate several important milestones: the two-year anniversary of our incorporation in March, the grand opening of our new campus in May, and announcements for DMDII project awards and the first wave of CityWorks projects.

UI LABS remains committed to pursuing efforts that accelerate innovation and harness technology. These efforts will enhance Illinois and Chicago’s competitiveness as a global tech hub and destination for talent. DMDII and CityWorks are emblematic of these initiatives, and we have been encouraged by

the robust network of universities, industry, and civic organizations that have lined up to participate.

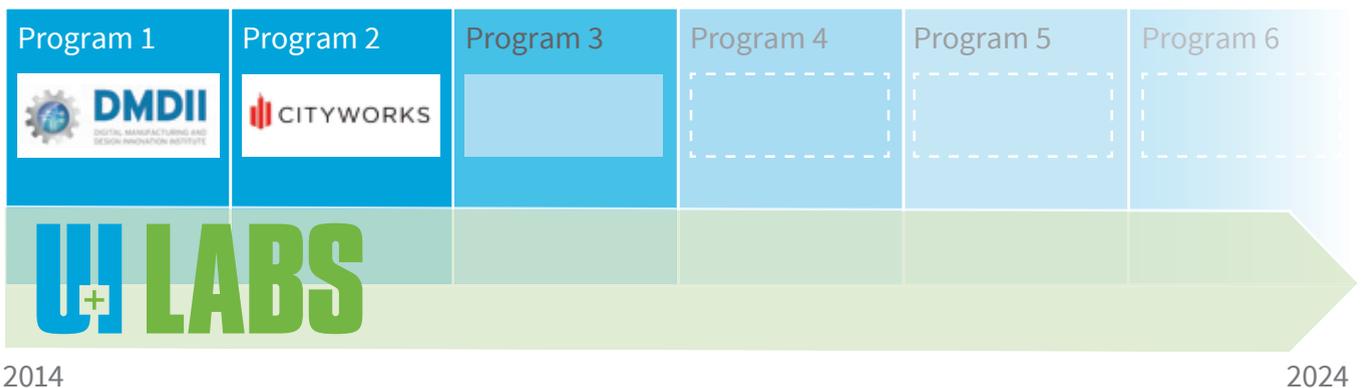
We have much more work to do. In addition to bringing these programs from initial concept to market, UI LABS has focused on curating groups of stakeholders to address other challenges—such as food and water security, stewardship of natural resources, healthcare, and transportation—that are affecting countries around the world.

UI LABS will continue to convene the best minds and develop programs to solve the grand challenges the world faces. We look forward to sharing regular updates on our progress.

LAYING THE FOUNDATION FOR SUSTAINED INNOVATION

Existing programs

Future programs





CITYWORKS

According to the World Health Organization, 54 percent of the world's population lives in urban areas, a figure forecast to grow to 66 percent by 2050. This continued migration to cities will place increasing pressure on the urban infrastructure that forms the backbone of our cities, economy, and society. The need is greater than ever for creative new approaches to how cities manage their resources to accommodate residents.

To address this challenge, UI LABS launched CityWorks, which seeks to combine innovations in infrastructure design, materials, and management with advances in computing, sensing, and data analysis. This program will enable experiments at scale to develop real solutions for the marketplace that can be extended to other cities around the world. CityWorks has attracted leading industry partners to collaborate with Illinois' top research institutions on four key areas:



Energy management. Partners will explore the use of sensing technologies, data collection, and advanced diagnostics to optimize energy use, efficiency, availability, and reliability within large buildings and across entire neighborhoods. Solutions will include building management systems, smart meters, micro grids, and intelligent loads as well as the implications of electric vehicles and variable energy sources.



Physical infrastructure. Research and demonstration projects will be conducted on dynamic mobile sensing technologies and advanced data analytics to improve public safety and emergency management communications, monitor infrastructure, and optimize the operation and maintenance of these assets.



Transportation. The development and application of advanced technologies, data collection, and design will be explored to enable cities to monitor and manage congestion more effectively, optimize distribution systems and networks, enhance transportation safety, improve user experience, and expedite intermodal transport.



Water and sanitation. Through data collection and predictive analytics, CityWorks will pursue solutions to manage storm water efficiently and increase flood resilience. These efforts will also inform policies related to water quality and management, pricing for flood-related insurance, and the development of green and grey infrastructure technologies and policies.

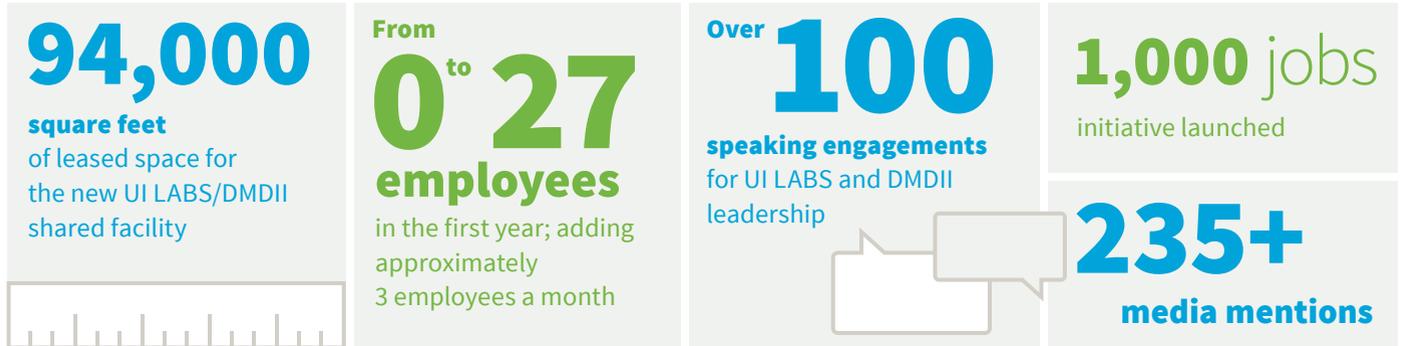
Through CityWorks, UI LABS will use Chicago as a test bed for urban innovation. Promising solutions will be exported to U.S. and global cities. The goal is to commercialize and scale the projects, showcasing Chicago as the model global city for pilot deployment of new technologies.

By the numbers

2014

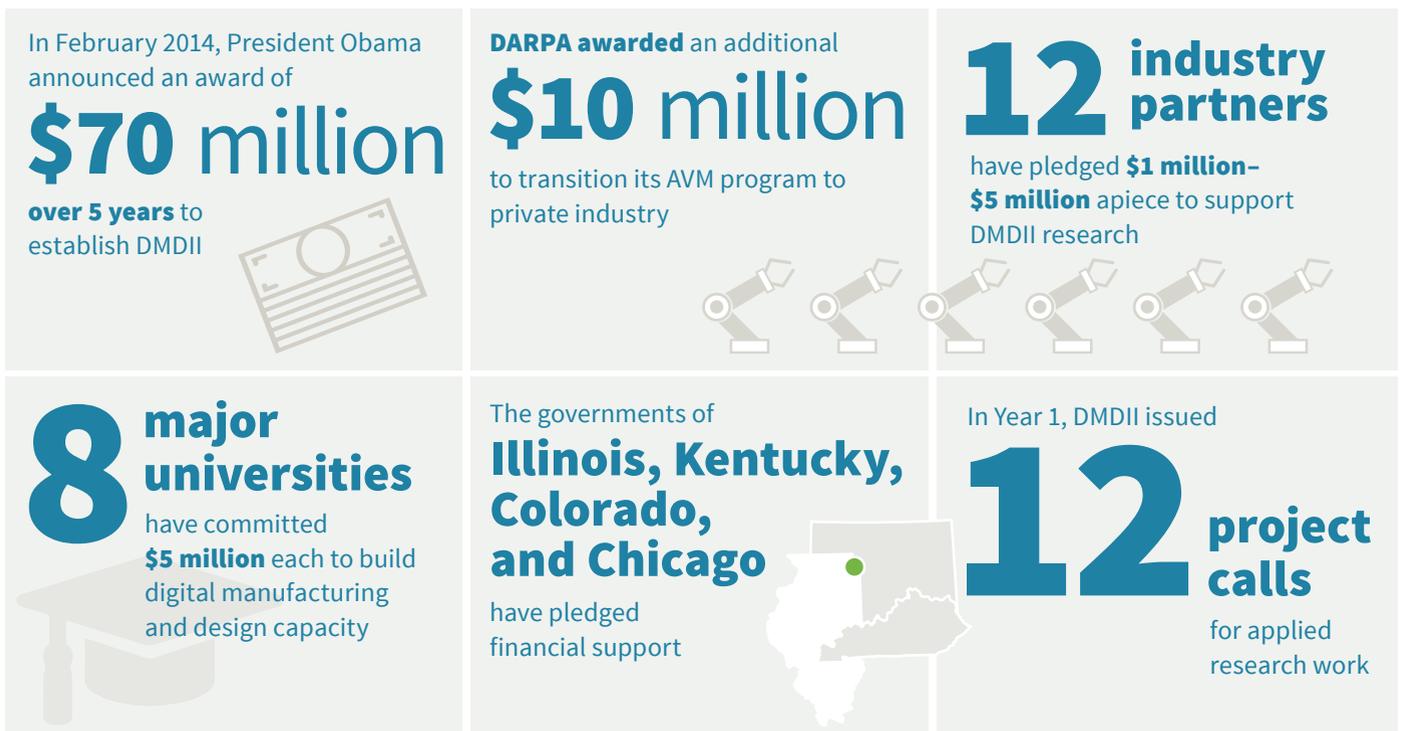
UI LABS

The statistics below reflect how UI LABS has laid the foundation for future growth and promoted its priorities for innovation and applied research.



DMDII

In 2014, DMDII secured the funding and forged a robust network of partners to pursue innovation and breakthroughs in manufacturing.



THANK YOU

A special thank you to our university, industry, and civic partners for their confidence in and support for UI LABS. Thanks also to our team, whose tireless work and dedication are helping to bring our ambitious vision to life.

LEADERSHIP

Caralynn V. Nowinski, MD
Executive Director
and Chief Operating Officer,
UI LABS

Dean L. Bartles, PhD
Executive Director,
DMDII

William P. King, PhD
Chief Technology Officer,
DMDII

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