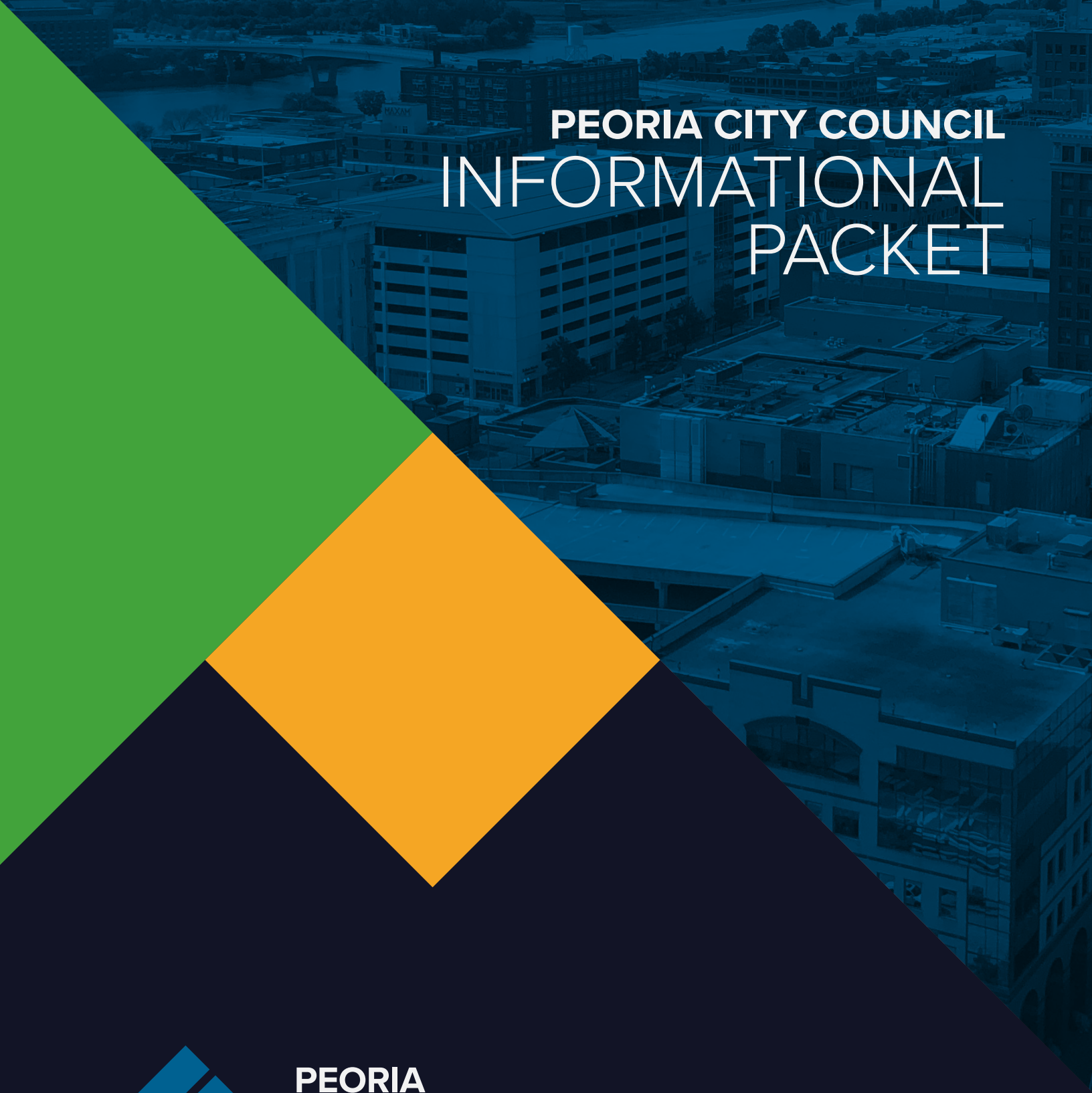

PEORIA CITY COUNCIL
INFORMATIONAL PACKET

PEORIA
INNOVATION
DISTRICT

peoriainnovationdistrict.com

PEORIA
INNOVATION
DISTRICT

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PEORIA
INNOVATION
DISTRICT

OVERVIEW

What is an Innovation District?

An innovation district is defined as a place-based urban development strategy that aims to regenerate an under-performing downtown neighborhood into a desirable location for innovative and creative companies and workers.

Furthermore, innovation districts facilitate the creation and commercialization of new ideas and support metropolitan economies by growing jobs in ways that leverage their distinct economic attributes. These districts build on and revalue the intrinsic qualities of cities: proximity, density, authenticity, and vibrant places. Given the proximity of many districts to low-income neighborhoods and the large number of sub-baccalaureate jobs many provide, their intentional development can be a tool to help connect disadvantaged populations to employment and educational opportunities.[1]

[1] https://www.brookings.edu/innovation-districts/

Who benefits from the Innovation District?

Property owners, companies, entrepreneurs, universities, disadvantaged populations, and regional citizens will see benefit from the designation of an innovation district. By offering the prospect of expanding employment and educational opportunities within a defined area, the subsequent creation and expansion of firms and jobs will co-invent and co-produce new discoveries and benefits for the entire regional economy.

Where is the Innovation District located?

Main Street (Northeast)
Water Street (Southeast)
Harrison Street (Southwest)
Jefferson Street (Northwest)

"The new innovation districts will be more like the market districts of a hundred years ago than the financial districts of fifty years ago."

- Nate Storring, Project for Public Spaces

Who it leading this effort?

The designation of Peoria's Innovation District is being led by the Peoria Innovation Alliance with support from the City of Peoria, Peoria Downtown Advisory Commission, Greater Peoria Economic Development Council, Tri-County Regional Planning Commission, OSF Healthcare, First-Mid Bank & Trust, Wells Fargo, Verizon, and the Peoria Riverfront Museum.

About the Peoria Innovation Alliance

The Peoria Innovation Alliance is a 501c3 tax-exempt organization dedicated to fostering a collaborative movement to reposition the Greater Peoria region and change its narrative to one of inclusion, optimism, and progress through the support and celebration of innovation, entrepreneurship, and startup activity.

First Mid
BANK & TRUST

September 27, 2019

Jake Hamann
Peoria Innovation Alliance

Re: Downtown Peoria Innovation District

Dear Mr. Hamann:

First Mid Bank & Trust First Mid is excited to partner with the Peoria Innovation Alliance and proud to offer support and collaboration for the proposed Innovation District in Downtown Peoria. It is our position that this is yet another step in helping businesses grow and prosper in our community.

First Mid is committed to supporting innovation, entrepreneurship, and startup activity throughout the Peoria community.

Sincerely,

Jeremy Howard, SVP
Community Bank President

230 SW Adams St, Suite 100 • Peoria, Illinois 61602
(P) 309-999-8721 • (F) 309-637-1889 • (W) www.firstmid.com

GREATER PEORIA
Economic Development Council

July 24, 2019

Jake Hamman
Peoria Innovation Alliance
820 SW Adams, Suite C
Peoria, IL 61602

Dear Jake,

Greater Peoria Economic Development Council (GPEDC) is proud to offer support and collaboration for the proposed Innovation District. As you know, GPEDC has been immensely involved with innovation and entrepreneurship in the region. This work includes a close partnership with OSF Healthcare and Illinois College to develop the Peoria Innovation Hub that will be located in the center of the proposed District. We think this facility, and more importantly its services and community, will become the nerve center for innovation activity in the region.

GPEDC takes seriously its charge to help improve and shape the regional economy. While traditional activities like business attraction, workforce development and assistance to existing businesses are vitally important, we recognize the long term value of investing in a robust innovation ecosystem. We are happy to help drive the programming and results of the Innovation District.

Please keep us in the loop on any developments in this regard. Never hesitate to call should you need anything.

Sincerely,

Christopher Setti
Chief Executive Officer

401 NE Jefferson Ave. | Peoria, IL 61603
(309) 495-5910
www.greaterpeoriaedc.org

OSF HEALTHCARE

September 25, 2019

Jake Hamann
Peoria Innovation Alliance

Re: Downtown Peoria Innovation District

Dear Mr. Hamann:

OSF HealthCare is proud to support the proposed Downtown Peoria Innovation District. Downtown is the heart of the entire region and its success is a barometer for the prosperity of Greater Peoria.

OSF HealthCare is investing significant resources in the core of the proposed Innovation District. The OSF Ministry Headquarters, Peoria Innovation Hub, and OSF digital health facility are all located within the Innovation District.

We look forward to a close partnership and collaboration with the Peoria Innovation Alliance as we proceed with the collective work to transform the economy of Greater Peoria.

Sincerely,

Ryan Spain
Vice President of Economic Development

30 Sept. 2019

To: The Honorable James Ardis, Mayor; and Peoria City Council members

Re: Downtown Advisory Commission support for the proposed Innovation District

Dear Mayor Ardis and Council Members:

This memo is written to officially express the support of the City of Peoria's Downtown Advisory Commission for the proposed **Downtown Peoria Innovation District.**

At the 12 Sept. 2019 regular meeting of the Downtown Advisory Commission (DAC), Jake Hamann, Executive Director of the Peoria Innovation Alliance/PIA, presented and overview of the efforts of the PIA, and the concept for the Downtown Innovation District.

After hearing the presentation, and a Q/A session, a motion was made to support the establishment of the proposed Downtown Innovation District as recommended by the PIA. This motion was unanimously approved by the DAC.

The DAC recognizes that the efforts of the PIA to connect, develop and foster a more vibrant ecosystem in Peoria for innovators, entrepreneurs, and business start-ups is critical for our downtown's and our entire city's success.

We strongly encourage the support of the entire city is these efforts.

Thank you.

Mark Misselhorn, Chair

Downtown Advisory Commission

TRI-COUNTY REGIONAL PLANNING COMMISSION

EST. 1958

July 25, 2019

Jake Hamann
Peoria Innovation Alliance

Re: Downtown Peoria Innovation District

Dear Mr. Hamann:

Tri-County Regional Planning Commission (TCRPC) is proud to offer support and collaboration for the proposed Innovation District in Peoria's Downtown. As you know, TCRPC proudly serves Peoria, Tazewell, and Woodford Counties as the "Steward of the Regional Vision." We believe that the vision, mission and tangible projects put forth by the Peoria Innovation Alliance (PIA) for not only the Innovation District but the entire region are critical to the future success of our community.

We look forward to a close partnership and collaboration with PIA as both the Innovation District and Smart City projects come into fruition; especially those initiatives related to smart transit, autonomous mobility and other transportation related activities.

Sincerely,

Eric W. Miller

Eric Miller
Executive Director
Tri-County Regional Planning Commission

456 FULTON STREET #401 ▪ PEORIA, IL 61602 ▪ TEL 309-673-9330 ▪ FAX 309-673-9802 ▪ TRICOUNTYRPC.ORG

WELLS FARGO

Commercial Banking Office
One Technology Plaza
211 Fulton Street
Suite 705
Peoria, IL 61602

September 27, 2019

Jake Hamann
Peoria Innovation Alliance
820 SW Adam, Suite C
Peoria, IL 61602

Dear Mr. Hamann:

As part of Wells Fargo Commercial Banking and LISC Peoria, I'm proud to offer support and collaboration for the proposed Innovation District in Peoria's Downtown. I strongly believe that the mission of Peoria Innovation Alliance to support and celebrate innovation, entrepreneurship and startup activity throughout our region is critical to our community's success.

I look forward to seeing the Innovation District and Smart City projects take shape in the coming months. Placemaking efforts along with creating an innovation ecosystem will allow Peoria to continue to better capitalize on some of the amazing resources we have available in our community. I look forward to continuing my involvement in making Peoria a great place to work and live.

Sincerely,

Jason Clay
Wells Fargo
Vice President/ Commercial Banking

PEORIA
INNOVATION
ALLIANCE

VISION:

The Peoria Innovation Alliance is a 501c3 tax-exempt organization dedicated to fostering a collaborative movement to reposition the Greater Peoria region and change its narrative to one of inclusion, optimism, and progress through the support and celebration of innovation, entrepreneurship, and startup activity.

MISSION:

The mission of the Peoria Innovation Alliance is to share our region's innovation history, promote our progress and vision for the future, and enable and empower the next round of innovators, entrepreneurs, and startups that call Greater Peoria home.

TAGLINE:

Rooted in History. Growing our Future.

VALUES:

Inclusion - The entrepreneurial playing field is not level, and certain groups face more significant and more persistent barriers to starting companies – leaving untapped human potential on the sidelines[1].

We believe that economic opportunity and access to resources should be equally accessible to everyone regardless of age, race, gender, sexual orientation, location or disability.

Optimism - Thought leader Simon Sinek defines the difference between positivity and optimism as the following: "Great leaders are optimists. This is not quite the same as being positive. Positive is finding the light in the now; optimists see the light always."

We believe that much like algorithms in software, complaining begets more complaints. Anger begets more anger. And optimism begets more optimism.

We proudly carry this torch of optimism into every aspect of our organization; spreading the power of potential into and across the entire Greater Peoria community.

Progress - Agile methodologies, design thinking, advancements in technology, etc. have all enabled the age of on-demand everything in our personal lives. However, many approaches to community and economic development are still rooted in top-down processes that result in long-term plans that often never see execution or full implementation.

We believe that by adopting a mentality and approach similar to that of many startups as well as the Strong Towns movement, small-scale experiments and incremental improvements set the stage for meaningful progress to be made from both a short-term and long-term perspective.

[1] Ewing Marion Kauffman Foundation - ESHIP Summit – The Entrepreneurial Ecosystem Building Playbook, Draft 3.0 | 2019

PEORIA INNOVATION ALLIANCE

START WITH WHY:

The exit of Caterpillar's headquarters, and the overall Illinois business climate has created economic uncertainty and a sense of urgency within the Greater Peoria region;

The region has made substantial progress over the past several years in terms of development and quality of place initiatives, but ecosystem growth has reached a point of stagnation;

The narrative of our region needs to change by highlighting and promoting the positive aspects of progress that have been made. Not only for our regional population, but to a national audience.

HOW:

Re-establish Greater Peoria as an aspirational community known for its deep rooted history in R&D and innovation activities, and its support of entrepreneurs and startups.

WHAT:

A collective movement by which the region can share our history, promote our progress and vision for the future, sponsor events and programming which foster collaboration and education, develop placemaking opportunities that contribute to quality of place, and support a seed fund and accelerator to enable and empower the next round of innovators and entrepreneurs that call Greater Peoria home.

A NEW MODEL OF ECONOMIC DEVELOPMENT HAS EMERGED:

1930's - Industrial Attraction - Reduce the cost of doing business through incentives to attract firm relocation.

1980's - Entrepreneurial Strategies - Supports individual small business owners through space/funding and market opportunity.

1990's - Cluster-Based Development - Focuses on the economic development environment and context in which large firms operate to create competitive advantage.

2000's - Entrepreneurial Ecosystems - Prioritizes creating a nutrient rich environment of hyper-connected actors that support entrepreneurs as they start and scale companies.

> *Ecosystem Building:* According to the Ewing Marion Kauffman Foundation, Ecosystem Building is emerging as a new profession at the intersection of economic and community development. Successful ecosystem builders must connect traditional, top-down economic development approaches with the grassroots, bottom-up, community-driven environments in which most entrepreneurs thrive.[2]

[2]Ewing Marion Kauffman Foundation - ESHIP Summit – The Entrepreneurial Ecosystem Building Playbook, Draft 3.0 | 2019

PEORIA
INNOVATION
ALLIANCE

OUR DEFINITION OF INNOVATION:

The word innovation comes from the Latin root *innovatus*, which means "to renew and change."

Innovation is significant positive change. It's a result. It's an outcome. It's something you work towards... -Scott Berken

The Peoria Innovation Alliance believes that while often associated with technology, innovation is merely approaching a problem from a renewed perspective and achieving a significant positive change.

Even though technology is a key component to enabling change through innovation; it has become evergreen and is no longer the primary driver.

STRATEGIC PILLARS:

TrepEd - Entrepreneurial thinking is a mindset that provides significant value from an early age. By building, maintaining, and promoting inclusive entrepreneurial education opportunities from Kindergarten through adulthood, TrepEd partners with various regional entities to cover the spectrum of programming and resources for entrepreneurs of any age.

Peoria Fund / Accelerator - Never before has a seed fund been created to help start, build, and grow companies in Peoria. This professionally managed fund will connect modern investors to social impact while diversifying risk but also delivering a return on investment. By closely modeling what has been done in other cities, like Cedar Rapids, Iowa, we're creating an industry-targeted startup accelerator with robust programming, mentoring, and funding.

Smart Mobility - Building upon Chuck Marohn's Strong Towns philosophy of revitalizing the urban core and focusing on incremental growth through small experiments, Smart Mobility brings together placemaking activities and emerging technology across a defined area in Peoria's Central Business District.

This area, soon to be designated as Peoria's Innovation District will be home to a Smart City pilot including autonomous vehicle test routes, smart transit solutions, public Wifi, pedestrian sensors, open data, and other innovation-related initiatives aimed at bringing concentrated economic activity to Downtown Peoria.

Peoria Made - Peoria Made is enabling and empowering our maker and artisan community through a digital storefront and physical space dedicated to generating more regional and national exposure; in turn increasing their ability to sell, grow, and scale. For more info, visit: https://www.peoriama.de

Peoria on Purpose - Peoria on Purpose is an actionable online platform through which we are capturing our region's stories and transmitting them not only throughout our own communities, but to the entire nation. For more info, visit: https://www.peoriaonpurpose.com

PEORIA
INNOVATION
ALLIANCE

BOARD OF DIRECTORS:

The Peoria Innovation Alliance Board of Directors consists of a diverse group of individuals that are primarily driven by their passion, optimism and a "give before you get" philosophy as it relates to the improvement of the Greater Peoria community.

With over half of the board members having first-hand experience as entrepreneurs and/or business owners, the phrase "by the entrepreneur, for the entrepreneur" is emboldened by the lens in which the board operates and makes strategic decisions for the organization.

Philip Lockwood / President - CGN

David Lucas / Vice President - Lucas Partnering

Justin Pflederer / Treasurer - Caterpillar, Inc.

Francie Hinrichsen / Secretary - Simply Integrated, LLC

Kevin Evans - City of Peoria

Reuben Cummings - Nerevu Group

Denise Moore - Black Business Alliance, Minority Business Development Center

Peter Kobak - Peoria Public Schools (District 150)

Ashley Schreck - EP!C

LEADERSHIP TEAM:

The day-to-day activities of the Peoria Innovation Alliance are led by two individuals with unique backgrounds, yet similar philosophies when it comes to the growth of people, communities and ecosystems.

Under their leadership, the Peoria Innovation Alliance has quickly grown into a robust, action driven organization that is producing results and making an impact in just a little over 5 months (May-September 2019).

Jake Hamann / Founder & Executive Director - A self-proclaimed Serial Entrepreneur, Disruptive Innovator and Ecosystem Builder, Jake's resume speaks for itself. In 2012, Jake founded and grew an innovation agency (ONEFIRE) from 2 to 35 employees and $3M in revenue within 4 years; focusing on operations, sales, strategy and culture.

As the co-founder of Startup Peoria and a founding member of the Startup Champions Network (formerly Startup America), a nationwide non-profit dedicated to supporting innovation ecosystem builders and the entrepreneurs they serve, Jake has built an extensive global network of connections that have brought Peoria into the national spotlight.

Jess Brown / Co-Executive Director - Over the past 15 years of working in the design industry Jess truly believes design should be informative, intuitive, and inspiring. Formerly the lead Interaction Designer at Google Nest and previously a Designer-in-Residence at the incubator, Science Inc., he now resides as founding member and VP of Design at Aspiration.

Jess' overall goal is to help build companies & communities that are designed to create a positive impact. Not just toward their customers, but their community, their employees and the planet.

The Rise of Innovation Districts: A New Geography of Innovation in America

Bruce Katz and Julie Wagner

"The trend is to nurture living, breathing communities rather than sterile compounds of research silos."

Introducing Innovation Districts

As the United States slowly emerges from the Great Recession, a remarkable shift is occurring in the spatial geography of innovation.

For the past 50 years, the landscape of innovation has been dominated by places like Silicon Valley—suburban corridors of spatially isolated corporate campuses, accessible only by car, with little emphasis on the quality of life or on integrating work, housing, and recreation.

A new complementary urban model is now emerging, giving rise to what we and others are calling "innovation districts." These districts, by our definition, are geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators.[1] They are also physically compact, transit-accessible, and technically-wired and offer mixed-use housing, office, and retail.

Innovation districts are the manifestation of mega-trends altering the location preferences of people and firms and, in the process, re-conceiving the very link between economy shaping, place making and social networking.[2]

In recent years, a rising number of innovative firms and talented workers are choosing to congregate and co-locate in compact, amenity-rich enclaves in the cores of central cities. Rather than building on green-field sites, marquee companies in knowledge-intensive sectors are locating key facilities close to other firms, research labs, and universities so that they can share ideas and practice "open innovation."

Instead of inventing on their own in real or metaphorical garages, an array of entrepreneurs are starting their companies in collaborative spaces, where they can mingle with other entrepreneurs and have efficient access to everything from legal advice to sophisticated lab equipment. Rather than submitting to long commutes and daily congestion, a growing share of metropolitan residents are choosing to work and live in places that are walkable, bike-able, and connected by transit and technology.

Led by an eclectic group of institutions and leaders, innovation districts are emerging in dozens of cities and metropolitan areas in the United States and abroad and already reflect distinctive typologies and levels of formal planning. Globally, Barcelona, Berlin, London, Medellin, Montreal, Seoul, Stockholm and Toronto contain examples of evolving districts. In the United States, districts are emerging near anchor institutions in the downtowns and midtowns of cities like Atlanta, Baltimore, Buffalo, Cambridge, Cleveland, Detroit, Houston, Philadelphia, Pittsburgh, St. Louis, and San Diego. They are developing in Boston, Brooklyn, Chicago, Portland, Providence, San Francisco and Seattle where underutilized areas (particularly older industrial areas) are being re-imagined and remade. Still others are taking shape in the transformation of traditional exurban science parks like Research Triangle Park in Raleigh-Durham, which are scrambling to meet demand for more urbanized, vibrant work and living environments.

Innovation districts represent a radical departure from traditional economic development. Unlike customary urban revitalization efforts that have emphasized the commercial aspects of development (e.g., housing, retail, sports stadiums), innovation districts help their city and metropolis move up the value chain of global competitiveness by growing the firms, networks, and traded sectors that drive

broad-based prosperity. Instead of building isolated science parks, innovation districts focus extensively on creating a dynamic physical realm that strengthens proximity and knowledge spillovers. Rather than focus on discrete industries, innovation districts represent an intentional effort to create new products, technologies and market solutions through the convergence of disparate sectors and specializations (e.g., information technology and bioscience, energy, or education).

Innovation districts are still an early trend that, because of their multi-dimensional nature, has yet to receive a systematic analysis across the United States and other countries. Yet we believe that they have the unique potential during this pivotal post-recession period to spur productive, inclusive, and sustainable economic development.

Innovation districts help address three of the main challenges of our time: sluggish growth, national austerity and local fiscal challenges, rising social inequality, and extensive sprawl and continued environmental degradation.

They do so by providing a strong foundation for the commercialization of ideas and the creation and expansion of firms and jobs via proximity and collaboration. They are a vehicle for both revenue growth as well as the more efficient use of existing infrastructure. They offer the prospect of expanding employment and educational opportunities for disadvantaged populations given that many districts are close to low- and moderate-income neighborhoods. And, at a time of inefficient land use, they present the potential for denser residential and employment patterns, the leveraging of mass transit, and the repopulation of urban cores.

The purpose of this paper is to capture this emerging trend, explore the large forces and local practices and practitioners that are driving it and provide initial guidance to U.S. city and metropolitan leaders on how best to recognize and extend the growth of their own innovation districts, building on the distinctive assets and potential of their economies.

The next section of this paper defines innovation districts and offers a typology of places where they are developing. Section III then explains why they matter (namely their role in addressing a range of economic, social and environmental challenges our country now faces) while Section IV describes the profound market, demographic, technological, and cultural forces that are propelling this new spatial geography of innovation. Sections V and VI analyze the multiple assets of innovation districts, and provide real-world guidance and insights for cities trying to start or extend this model in their own communities. The paper concludes by exploring the implications of the innovation district trend for large private companies and institutional investors, federal and state government, and the broader field of urban practitioners.

Defining Districts

Innovation is when new or improved ideas, products, services, technologies, or processes create new market demand or cutting-edge solutions to economic, social and environmental challenges.

Innovation districts constitute the ultimate mash up of entrepreneurs and educational institutions, start-ups and schools, mixed-use development and medical innovations, bike-sharing and bankable investments—all connected by transit, powered by clean energy, wired for digital technology, and fueled by caffeine.

They embrace those very attributes of urbanism—what Saskia Sassen calls "cityness"—that were denigrated and often destroyed in the 20th century: complexity, density, diversity of people and cultures, and a layering of the old and the new. As Business Week observed in June 2009, "The trend is to nurture living, breathing communities rather than sterile remote, compounds of research silos."[3]

Given the vast distinctions in regional economies, the form and function of innovation districts differ markedly across the United States. Yet all innovation districts contain *economic, physical, and networking assets*. When these three assets combine with a supportive, risk-taking culture they create an *innovation ecosystem*—a synergistic relationship between people, firms, and place (the physical geography of the district) that facilitates idea generation and accelerates commercialization.[4]

Most innovation districts adhere to one of three general models.[5]

The "anchor plus" model, primarily found in the downtowns and mid-towns of central cities, is where large scale mixed-use development is centered around major anchor institutions and a rich base of related firms, entrepreneurs and spin-off companies involved in the commercialization of innovation. "Anchor plus" is best exemplified by Kendall Square in Cambridge (and the explosion of growth around

MIT and other nearby institutions like Mass General Hospital), Philadelphia's University City (anchored by The University of Pennsylvania, Drexel University and the University City Science Center), and St. Louis (flanked by Washington University, Saint Louis University, and Barnes Jewish Hospital). Other emerging districts can be found in the Greater Oakland neighborhood of Pittsburgh (around Carnegie Mellon University and the University of Pittsburgh Medical Center), Midtown Atlanta (around Georgia Tech University), downtown and midtown Detroit (around Quicken Loans, the Henry Ford Health System and Wayne State University) and the Texas Medical Center in Houston, Texas.

The "re-imagined urban areas" model, often found near or along historic waterfronts, is where industrial or warehouse districts are undergoing a physical and economic transformation to chart a new path of innovative growth. This change is powered, in part, by transit access, a historic building stock, and their proximity to downtowns in high rent cities, which is then supplemented with advanced research institutions and anchor companies. The model is exemplified by the remarkable regeneration underway in Boston's South Waterfront, San Francisco's Mission Bay, Seattle's South Lake Union area, and the Brooklyn Navy Yard. The ambitious plans for the Cornell-Technion Campus on Roosevelt Island in New York City and Hunters Point in San Francisco also hold great promise. Many of these areas draw from the experiences of 22@Barcelona, a self-proclaimed innovation district that involved the complete re-make of an older industrial area in the city core.[6]

The third model, "urbanized science park," commonly found in suburban and exurban areas, is where traditionally isolated, sprawling areas of innovation are urbanizing through increased density and an infusion of new activities (including retail and restaurants) that are mixed as opposed to separated. North Carolina's Research Triangle Park, perhaps the 20th century's most iconic research and development campus, is the strongest validation of this model. In November, 2012, after several years of review and outreach, RTP announced a new 50-year master plan to urbanize the quintessential exurban science park, recognizing that its isolated car-dependent environment is no longer optimal for spurring innovation and attracting younger talent. The master plan calls for a greater concentration of buildings and amenities, including the creation of a vibrant central district, the addition of up to 1,400 multi-family housing units, retail, and the possible construction of a light rail transit line to connect the park with the larger Raleigh-Durham region, including the universities.[7] Other science parks actively engaged in urbanization efforts include the University Research Park at the University of Wisconsin-Madison, the University of Virginia Research Park in Charlottesville and the University of Arizona Tech Park in Tucson.[8]

Unlike convention centers or suburban malls, innovation districts are not cookie cutter developments; rather, they leverage distinct economic strengths in each metropolitan area. Districts vary not only by type but also in size, from 200 acres in St. Louis to 1000 acres in Boston. They have different avenues for growth, with some leading with new fields like "tech/information" (including the burgeoning "app economy"), others leading with life sciences (with clear niches in such fields as nano-technology,

WHO DELIVERS INNOVATION DISTRICTS

The list of institutions and individuals that are driving the growth of innovation districts is as varied as the economic composition of districts themselves. The following list provides a sample of the leaders at the vanguard of this trend in the United States and abroad:

- ***Mayors and local governments***, such as former Mayor Tom Menino of Boston, former Mayor Joan Clos of Barcelona, and the Stockholm city government.
- ***Major real estate developers and major land owners***, such as Vulcan Real Estate in Seattle's South Lake Union and the Brooklyn Navy Yard.
- ***Managers of research campuses***, such as the Research Triangle Park Foundation in Research Triangle Park and the Texas Medical Center in Houston.
- ***Anchor companies***, such as Quicken Loans in Detroit, Comcast in Philadelphia, and Amazon in Seattle's South Lake Union.
- ***Advanced research institutions***, such as Washington University in St. Louis, Carnegie Mellon in Pittsburgh, Drexel University in Philadelphia, and MIT in Cambridge.
- ***Advanced medical campuses***, such as the Henry Ford Health System in Detroit and the University of Pittsburgh Medical Center in Pittsburgh.
- ***Philanthropic investors***, such as the New Economy Initiative and the Kresge Foundation in Detroit and the former Danforth Foundation in St. Louis.
- ***Incubators, accelerators, and other economic cultivators***, such as Barcelona Activa in Barcelona, the Cambridge Innovation Center in Cambridge, and the BioGenerator in St. Louis.
- ***Social networking programmers***, such as Venture Café Foundation in Boston and Cambridge and High Tech Campus Eindhoven.

imaging, and robotics), and others still leading with highly creative industries, such as industrial design, media, and architecture. Further, they vary in their urban form and density, the historic presence of transit (one hundred years in the case of Kendall Square, one year in the case of the Texas Medical Center), the presence of housing and retail, and the extent of collaboration with local schools and community organizations. Finally, they are distinctive in their level of geographic and institutional formality, where some, like Boston, are officially designated and branded, while others, like Kendall Square, are growing more organically in response to market forces. This intense variation in innovation districts requires practitioners to assess assets and liabilities with clear-eyed objectivity, so that growth strategies can be realistic and customized.

Why Innovation Districts Matter

Metropolitan areas in the United States and other mature economies face outsized challenges in the aftermath of the Great Recession. At the most basic level, U.S. cities and metropolitan areas need more and better jobs. According to the March 2014 Brookings Metro Monitor, the number of jobs in 61 of the 100 largest U.S. metro areas are still lower than their pre-recession peak; incredibly, job levels in 23 metros are more than 5 percent below their pre-recession peak figures.[9] At the same time, the number of people living in poverty and near poverty has grown precipitously in the largest 100 U.S. metros—from 48 million in 2000 to 66 million in 2012—due not only to the recession but broader trends around wage stagnation and economic restructuring.[10] Beyond these economic and social demands, cities are on the front lines of addressing enormous fiscal and environmental challenges given federal gridlock and the absence of leadership in many states.

In the face of these challenges, cities and metropolitan areas are experimenting with new approaches to economic development and sustainable development that focus on growing jobs in productive, innovative, and traded sectors of the economy while concurrently equipping residents with the skills—particularly STEM (science, technology, engineering and math) skills —they need to compete for and succeed in these jobs.[11] These new approaches try to build on the distinctive assets and advantages of disparate places rather than merely pursuing heavily subsidized consumption-oriented strategies (e.g., building the next sports stadium, convention center, or performing arts facility) that yield low quality jobs or aspiring to unrealistic economic goals ("becoming the next Silicon Valley").

Innovation districts are a key part of the new wave of local economic development and advance several critical objectives.

First, innovation districts further the ability of cities and metropolitan areas to grow jobs in ways that both align with disruptive forces in the economy and leverage their distinct economic position. Innovation districts enable companies, entrepreneurs, workers, researchers and investors to work across disparate sectors and institutions to commercialize ideas and co-invent and co-produce new discoveries for the market. They foster innovation across industries by concentrating people with different knowledge and expertise in dense urbanized areas; experts in technology, for example, work closely with experts in bioscience, finance, education, and energy. Innovation districts are, in essence, the vanguard of a new "convergence economy" which is galvanizing the growth of more competitive firms and higher quality jobs and spurring expansion in supportive professional and commercial service sectors.

Second, innovation districts can specifically empower entrepreneurs as a key vehicle for economic growth and job creation. Studies show the important role that entrepreneurs and start-up companies play in urban and metropolitan job growth and innovation districts can support this trend in several ways. The rise of collaborative facilities and spaces can, for instance, reduce overhead costs by offering below rate, low risk work spaces and providing technical spaces where exorbitantly expensive technologies are shared. At the same time, imaginative programming and networking can support idea generation and efficiently link young firms to mentors, advisors with specialized expertise, and potential investors.

Third, innovation districts can grow better and more accessible jobs at a time of rising poverty and social inequality. A substantial number of emerging innovation districts across the United States are close to low- and moderate-income neighborhoods, offering the prospect of expanding

employment and educational opportunities for disadvantaged populations. Leaders in cutting edge innovation districts are already dedicating resources to revitalize neighborhoods directly through investments in affordable housing, education, infrastructure and improved internet connectivity, and indirectly via enhanced tax revenues. Leaders in these districts are particularly focused on increasing labor market participation of local residents through training for jobs in both the STEM sector as well as retail and service firms.

Fourth, innovation districts can reduce carbon emissions and drive denser residential and employment patterns at a time of growing concern with environmentally unsustainable development. Innovation districts are potential engines for sustainable development since they embrace residential and employment density via the strategic use of transit, historic buildings, traditional street grids, and existing infrastructure. Some districts are going further by using renewable energy as their primary power source and by transforming their buildings, streets, and parks into living labs to test cutting edge sustainable projects in concert with technology firms and entrepreneurs.

Finally, innovation districts can help cities and metropolitan areas raise revenues and repair their balance sheets at a time when federal resources are diminishing and many state governments are adrift. Municipal governments generally rely on property, business, and sales taxes for revenue. Innovation districts can generate revenues through increased economic activity, rising housing values and increased demand for goods and services. Increased revenues can then be used to make necessary investments in infrastructure, public safety, affordable housing, local schools, and other necessary services. At time when federal resources are shifting to entitlement programs (e.g., Social Security) and many states are otherwise focused, these types of investments disproportionately fall on local governments.

Why Now—The Evolution of Innovation

The early rise of innovation districts could constitute the next phase of what one observer has called the "architecture of technology."[12] This architecture was once represented by industrial districts, and later by suburban science parks, both of which were products of the distinctive mix of demographic preferences, cultural norms, and economic imperatives of their times. Similarly, the growth of innovation districts is reflective of forces that are radically altering the requirements and preferences of people and firms that are today engaged in technology driven activities. These shifts are forging new links between economy-shaping, place-making, and network building that were not evident in early models.

A. Industrial Districts to Science Parks

In the 19th century and early 20th century, industrial districts—areas with high concentrations of manufacturing enterprises commonly engaging in similar or complimentary work—emerged in cities like Manchester, Milan, and Stuttgart in Europe and Baltimore, Cleveland, Detroit, New York, and Philadelphia in the United States. In the United States, these districts straddled the temporal boundary between the early mercantile city and turn-of-the-century industrial metropolis, a period marked by new types and organizational forms of manufacturing activity, innovations in energy and transportation, and rapid urbanization.[13] Many cities in fact had multiple districts, which varied by product type, methods of production, power source, and labor force composition.[14] Such a clustering of like activities facilitated the supply of materials and parts from one firm to another, and also attracted a large and fluid supply of workers, many of whom lived in the surrounding communities and walked to work. Enmeshed in the urban fabric, these "sub-city" areas thus provided not only a high density of employment opportunities, but essential neighborhood services and social amenities.[15]

As the 20th century moved forward, the nature of manufacturing activity changed and eventually dispersed—first within regions, and eventually across the globe—and by the mid-1900s production in U.S. and European cities had sharply declined. The foundations of modern technology laid during the preceding decades had, however, enabled the advent of a new era of invention and innovation in science, communications, and information—as well as the rapid suburbanization of housing and commercial activity.

In the United States, technological advancement and geographic dispersion together helped drive the creation of innovative enclaves variably referred to as science parks or research parks. Beginning in the 1950s, collaborations of universities, private developers, and government designed and built these clusters of labs and firms with the aim of increasing the commercialization of research and attracting entrepreneurially-oriented scientists from industry and academia.[16] The model originated with the Stanford Research Park—in what is now Silicon Valley—and was then expanded to include the development of Research Triangle Park in Raleigh Durham, and later the innovation corridors outside Boston, Philadelphia, and Washington D.C. Unlike urban industrial districts, these suburban parks were built as spatially isolated corporate campuses accessible only by car, mirroring the patterns of residential and commercial growth that dominated the post war landscape. They also reflected a research culture and patenting policies that encouraged secrecy. As such, they were generally closed innovation systems in which firms and scientists carefully guarded their ideas, and where interactions between them were limited.

B. A New Geography of Innovation

Innovation districts maintain elements of these earlier models but embody a new interplay of form and function that the modern innovation economy demands, and in turn supports. Like their predecessors, these districts grow out of a powerful set of economic, cultural, and demographic forces that are reshaping both how and where people live and work.

The emergence of innovation districts has been observed by a number of scholars and practitioners, many of whom have offered initial theories for their development. Research led by Thomas Hutton in over seven global cities found a rise of new industrial clusters within the inner city to "constitute important aspects of the spatiality of the New Economy," making four classifications of specialized production.[17] A research team at MIT's Department of Urban Studies and Planning likewise identified discrete geographic clusters of creative industries, life sciences, and applied sciences within large-scale real estate development projects. Defined as "New Century City Developments," these innovative clusters are "driven by inter-organization and cross-industry collaboration, open systems for R&D, and workers who have the aptitudes and skills required by the networked, knowledge economy."[18]

George Bugliarello of Polytechnic University in New York observed the emergence of "urban knowledge parks," concluding that these urban parks develop around a knowledge institution in a city, provide public space or spaces for community activities, and possess high levels of density."[19] In September, 2013, the American Institute of Architects released a report on Innovation Districts, describing them as "creative, energy-laden ecosystems" that are emerging world-wide.[20]

Richard Florida has provided important validation for the new geography of innovation. His recent mapping of venture capital activity by ZIP codes and area codes, rather than more expansive metro areas, shows that "high tech development, startup activity, and venture investment have recently begun to shift to urban centers and also to close-in, mixed-use, transit-oriented, walkable suburbs."[21]

These observations—and ours—recognize a trend that is both multi-dimensional and hyper-local, one reason why market dynamics on the ground have outpaced uniform labeling or analysis. Quantitative assessments, therefore, are still a work in progress. Innovation districts in Boston and St. Louis, for example, are assiduously documenting district-level growth, although not against broader city and metropolitan trends or other cities with similar economic starting points.[22] Similarly, studies in New York, Pittsburgh, and San Francisco have documented the growth of leading tech sectors at the city rather than innovation district scale.[23] While the analytics supporting this trend mature, Brookings and a growing number of practitioners are turning to broader economic and demographic research to understand the forces driving this new spatial geography of innovation.

1. The evolution of a knowledge and technology driven economy is altering the value and function of density and proximity.

In the past several decades, the U.S. economy has become increasingly reliant on knowledge and innovation. Today, approximately 20 percent of all U.S. jobs are in science, technology, engineering, or math (STEM) related occupations—a share that has doubled since the Industrial Revolution.[24] These occupations can be found in a wide range of fields including the production of advanced goods like pharmaceuticals, medical devices, motor vehicles and aerospace as well as the provision of advanced

services like software, data processing, among many others.[25]

As the role of these innovative industries and occupations has grown in size and importance, so too, then, has the value of density and agglomeration. The benefits of clustering that produced industrial districts, and then science parks, are intensifying in ways that we are just beginning to understand. A growing body of research shows that employment density not only eases resource, goods, and labor sharing, but also enhances innovation. This happens by enabling a more seamless transfer of knowledge within and across firms, workers, and supporting institutions—in turn facilitating the creation and exchange of new ideas that fuel even greater economic activity and growth. A recent study by the British government captures this latter point well:

> "While the marginal cost of transmitting information across geographical space has fallen significantly, the marginal cost of transmitting knowledge still rises with distance …. Therefore, the knowledge spillover benefits of clustering in cities can be large for high-value, knowledge intensive sectors."[26]

The proximity effect is significant. Recent research conducted by Gerald Carlino and Robert Hunt found the clustering of R&D labs to be by far the "most significant" at very small spatial scales, such as distances of about one-quarter of a mile. They also discovered the clustering effect to quickly dissipate with distance, concluding knowledge spillovers to be "highly localized."[27] Isaac Kohane and several colleagues at Harvard Medical School found that even working in the same building on an academic medical campus makes a difference for scientific breakthroughs; "Otherwise, it's really out of sight, out of mind."[28]

Density also matters when it comes to workers. The large number of employers within an urban area allows workers to change jobs more easily, giving them both greater flexibility and stability than employees in non-urban locales. This concentration of employment, which economists refer to as "labor market pooling," also contributes to labor productivity.[29] One seminal study found that doubling employment density increases average productivity by around 6 percent.[30]

This general research on proximity and density takes on new meaning in what one observer has called the "age of convergence." In biosciences, digital and biological technologies are co-mingling, opening entirely new possibilities for innovation breakthroughs to be commercialized.[31] A recent San Francisco analysis coined the term "tech/information" industries to reflect "the convergence between technology and content."[32] The spatial implications of this hybridization of industry are profound.

> "[Tech/information] companies thrive in urban environments, where they can connect with other industries, drawing on the culture and diversity of the city. By contrast, the previous generation of tech companies thrived with their headquarters located in suburban areas, located mainly near other tech companies. *There was no possibility of cross-industry diversity.*" [Emphasis added][33]

Recent analysis in New York similarly found tech industries to be less focused on building new technologies but rather "applying technology to traditional industries like advertising, media, fashion, finance, and health care."[34] These shifts reinforce and reinterpret notions of proximity and density.

> The early days of technology growth was driven by semiconductors and computer hardware, products that depended on a deep roster of engineering talent and required large amounts of physical space to develop. … In contrast, today's growth is being fueled by the Internet and smart phones, and the creation of new ways of taking advantage of these now widely used platforms to deliver content, sell products, deliver services, play games and simplify life for individuals and businesses. … [In other words], today's technology revolution is much less about creating the infrastructure and plumbing for the Internet, but about applying technology to traditional industries.[35]

To be sure, physical proximity alone doesn't guarantee greater collaboration and idea exchange, nor is it necessarily even required. Silicon Valley, while a huge regional agglomeration of innovative activity, is the quintessential low-density, suburban model of physical development—yet its strength and success is defined by a pervading culture of openness and network building. But urbanization—and

the physical proximity that comes with it—does appear to both grow from, and in turn help smooth, the development of "horizontal" relationships both within and between large firms, smaller subcontractors, vendors, and, importantly, talent. The move to create denser enclaves of innovation thus appears to be a critical shift for communities that are not as "wired" for collaboration as Silicon Valley.

2. An economy increasingly oriented toward open innovation is changing both where firms locate and how buildings and larger districts—from research labs to collaborative spaces to mixed-use developments—are designed.

As the knowledge and technology driven economy grows, it is also becoming increasingly characterized by what Henry Chesbrough and others call "open innovation." Chesbrough describes this as a process whereby companies and firms more openly generate new ideas and bring them to market by nimbly drawing on both internal and external sources. Under this new modus operandi, external sources can generate the ideas that are then commercialized internally by a firm, while internal ideas can be commercialized by external start-up companies and entrepreneurs. In other words, as Chesbrough observes, "The boundary between a firm and its surrounding environment is more porous, enabling innovation to move easily between the two."[36]

What was once a phenomenon for highly specialized fields, the imperative to collaborate has expanded to a broader group of knowledge-intensive sectors, including such science- and technology-heavy fields as chemicals, biotechnology, telecommunications, and semiconductors. McKinsey & Company, for example, has noticed a move from internal R&D labs to new "multichannel R&D models," which involve partnerships with "academic centers, partners, competitors, customers, venture capital funds, and startups."[37]

The rise of smaller companies engaged in research and development has also contributed to the growing movement toward open innovation. A field once dominated exclusively by large corporations, research labs and universities has become increasingly stratified, prompting greater collaborations between firms of disparate sizes to develop and advance innovations. A number of factors contributed to the proliferation of smaller R&D companies, namely the downsizing of larger companies, the passage of the Bayh-Dole Act (which enables university and individual researchers to own their federally-funded research, sparking a new entrepreneurial mind set), and the growth of venture capital funding, from very little funding in 1970 to nearly $100 billion in 2000.[38]

The result is that in today's economic landscape, no one company can master all the knowledge it needs, so companies rely on a network of industry collaborators.[39] This, in turn, has led to a shift in where companies and support organizations locate. A recent article, for example, on the growth of Pfizer, Novartis, and other major pharmaceutical companies in Cambridge noted the following:

> "Pharmaceutical companies traditionally preferred suburban enclaves where they could protect their intellectual property in more secluded settings and meet their employees' needs. But in recent years, as the costs of drug development have soared and R&D pipelines slowed, pharmaceutical companies have looked elsewhere for innovation. Much of that novelty is now coming from biotechnology firms and major research universities like MIT and Harvard, just two subway stops away."[40]

The more open, collaborative nature of the knowledge economy has also altered the design inside and outside the walls of the singular company. A recent *New York Times* piece on the "monuments of tech" refers to this trend as the "aesthetic of disruption"—design which embodies change, flexibility, and openness while at the same time displays the unique character and ethos of the individual company.[41]

The early, highly-recognizable model for open and highly networked workplaces is the newspaper newsroom, but these principles have been implemented in places ranging from former New York City Mayor Michael Bloomberg's "bullpen" in New York City Hall to the campuses of Silicon Valley technology firms. Facebook and Google, for example, have embraced "hackable buildings," with open floor plans that can be easily reconfigured to create dense, collaborative spaces for new teams and projects.[42]

Beyond office spaces and individual buildings, the planning and design shifts described above have extended to the public and private realm. When Henderson, NV-based Zappos, the online retail shoe giant, was looking for a new headquarters in 2010, CEO Tony Hsieh decided to create a more dynamic

workplace, with the goal of increasing interaction and collaboration among its workers. That inspired for Hsieh a move toward open floor plans and the provision of greater amenities within the office. More than that, it also led him to embed the new headquarters building (and 2,000 Zappos workers) in Las Vegas' old City Hall, and launch the $350 million Downtown Project to catalyze growth of a dense, multi-use, and walkable environment. "The idea," Hsieh said, "went from 'let's build a campus' to 'let's build a city.'"[43]

In short, the phenomenon of open innovation is changing over time: expanding into new industries, altering the design of office spaces, reshaping the relationship between buildings, and now occurring at the district scale. Similar to open innovation between firms, innovation districts are experiencing the breakdown of traditional boundaries, making the process of innovation more porous between the public and private realms. Ideas, for instance, can be brainstormed in wired, public spaces, advanced in shared work spaces, prototyped in private technology labs, and tested on public streets.

3. Shifting demographic and household dynamics are fueling demand for more walkable neighborhoods where housing, work, and amenities intermix.

Recent data show that cities and metropolitan areas are increasing in population faster than the rest of the country, with the largest growth seen in large urban areas. From 2012 to 2013, large metropolitan areas with over 1 million people grew twice as fast as smaller metropolitan areas with populations under 250,000, while nonmetropolitan/micropolitan regions saw a collective decline.[44] Brookings' demographer William Frey believes that this trend is likely to continue, while the future of non-urban America is far less certain.[45]

Within many large metropolitan areas, the trend becomes more acute as one examines areas in greater proximity to commercial downtowns. The country's 10 largest "live-work" downtowns, as examined by the Philadelphia Center City District for the International Downtown Association, grew 77 percent faster than the country as a whole, and nine of the 10 downtowns increased in population faster from 2000 to 2010 than zones within a half-mile or mile of downtown.[46]

What's driving this revival in cities and their cores?

America's family structure has been altered by the simultaneous aging of the population and the tendency of young adults to delay marriage and have fewer children. As a result, the prototypical family of the suburban era—a married couple with school age children—now represents just under 20 percent of American households, down from 24.1 percent in 2000 and 40.3 percent in 1970.[47] This trend is only expected to accelerate in coming decades. As Arthur C. Nelson documents in his provocative book, *Reshaping Metropolitan America*, "Between 2010 and 2030, households with children will account for about 13 percent of the total change in households; households without children will represent the rest."[48]

This demographic tumult is sparking a palpable shift in consumer—and worker—preferences toward more urban-oriented environments. Research has documented, for example, that 70 percent of Americans place a high priority on walkability, and similar majorities prioritize proximity to health care, entertainment, recreation, work and school, and social contacts.[49] Older Americans are increasingly seeking smaller homes and apartments, as well as places with easy access to medical services, shopping, and other daily necessities. Meanwhile, middle-aged couples, whose children have "left the nest," show greater receptivity to urban neighborhoods, cultural amenities, and shorter commutes.[50]

These preferences are particularly prevalent among the millennial generation (Generation Y)—whose young and educated members form the core of our innovation workforce. For many of these young people, especially those that have delayed childrearing, "quality of life" is increasingly understood to mean proximity to urban amenities such as restaurants, retail, cultural, and social venues.[51] This is evidenced in residential choices of this cohort. According to Joseph Cortright, between 2000 and 2009, the number of 25- to 34-year olds with college degrees living in neighborhoods near the central business districts in the nation's 51 largest metropolitan areas increased by 26 percent, double the growth rate of college educated young adults in the rest of the metropolitan area.[52]

Data from the Urban Land Institute reveals that 63 percent of millennials plan to move in the next five years, and 40 percent of them indicate a preference for living in medium or large cities (compared to only 28 percent of Americans as a whole). Within urban areas, living in close proximity to shopping, dining, and work is preferred by 62 percent of this demographic, along with 60 percent of both singles

and renters.[53] A recent *New York Times* article underscored how these shifts in demographics are challenging the New York City housing supply, noting that "there are more single households, thanks to the young urban migration and the silver tsunami, that gathering wave of urban-minded retirees."[54]

Collectively, these three shifts—a converging knowledge economy, more open innovation ecosystems, and changing demographics—are stirring new demands for density, proximity, collaboration, and walkability, and in so doing are re-working the spatial geography of innovation. With concerted effort, the rise of innovation districts holds the potential to bring numerous benefits to the cities and regions in which they are located, and to the people who live and work there.

Deconstructing Districts

The potential for innovation districts to drive innovative, inclusive, and sustainable growth requires us to understand what drives them and makes them productive and prosperous. Unlike segregated business or residential districts that have for decades populated most cities and suburbs, or even the activity centers that more recently have sprung up around public transit stations, innovation districts uniquely contain three categories of assets: *economic assets, physical assets, and networking assets.*[55]

- **Economic assets** are the firms, institutions and organizations that drive, cultivate or support an innovation-rich environment.
- **Physical assets** are the public and privately-owned spaces—buildings, open spaces, streets and other infrastructure—designed and organized to stimulate new and higher levels of connectivity, collaboration, and innovation.
- **Networking assets** are the relationships between actors—such as between individuals, firms, and institutions—that have the potential to generate, sharpen, and/or accelerate the advancement of ideas.

The relative strength of these assets in different communities varies considerably. In some places, districts are emerging from a cluster of strong economic assets but lack important physical assets and are initiating a planning process to comprehensively redesign the physical realm. In other cases, districts possess a strong set of physical assets with only a handful of economic assets and networks to build upon.[56]

Innovation districts reach their potential when all three types of assets, combined with a supportive, risk-taking culture, are fully developed, creating an *innovation ecosystem*. As described earlier, an innovation ecosystem is a synergistic relationship between people, firms, and place (the physical geography of the district) that facilitates idea generation and accelerates commercialization.

Both research and interviews suggest that a supportive risk taking culture consistently undergirds highly productive innovation areas. This means, most unconventionally, embracing failure by making risky investments in people, firms, and development projects. It means breaking down the traditional, vertical hierarchies and valuing a diversity of talent, from 20- and 30-year olds to the more experienced leadership class. It means changing conventional rules still found in many inward-focused research institutions and organizations to encourage spin-offs, allow greater idea sharing across firms, and share spaces and technologies. It also means taking the long view and not expecting short-term returns or rewards as innovation processes commonly require consecutive failures before any breakthroughs can be achieved.

In describing these assets it is important to recognize that a number of them may appear to be conventional, if not strikingly rudimentary. While many assets described here have been integral to existing urban economic development efforts, they are being re-engineered to support the innovative, traded sectors that drive metropolitan economies. Research universities, for example, are by definition teaching institutions with research departments. A small, but growing, subset of these universities are now valuing commercialization as a primary objective and are successfully advancing innovations into the market. Moving well beyond their tech transfer offices, these universities are investing resources in accelerators, encouraging and supporting spin-offs, and developing adjacent land to concentrate future economic growth. Many more research universities have not yet expanded their mission to embrace commercialization fully, demonstrating a growth opportunity for these universities and the areas surrounding them.

A. Economic Assets

Economic assets can be separated into three categories: innovation drivers, innovation cultivators, and neighborhood-building amenities.

Innovation drivers are the research and medical institutions, the large firms, SMEs, start-ups, and entrepreneurs focused on developing cutting-edge technologies, products, and services for the market. Due to regional variations in industry strengths, each district is comprised of a unique mix of innovation drivers, contributing significantly to their distinctiveness. The research described below reveals important insights for districts building and assembling these assets.

First, a subset of industries—sensitive to the economic, demographic, and cultural trends described above—distinguishes innovation districts from other models and largely explains their preference for compact, urban-oriented enclaves. These industries are:

- High-value, research-oriented sectors such as applied sciences (from life and material sciences to energy technology to nanotechnology) and the burgeoning "app economy."[57]
- Highly creative fields such as industrial design, graphic arts, media, architecture, and a growing hybrid of industries that merge tech with creative and applied design fields.[58]
- Highly specialized, small batch manufacturing such as advanced textile production and small artisan-oriented manufacturing.[59]

Large advanced manufacturing facilities are not located within urban innovation districts. These facilities require substantial building or land footprints and require easy access to major highways. This includes fabrication plants, OEMs (original equipment manufacturers) and large suppliers.

Second, the role of universities deserves special consideration given their effects on the local and metropolitan economy, including their role in driving innovation activity at the district scale. Anselin, Varga, and Acs, for example, sought to reconcile conflicting research findings on the role of universities and the local economy, drawing on larger and more geographically precise data sets. Their research found a "positive and significant relationship between university research and innovation activity," both directly, as well as indirectly through its impact on private sector R&D.[60] Further, Hausman, in analyzing Census data around universities after the passage of the Bayh-Dole Act in 1980 (an act allowing universities and other researchers the ability to commercialize research funded by federal dollars), found both long-term employment and worker income to rise "in industries more closely related to local university innovative strengths."[61] In short, universities are particularly helpful drivers for growing districts; for this reason, many districts that did not originally include universities (such as the "re-imagined urban areas" model) have convinced universities to build satellite campuses.

Third, entrepreneurs are another asset worth highlighting. While Edward Glaeser's research convincingly affirms the role of entrepreneurs in driving city employment growth, interviews with practitioners reveal that entrepreneurs are equally valued at the district-scale.[62] All innovation districts aspire to support entrepreneurs. Boston's innovation district, for example, includes an "innovation component" for new office and retail developments, where 15 percent of the space is earmarked for entrepreneurs and start-ups.[63]

Fourth, while many districts are focused on the cultivation of entrepreneurs, they alone cannot be a growth strategy for districts. Research conducted by Agrawal, Cockburn, Galasso, and others found that a mixing of firms creates the optimal environment for innovation. Larger laboratories, for example, may stimulate spin-offs considered irrelevant to the lab's overall business objectives, while smaller labs can create demand for specialized services that lower the entry costs for others in the market.[64]

Innovation cultivators are the companies, organizations, or groups that support the growth of individuals, firms, and their ideas. They include incubators, accelerators, proof-of-concept centers, tech transfer offices, shared working spaces (with programs to support idea and firm development), and local high schools, job training firms, and community colleges advancing specific skill sets for the innovation-driven economy. In a small number of districts, legal counsel, patent attorneys, and venture capital firms are scrubbing project concepts to identify their value in moving forward. The rise of technology-driven industries in general is creating demand for supportive industries that employ highly-educated workers, such as advanced business services.[65]

The aggregation of innovation cultivators in districts distinguishes them from standard business and research parks. While cities and suburban areas have cultivators sprinkled across their landscape, district leaders are assembling a critical mass of cultivators within a discrete geographic area. Equally

important, district leaders are "planning for the continuum" by building a range of cultivators to support entrepreneurs and start-ups at each stage of development, keeping them in the district as they mature. There appears to be a tipping point, however, when too many cultivators become counterproductive. "Too many incubators run the risk of spoon-feeding entrepreneurs too much. They need to work hard at achieving success," shared Ylva Williams of the Stockholm Science City Foundation.[66]

Neighborhood-building amenities provide important services to residents and workers in the district. This includes medical offices, grocery stores, restaurants, coffee bars, small hotels, and local retail (such as bookstores, clothing stores, and sports shops). In his analysis of the "new economy" clusters in the urban core, which include innovation-oriented clusters, Thomas Hutton found restaurants, coffee shops, and bars to "reflect not only contemporary urban consumption patterns but also a distinctive 'geography of amenity,' which complements the intensive social interactions of the new economy."[68]

Amenities activate district streets and public spaces, inviting a mix of people to shop, browse, and mingle. Many cities understand this well, and have heavily invested in corridor or neighborhood revitalization initiatives, often providing tax relief and other incentives for local businesses. District strategies build off these efforts, seeking to not only create a critical mass of amenities but to encourage a compelling design of storefronts and signage.

B. Physical Assets

There are three categories of physical assets, all of which are uniquely applied in each district: physical assets in the public realm, physical assets in the private realm, and physical assets that knit the district together and/or tie it to the broader metro area. Similar to economic assets, physical assets are in the process of being re-imagined to advance an innovation imperative—a process that is transforming the physical landscape into a laboratory of creativity, ingenuity, and invention. Experts in the fields of urban design, architecture, landscape architecture, and planning are experimenting with new concepts that facilitate collaboration and connectivity. This story of testing, trying and evolving was observed by MIT researchers, who in their global work on "New Century Cities" found districts to be "messy, with activities and uses all mixed up and things in a constant state of adjustment and change."[69]

Physical assets in the public realm are the spaces accessible to the public, such as parks, plazas, and streets that become locales of energy and activity.

In innovation districts, public places are created or re-configured to be digitally-accessible (with high speed internet, wireless networks, computers, and digital displays embedded into spaces) and to encourage networking (where spaces encourage "people to crash into one another").[70] "Digital places," as defined by MIT's New Century Cities work, are the culmination of ambient technology, digital systems, and the physical form, creating venues for training and education, cultural events, and entertainment.[71]

Streets can also be transformed into living labs to flexibly test new innovations. In Boston, Barcelona, Eindhoven, Helsinki, and Seoul, streetscapes and public spaces are testing new innovations in street lighting, waste collection, traffic management solutions, and new digital technologies. Living labs are what 22@Barcelona calls "open innovation at the city-scale."[72]

The re-make of physical assets extend far beyond technology-infused places however, as the design and programming of public spaces is equally valued. Small-scale parks and plazas programmed with concerts, innovation expositions, and eateries give reason for people to congregate and mix. District leaders are designing and programming such spaces strategically across their districts in an effort to facilitate the building of networks.

Physical assets in the private realm are privately-owned buildings and spaces that stimulate innovation in new and creative ways. Building from a solid base of traditional assets, such as mixed-income housing, neighborhood-serving retail, and research and office complexes, new assets are designed to support the innovation-driven demographic. Office developments, for example, are increasingly configured with flex work spaces, lab spaces, and smaller, more affordable areas for start-ups.

Micro-housing is another example of a new physical asset. These units offer smaller private spaces (typically 300 to 600 square feet) and access to larger public spaces such as co-working spaces, entertainment spaces, and common eating areas. Often marketed for migrating workers in innovation sectors, local residents, and younger single workers, micro-housing is now found in the districts

of Boston, Barcelona, and Philadelphia (under construction). St. Louis is also planning micro-housing units in their district.

Physical assets that knit the district together and/or tie it to the broader metro area are specific investments aimed to eliminate barriers that hinder relationship-building and connectivity.

Practitioner interviews suggest there is considerable work to be done within districts, particularly in linking anchor institutions (commonly oriented within their own campuses) with the rest of the district. For some districts, knitting together the physical fabric requires remaking the campuses of advanced research institutions to remove fences, walls and other barriers and replace them with connecting elements such as bike paths, sidewalks, pedestrian-oriented streets and activated public spaces. For other districts, strengthening connections requires changes at a much larger-scale, such as entirely re-structuring large areas with smaller, more walkable blocks and pedestrian-scale streets.

Strategies to strengthen connectivity between the district and the broader metro aim to ensure innovation districts do not become islands unto themselves. Investments in infrastructure, such as broadband, transit, bike, and pedestrian paths are natural connectors to be considered. Extending broadband into adjacent, often low-income neighborhoods, for instance, is a valuable strategy in reducing the digital divide. Investments in public transportation—including the Silver Line in Boston, the Red Line in Houston, the future M-1 in Detroit—have been essential, for instance, in increasing accessibility between districts and their surrounding metro areas.

C. Networking Assets

The inclusion of networking as its own asset category is supported by a growing body of research that reveals how networks are increasingly valuable and prolific within innovation-driven economic clusters. Scholars cite numerous advantages of networks: they are important sources of new or critical information for new discoveries; they encourage experimentation and are a testing ground for ideas; they help firms acquire resources; they strengthen trust and collaboration within and across sectors; and they help firms enter new markets including global markets.[73]

The most famous success story of networking is Silicon Valley, where dense social networks were found to drive both experimentation and entrepreneurship. In her analysis of Silicon Valley, Saxenian observed, "Companies compete intensely while at the same time learning from one another about changing markets and technologies through informal communication and collaborative practices." She argues that while proximity—in this case, a regional agglomeration—contributes to the development of dense networks, a collaborative culture appears to play a more significant role.[74]

While countless numbers of science parks and tech parks were built on the hopes that Silicon Valley could be easily copied, Bert-Jan Woertman, an enthusiastic connector and creative communicator for High Tech Campus Eindhoven, reflects that "Networks cannot be copied nor can they be easily established."[75] A recent *Harvard Business Review* article similarly presented the difficulties in establishing networks, finding that even start-ups and their parent companies "cannot leave knowledge spillovers to chance."[76]

Districts attempting to cultivate networks are driven by experimentation, creativity, and even a sociological understanding of how networks function. A leading scholar on networks, Granovetter, differentiates networks as either having "strong ties" or "weak ties," which are determined by factors such as the frequency of contact, the emotional intensity of the relationship, and the reciprocity of commitments between the actors.[77]

Strong ties occur between people or firms with a working or professional history, higher levels of trust, willing to share more detailed information, and more apt to participate in joint problem solving. Weak ties occur between people or firms working within a different economic cluster or context where there is infrequent contact. Weak ties provide access to new information, even novel industry information, new contacts, and new information on business leads that are outside of existing networks.[78] While it may seem obvious that a dense network of strong ties is the optimal condition for a highly innovation-driven environment, research indicates that both strong ties and weak ties are fundamental to firm success.[79] Two primary categories of networking assets emerge from this research:

Networking assets that build strong ties focus on strengthening relationships within similar fields. These types of assets include: "tech regulars" (such as Eindhoven's Tech Regulars, where "techies" discuss problems or advances in their work as a collective), workshops and training sessions for

specific fields or technicians (daily activities along Boston's waterfront), cluster-specific meetings (22@Barcelona), industry-specific conferences and monthly meetings (found in several districts), and industry-specific blogs for local firms and entrepreneurs.

Networking assets that build weak ties focus on building new, often cross-sector, relationships. Examples include: networking breakfasts (such as 22@Barcelona's breakfast where experts and star innovators offer new insights in their fields followed by open time to network), innovation centers (such as Boston's newly constructed 12,000 square foot District Hall), hack-a-thons across industry clusters such as life sciences and tech (Stockholm), tech-jam start-up classes (found in Boston), and even the choreographed open spaces between highly programmed buildings (St. Louis). In this last example, St Louis will be clustering five innovation centers, with the purpose of generating "collision points" between smart people.[80]

Reflections from Practitioners

As innovation districts take hold, the real challenge is how each community marshals resources in a deliberate and customized way to capitalize on advantages and realize the promise of productive, inclusive, and sustainable growth. To that end, this section summarizes reflections from practitioners spearheading efforts to drive and develop districts. We found their experiences to vary considerably, in part due to the types of local actors, the level of resources at their disposal, and the distinct economic, physical, and networking challenges they set out to address. Even with these and other variations at play, practitioners for the most part offered similar reflections from their work so far.

This section is not meant to be a how-to guide for future districts but is instead intended to illustrate how these practitioners have come to understand and organize the complexities inherent in their work. It draws from interviews with practitioners and researchers working in leading edge innovation districts including University City in Philadelphia, Cortex in St. Louis, Kendall Square in Cambridge, the South Boston Waterfront, downtown and midtown in Detroit, South Lake Union in Seattle, the Texas Medical Center in Houston, 22@Barcelona, two innovation districts in Stockholm (Stockholm Life and Kista Science City), and Eindhoven in the Netherlands.[81]

We have consolidated their reflections into the following five strategies, each of which will be discussed in turn:

- Build a collaborative leadership network
- Set a vision for growth
- Pursue talent and technology
- Enhance access to capital
- Promote inclusive growth

1. Build a collaborative leadership network

A collaborative leadership network is a collection of leaders from key institutions, firms, and sectors who regularly and formally cooperate on the design, delivery, marketing, and governance of the district. Practitioners reflected that to bring innovation to scale—i.e. beyond the boundaries of individual organizations and firms—has required leaders from disparate institutions to encourage idea sharing across researchers, firms, universities, and supportive organizations. Likewise, physically remaking a place in the service of innovative growth and expanding employment and educational opportunities for low-income residents has required leaders to think and act in a multi-dimensional fashion, across multiple sectors and communities.

Practitioners in the field underscored the importance of a focused and organized leadership network to super-charge innovation, reshape places, build a culture of trust and collaboration, and steward networks. Interviews identified three key and, in some cases overlapping, models of leadership:

An important share of innovation district leaders found the Triple Helix model of governance to be foundational to their success.[82] The Triple Helix consists of structured interactions between industry, research universities, and government. Collectively, they design long-range visions and create new

vehicles for innovation, such as research centers and incubators. In the case of 22@Barcelona, St. Louis, Kista Science City (Sweden), and Eindhoven (Netherlands), the Triple Helix model established a clear organizational model of collaboration from the start. Further, Eindhoven and St. Louis are finding real success in a leadership model that includes a powerful development agency to execute strategies.

Practitioners also cited the valuable role of one person, a team of people, or designated entity serving as a "catalyst," an "integrator, or a "facilitator" throughout the process. This was found to be true even in cases using the Triple Helix model. Integrators or facilitators were found to stitch together disparate efforts, help conflicted leaders reach consensus, and simply kept the process moving along. In St. Louis, Bill Danforth, chancellor emeritus of Washington University, founded the BioSTL Coalition, a regional organization championing the bioscience cluster, which brought together city and regional leaders to forge a vision for growth and innovation.[83] In other places like Houston, Research Triangle, and Philadelphia, the powers and activities of an existing entity are rediscovered or reconfigured to fit the new purpose.[84] In Seattle, Vulcan Real Estate has played a critical role in including local community groups in discussions around the design and location of housing, infrastructure and amenities.

Finally, and of particular importance in the United States, practitioners cited the instrumental role mayors can play in catalyzing the formation and evolution of innovation districts—a role that will likely grow over time. Former Seattle Mayor Greg Nickels played a critical role in the growth of South Lake Union, making key infrastructure decisions around transit, roads, and energy. Former Boston Mayor Tom Menino's successful effort more recently to designate the South Boston Waterfront as an innovation district and steer its redevelopment in collaboration with a broad network of stakeholders is now being studied by mayors in cities as diverse as Albuquerque, Austin, Chattanooga, Detroit, and Pittsburgh as they seek to build on their strengths.

2. Set a vision for growth

A vision for growth provides actionable guidance for how an innovation district should grow and develop in the short-, medium- and long-term along economic, physical, and social dimensions. 22@ Barcelona, for example, envisioned and articulated in forward-looking documents, a "new model of a compact city," replete with innovation activities, green spaces, advanced industries, a strong industrial heritage, subsidized housing, a new mobility model, and revitalized public spaces.[85] St. Louis and Stockholm Life also devoted the necessary time and resources to develop a highly visual, long-term vision for their districts. Beyond these examples, most practitioners cited the importance of developing a vision to leverage their distinctive strengths—economic clusters, leading local and regional institutions and companies, physical location and design advantages, and other cultural attributes. Innovation districts that may share the same physical geography (e.g., a downtown or waterfront setting) or similar institutional platforms (e.g., an advanced research institution or medical campus) can have radically different opportunities for growth.[86]

Clarify your competitive advantage

Given the distinctive starting points and strengths of disparate places, many district leaders grounded their visions in evidence, developed through the accumulation of relevant data and information, and accompanied by smart analysis, experience and intuition. Some places conducted analyses to guide areas of industry and entrepreneurial growth. Others instead used a bottom-up process driven by entrepreneurs to identify new and emerging areas of growth.

Many practitioners in the United States explained how detailed analysis helped define which clusters and/or research areas to advance. In the early stages of St. Louis' conceptual planning, for instance, Battelle was hired to conduct a thorough analysis of the region's industry clusters in life and plant science. The diagnostic included several areas of study: an assessment of the region's economic strengths (evaluating their range of strengths within life sciences); a benchmarking exercise (against leading and comparable regions); and a SWOT analysis (a quantitative and qualitative analysis of strengths, weaknesses, opportunities, and threats). This work was an important precursor to the formulation of specific plant and life science strategies for St. Louis to consider.[87]

As the St. Louis example demonstrates, a city's or metropolitan area's distinctive economic strengths helped orient actors to the clusters that have the best chance of success rather than rely on a government's attempt to pick industry winners. In fact, St. Louis' strength in plant and life sciences,

Philadelphia's strength in health, computing and informatics, and energy, and Eindhoven's strength in precision machinery are the very clusters promoted in their innovation districts. As these places have evolved, new, emerging clusters grew out of R&D and smart commercialization or through surprising synergies between two or more clusters, creating an even more dynamic network of clusters.

Other practitioners have applied a more bottoms-up approach to identify new and emerging areas of growth. Through a methodology known as "smart specialization," Stockholm and Eindhoven encourage entrepreneurs and other economic actors to enter into a process of "entrepreneurial discovery" to collectively determine new innovation projects or new areas of R&D. Rooted in open innovation, firms and entrepreneurs meet in structured settings to brainstorm, analyze, and ultimately test new ideas. Importantly, this approach aims to move the broader collective of firms into new and emerging areas.[88]

Ylva Williams of the Stockholm Science City Foundation described their intricate process of supporting entrepreneurs, larger companies, universities, and health care providers to collectively identify new market opportunities. One successful example is the convergence between Stockholm's strong sectors of life science, tech and ICT sectors (which also builds bridges between the city's two main innovation districts: Stockholm Life and Kista Science City). In an effort to develop new digital health products and services, entrepreneurs, companies, and other public organizations developed the following process:

- **Ideation workshop.** Patients, healthcare providers, companies and entrepreneurs define challenges or problems and subsequently develop potential solutions. If desired, participants can form teams around a possible solution.
- **HealthHack.** A 48-hour workshop where teams of experts from tech/ICT and life sciences work together to find solutions to the ideas generated in the ideation workshop. Products in this phase range from sketches and prototypes to software ideas.
- **Design workshop.** With the support of sector experts, the teams refine and design their prototypes developed during HealthHack.
- **Pitch workshop.** The teams receive training in how to make successful pitches.
- **Digital Health Days.** The best teams are selected to give a pitch presentation during the international meeting and the audience will vote for the best team.[89]

Smart specialization, such as this above process, aims to "identify new product segments and further strengthen our competitive advantage," said Williams. Perhaps somewhat similar in philosophy, some U.S. districts, including Boston's innovation district, have opted to be silent on clusters, arguing that the selection process derive from entrepreneurs and the market itself.

Imagine a new mix of institutional assets

Practitioners have come to understand that a future vision of a particular district does not begin and end with an assessment of its existing institutional assets. They are keenly aware of the growing trend of leading edge technology and pharmaceutical companies, private and public universities, and even medical campuses to move advanced research and other critical assets to those locations that generate the largest return on investment for the firm or institution. From this understanding, district leaders have become more deliberate in their efforts to lure major innovation assets to their sites (i.e., to "un-anchor anchors") or to form new institutions whole cloth."

The innovation district in downtown Detroit was catalyzed by the decision of Quicken Loans to move its headquarters from suburban to downtown Detroit. Boston's successful enticement to Babson College and the Fraunhofer Institute to open outposts on the South Boston waterfront is another example of this trend as is the University of Washington's decision to locate an advanced medical research campus in Seattle's South Lake Union. Stockholm's largest technical university, KTH, opened a technical branch within Kista Science City. Lastly, 22@Barcelona successfully lured numerous universities to locate within their district, creating a new gravitational pull in the region and a new location for students, researchers and entrepreneurs to innovate jointly.

Re-imagine your physical landscape

Successful practitioners routinely spoke of the need to transform the physical landscape of their districts to create the favored attributes of complexity, density, and mixed uses and activities. This has been particularly challenging in places that bear the indelible markings of 20th century development.

Heavy infrastructure—highways and exposed railroad tracks—often divide natural districts. Euclidian zoning, originally intended to protect health and safety, segregated uses and isolated housing, office, commercial, and manufacturing activities from each other.[90]

A number of innovation districts have therefore required variances from antiquated land use and zoning ordinances and, in some cases, radical changes to existing infrastructure.

In the "anchor plus" model, practitioners have re-drawn existing lines—tearing down walls, fences and other, even more substantial, barriers between anchor institutions and others, creating new mixed-use neighborhoods, making and creating new public spaces, and activating streets to draw people together, and re-designing corridors to make them more pedestrian-friendly. In both Kendall Square near MIT and St. Louis' Cortex district, city governments (or their designated agents) revised land use conventions and zoning ordinances to affect this change. One Stockholm innovation district, Stockholm Life, is in the process of covering over (also known as "decking") two highways that divide their anchor institutions and firms. In doing so, they will have space to build 5,000 units of housing, laboratories, several schools, and open space, effectively stitching the district together.[91]

Practitioners involved in re-imagining urban areas have also undertaken (or benefitted from) pronounced changes to the physical infrastructure. 22@Barcelona, for example, was built on the remains of a 494-acre industrial area, scarred and separated from the rest of the city by railroad tracks. Through extensive public planning and investment, 22@Barcelona buried these tracks, increased access via a new public tram, designed walkable streets, and created new public spaces and housing.[92] Boston's innovation district was enhanced by the Big Dig, the removal (and submerging) of elevated highways that separated the south waterfront from the rest of the city. Equally important, construction of Boston's third harbor tunnel markedly increased the level of access to the innovation district for both cars and transit.[93]

In the few cases of the "urbanized science park," re-imagining land use is the precursor to realizing any aims of urbanization—density, a mixing of uses, and a concentration of activities. This counters the original design of science and research parks, as exemplified by North Carolina's Research Triangle Park, which were intended to ensure seclusion, isolation, and the protection of intellectual property, often on their own "research estates," as the RTP Master Plan puts it.[94] Today, an outsized portion of RTP's master plan focuses on its physical redevelopment: specific urban nodes allowing greater density and amenities, the development of a vibrant central district with more retail, and building up to 1,400 multifamily housing units.

Innovation districts relied on a variety of planning tools as they engaged in this work. 22@Barcelona, Cortex in St. Louis, and Cambridge (MA), for example, developed master plans to address the complexity in physically redeveloping their districts. Under existing state statute, the city of St. Louis designated Cortex West Redevelopment Corporation the master developer of the innovation district. Cortex is also responsible for master planning, oversees development, issues tax abatements, and may use eminent domain. MIT experts in their global work on innovation districts found tremendous success using strategic visions, which are more nimble in scope than traditional master plans. Boston, instead, developed design guidelines and development standards to guide changes incrementally as new developments come on-line.

Lastly, a number of district leaders spoke of efforts to physically brand their area in effort to create a clear, undeniable experience when people enter a district. Dennis Frenchman from MIT describes branding as "narrative design" where the physical landscape is enhanced "so they more clearly communicate a particular set of images and stories."[95] District branding has included the strategic use of urban design elements (such as building massing, street design, public spaces, materials, and plantings); gateway development (where entrances into the district are pronounced or marked in some unique way); communicative digital displays, lighting, signage and banners (all carrying the district logo) along key corridors, at district gateways, and in public spaces.

3. Pursue talent and technology

Talent and technology appear to be the twin drivers of innovation in these districts. Talent commonly refers to those workers with the specialized education and skills necessary to generate new discoveries, commercialize ideas, design new products or production methods (or tinker with existing ones), and manage, brand, and package the ultimate result for the marketplace. Technology refers to the

tools, machines, infrastructure, and systems that help talented workers engineer industrial breakthroughs, disentangle big data and complex problems, and facilitate the production processes that follow. Both fields of work, practitioners shared, have required systematic planning and execution.

Dedicate efforts to attract, retain and grow talent

Practitioners argue that their ability to attract, retain, and grow talent plays a valuable role in differentiating seemingly identical clusters across U.S. and global cities and regions. Similar to businesses and leaders at the regional- and city-scale, district leaders have developed their own campaigns to lure individuals trained or educated in specific niches and specializations.

Practitioners explained that efforts to attract talent—which includes organized outreach programs, marketing campaigns, and highly tailored scouting techniques—largely target highly educated and skilled workers from other parts of the country, if not other global regions. Barcelona's aim to become a global hub of innovation required both a local and global workforce, driving efforts to target international professionals as stimulants for local economic activity.[96] Eindhoven, in their drive to be the "smartest region in the world," found this necessitated a pooling of talent from across Europe and around the globe.[97] South Lake Union's most successful attraction strategy was to entice Amazon to move to the area. As one entrepreneur said: "We love being next to Amazon" They are to South Lake Union and Seattle what Microsoft was to Redmond and the Eastside in the 1990s. They attract a lot of talent. Talent begets talent."[98]

Efforts to retain talent were found to be similarly critical. Years of growing and assembling a strong pool of talent can quickly lead to paralyzing setbacks with the loss of key researchers and faculty. Eindhoven, for example, has dedicated staff focused on talent retention, offering a pipeline of support including cultivating dual career opportunities, and cultural training for international workers on "how to deal with the Dutch."[99] The retention of recent university graduates is equally important, a renewing source of human capital.

Growing talent, while the most time- and resource-intensive of these three categories, is described by practitioners as the very heart of a district's core mission. On one hand, growing talent means growing entrepreneurial capacity and catalyzing start-ups and spin-offs dedicated to commercializing ideas. All practitioners interviewed underscored the extent to which they designed programs, and even often constructed new buildings, to support the growth process of entrepreneurs. "It's all about programming: choreographing 'spontaneous' opportunities for smart people to interact with each other. This is what separates us from traditional science parks," shared Dennis Lower of Cortex in St. Louis.[100] On another level, growing talent means developing a feeder system of STEM workers with the general and customized skills necessary for participation in innovative sectors. Recent work and experiences will be highlighted in the section on promoting inclusive growth.

Seamlessly integrate technologies into the landscape

Practitioners emphasized that technology plays two roles across the district landscape.

First, advanced technology provides the platform upon which innovation is conceptualized, advanced in R&D, and developed during prototyping and product formulation. Specializations such as artificial intelligence, next-generation genomics, and software development, rely heavily on advanced technologies, such as robotics, nanotechnology, and sophisticated computer systems.

The extent to which technologies now drive advancements in science and other fields is what propels districts to invest in technology enhanced facilities. A 2012 survey of university research parks in North America—one example of the "anchor plus" typology—reveals that 75 percent of these districts now contain specialized laboratory facilities.[101] Innovation districts in Cambridge, St. Louis, and Eindhoven have found real success in sharing many of these cost-prohibitive technologies with firms and entrepreneurs through shared workspaces, shared laboratories, and technology centers. As Johannes Fruehauf, the head of Lab Central in Cambridge says, researchers should focus on "perfecting their science" rather than making substantial capital expenditures and assuming large early risks and liabilities.[102]

Second, practitioners have observed the salutary effect of embedding technology in standard public infrastructure to create a platform for innovation. Installations of fiber optics to create a high quality internet environment are now considered an investment in "the basics." St. Louis, for instance,

is making substantial upgrades in internet connectivity by adding fiber to the existing sub-street infrastructure, further enhancing the computing power around big data and the potential for the commercialization of innovation.[103] 22@Barcelona constructed separate tunnels to lay fiber to ensure that upgrades to the system would be easier to meet growing demand.[104] As described in the section describing physical assets, some districts are attempting to reduce the digital divide by extending fiber optics into adjacent, often low-income, neighborhoods. In their global work, MIT researchers focused on New Century Cities observed real growth in the development of digital systems (display and interactive communication systems designed into objects such as bus stop walls and café table tops) and digital places (the nexus of technology, the physical form, and activity creating new ways to teach/train and to entertain). These digital models are particularly pronounced in newer cities and districts in Asia (such as Seoul's Digital Media City) and the United Arab Emirates (Masdar City in Abu Dhabi).[105]

4. Promote inclusive growth

Promoting inclusive growth means using innovation districts as a platform to regenerate adjoining distressed neighborhoods as well as creating educational, employment, and other opportunities for low-income residents of the city.

Given broader trends around economic restructuring, anemic job growth, and wage stagnation, many cities and metropolitan areas have experienced substantial increases in the number of people living in poverty and near poverty over the past decade. As described below, innovation districts offer multiple opportunities for neighborhood revitalization, quality employment, and poverty alleviation. Pursuing these opportunities will lessen the tensions between innovative and inclusive growth, which have emerged in many communities.

Pursue comprehensive neighborhood revitalization

As a recent survey of urban-oriented research parks highlights, 45 percent of these parks are adjacent to, or located within, distressed communities.[106] For this very reason, anchor institutions, like the University of Pennsylvania and Drexel University are pursuing the regeneration of adjoining neighborhoods through multiple strategies to improve public safety, provide quality education, enhance digital literacy and connectivity and expand affordable housing and retail opportunities.

As one practitioner explained, quality public schools are central to this multi-layered effort. To that end, several innovation districts are placing their considerable academic, real estate, and tech talent in the service of broader education reforms. This includes creating or adopting area schools, such as STEM charter schools or magnet schools, developing STEM-oriented curriculum, offering teaching assistance, and providing internship opportunities. In Philadelphia, for example, a consortium of institutions led by Drexel University is working with the city to create a K-8 school near its campus in an underserved neighborhood. The middle school program will be created and overseen by such esteemed institutions as the Science Leadership Academy high school in partnership with the Franklin Institute and the Academy of Natural Sciences of Drexel University. The development of the larger site would include a commercial component to yield capital dollars to help fund this school.[107]

Increase labor market participation

Innovation districts are likely to grow jobs in multiple sectors such as housing, construction, medical, tech, services, and retail. The districts, therefore, offer ample opportunities to connect residents in high unemployment areas (particularly young residents) to occupations that require disparate sets of skills and work experience. Practitioners noted the need to be purposeful in hiring, training, and supporting local talent, with the ultimate goal of giving low-income workers economically-mobile career paths with family-sustaining wages. Further, by redirecting capital and jobs back into urban cores and urbanizing suburban parks, jobs become increasingly accessible, particularly by transit.

A number of practitioners emphasized the potential for equipping workers with the skills they need to participate in the innovation economy. Tom Andersson of Kista Science City in Stockholm, explained how they view this as their responsibility "in addressing the competence issue for the long-term."[108] One strategy a few practitioners are applying is to focus on the many innovation jobs (e.g., lab technicians) that require customized technical training in high schools or community colleges, rather than a four-year or advanced college degree. In fact, in mature science and research parks, the conventional

wisdom is that 40 percent of the jobs require high school diplomas or associate degrees, 40 percent require bachelor degrees, and only 20 percent require masters and Ph.Ds.[109] This dovetails with Brookings research, which found that half of all STEM occupations are available to workers without a four-year college degree, arguing for an expanded definition of talent.[110] The St. Louis and Barcelona districts are particularly focused on this potential, experimenting with school-to-work programs, apprenticeships that teach career-building skills and on-the-job training programs.

The challenges associated with linking low income residents to innovation-oriented jobs should not be underestimated given vast educational disparities. In Philadelphia, district leaders are also looking to connect area residents to job opportunities in the secondary and tertiary sectors (e.g., services, retail) that the innovation district catalyzes.[111]

Stimulate local entrepreneurship

Innovation districts, finally, also offer rich opportunities for local entrepreneurial growth. In some cases, specific programs have been designed to grow or support entrepreneurs from pools of less educated residents and workers. The district in Medellin, Colombia, for example, is growing talent through its fabrication lab (known as Fablab), cultivating innovations developed by people living in informal settlements.[112] Free to the public, the Fablab offers state-of-the-art high technology equipment, including the latest in 3-D, digital production.[113] Drexel University and other area anchors in Philadelphia are pursuing entrepreneurial opportunities presented through local procurement.[114] As shown by a recent report released by the Philadelphia city controller, purchases made by anchor institutions form a substantial potential market for local firms.[115] These anchors are now coordinating efforts to hire local (including minority-, and women-owned) businesses to provide these products and services—essentially creating their own local supply chain. As Lucy Kerman of Drexel observed, "Local businesses tend to hire locally so anchors can effectively partner with local businesses, creating new jobs and new opportunities."[116]

5. Ensure Access to Capital

Capital is a necessary ingredient to fuel district growth and expansion. Financing in many forms and from a variety of sources is needed to support basic science and applied research; the commercialization of innovation; entrepreneurial start-ups and expansion (including business incubators and accelerators); urban residential, industrial, and commercial real estate (including new collaborative spaces); place-based infrastructure (e.g., energy, utilities, broadband, and transportation); education and training facilities; and intermediaries to steward the innovation ecosystem. A district-wide integrated strategy, as opposed to compartmentalized efforts, enhances the likelihood that different sources of capital will value the potential of this new form of development, ultimately supporting different kinds of firms, institutions, and activities.

Redeploy and leverage local capital

Many practitioners understand the importance of garnering local capital from disparate public, private, and civic sources to spur innovation district growth, particularly in the early stages. The provision of local capital, particularly at-risk capital, is a market validator and shows that local investors are willing to back the effort. To accomplish these goals, practitioners have been intently focused on redirecting local resources to new innovative purposes and smartly leveraging these resources so that they have full impact.

Practitioners point to early signs that the mixing and leveraging of different sources of local capital is already underway. City governments, for example, are smartly redirecting scarce public resources in ways that garner large private and civic investments. In St. Louis, the city government is using tax increment financing to support infrastructure improvements. The city has also designated Cortex as the master developer for the area, delegating an ample suite of redevelopment powers including the right to exercise eminent domain, abate taxes, and enter into parcel agreements with developers; those decisions have likewise leveraged hundreds of millions of dollars in private and civic sector investment.[117] In 2003, for example, the Danforth Foundation announced that St. Louis-based plant and life sciences would be a predominant focus of its grant-making.[118] In tandem with the McDonnell Foundation and private corporations, the Danforth Foundation led efforts to establish

the BioGenerator, a sophisticated accelerator with a non-profit seed fund. In the last five years, the BioGenerator helped close the funding gaps challenging many local startups, aiding in the successful launch of over 40 new life science enterprises. Further, this accelerator set its eyes on drawing national and regional capital, with its parent organization BioSTL hiring a dedicated person to increase access to national VCs, angel investors, and others.[119]

Local institutional capital is also being unlocked to spur urban regeneration. MIT, for example, has used its extensive land holdings in Cambridge to spur the development of research, entrepreneurial, commercial, office and residential space.[120] In Detroit, meanwhile, philanthropic investments have been a main catalytic force. The Kresge Foundation alone recently committed $150 million over five years to implement the recommendations and strategies outlined in the Detroit Future City report, doubling down on the investments it has already made along the riverfront, in M1 Rail, in the planning for the Detroit Future City effort, and as part of both the New Economy Initiative and Living Cities.[121] These investments have provided a platform for large-scale federal investments (via FHA, DOT, SBA, HUD, and other sources) as well as other state and private sector commitments.

Provide a roadmap for broader private, civic and public sector investment

Practitioners understand that innovation districts will only reach their full potential when companies and investors outside the city and metropolis either decide to locate facilities in the district or otherwise deploy capital. Practitioners recognize further that innovation districts, by providing both a geographic, economic, and entrepreneurial focus, can bring together, in a disciplined and market-oriented way, the disparate elements required to accelerate city regeneration and metropolitan growth.

The practical implications of these insights: innovation districts must make a compelling case for investment and even create special investment vehicles tailored to disparate kinds of activities. Some innovation districts are experimenting in this regard as an avenue to raise capital. The emerging innovation district in Detroit, for example, is considering an investment prospectus that presents the vision and goals of the district, shows the market momentum to date (including a profile of major investors and investments), and describes current and future market opportunities. The prospectus would both make a general case for investment in the district but also target discrete classes of investors and institutions (real estate developers, equity investors, large firms, venture capital, and others).

The Detroit investment prospectus would cleverly build upon existing activities that have already attracted disparate kinds of investors to distinct opportunities. Invest Detroit, for example, has established a series of funds (e.g., a Predevelopment Loan Fund, an Urban Retail Fund, a Lower Woodward Housing Fund, a New Markets Tax Credit Fund) that try to match the expectations of private and civic investors with the financing needs of small- and medium-sized firms that serve different market functions in the downtown and midtown area.[122] It is expected that the Detroit investment prospectus and the subsequent hosting of investor forums would educate the investment community about the market momentum in the innovation district and attract more capital to the specialized funds administered by an institution with a proven track record.

Scaling Innovation Districts

The rise of innovation districts—in all three typologies—has, to date, been a local phenomenon. Mayors and corporate, university, and philanthropic leaders, local developers, and intermediaries have largely driven their growth and development in most cities. A few national and global institutions have established a presence, with capital and facilities, in the leading edge districts, but most major companies and institutional investors have yet to acknowledge or adapt to this trend. The federal government has been an important but silent investor. With a few notable exceptions, states have largely acted without focus or purpose. To date, networks of innovation district practitioners and leaders remain nascent and isolated.

If current trends are any indication, innovation districts will continue to grow in size and scale, fuelled by market and demographic dynamics, open innovation, local leadership, and the place based investments of large anchor institutions. But if innovation districts are to realize their full potential across the country, then asset-rich companies, civic entities and financial institutions—with expertise

honed from global experience—need to invest at scale. Higher levels of government also need to act with more predictability and purpose.

A. Scaling Private and Civic Investment

As described previously, local institutions and investors have, to date, played the primary role in powering growth and innovation district development forward, leveraging local institutional assets and sharpening their case for broader investment. A few institutions of national scope—tech giants like Microsoft and Google, big pharmaceutical companies like Pfizer and Novartis, large urban development firms like Forest City Enterprises and life science focused real estate investment trusts like Alexandria Equities—have spotted the emerging trend and moved facilities and capital to the leading edge innovation districts. But, for the most part, large national and global institutions have not participated at scale.

Several things are necessary if that is to happen.

First, innovation districts need to be recognized as a separate sub-metropolitan/sub-urban geography worthy of focused data collection and analysis by companies that follow urban real estate and innovation trends.

Markets are created when risks and returns are made transparent, so that investors can invest in an informed way. Tracking economic trends in innovation districts (e.g., residential growth, real estate value appreciation, business formation and growth, tech transfer activity) will give investors the confidence to enter the market at scale. Companies that invest in innovative firms and start-ups will look at a broader set of cities and metropolitan areas for their investments. Companies with expertise in delivering mixed-use development and urban-oriented retail (e.g., Post Properties, Whole Foods) will see innovation districts as fertile geography for their products and services and locate accordingly. Firms that either provide innovative products and services (or provide legal, accounting, marketing, and other advice to such firms) will shift locations as well.[123]

Given the potential for job creation in the districts, philanthropies, corporate as well as civic, will see the wisdom of supporting efforts to make innovation more inclusive. And given the entrepreneurial spirit of these new communities, demand for crowd-funding for creative and community projects will grow exponentially. Innovation districts represent, in short, a form of market creation, which will grow in size and scale as data and analytics are sharpened, first mover firms show decent returns on their initial investments and standards and models for more routinized investment are established.

Second, and more aspirational, innovation districts ultimately need to be treated as a unified asset class that recognizes the synergistic effect of disparate investments that strengthen and reinforce each other's value, rather than as a collection of separate and unrelated investments. This is a major challenge to the status quo. Financial institutions, governmental agencies, and philanthropies compartmentalize all aspects of financing (equity investments, debt lending, and grant making just to name a few) even though the focus of these investments (e.g., housing, infrastructure, small business) are physically located in small geographies and interact in a way that enhances value for each of the disparate elements.

Innovation districts, by contrast, offer a possible vehicle for "thinking horizontally across industries and sectors" and overcoming the propensity of investments in cities to come from fragmented sources in "vertical silos."[124] As innovation districts evolve, the hope is that this insight will spur new financial innovations and unleash new flows of capital. Large commercial banks might establish special initiatives to bring spatial coherence to their current array of aspatial products and financing vehicles. Other large financial institutions might invest directly in firms and intermediaries at the cutting edge of design, execution, and management of this new development form (Blackstone's investment in the mixed use developer Eden Communities is an early example of this kind of capital shift). The end result of this: an ample supply of early stage venture capital and commercial lending becomes available in innovation districts to support the building and expansion of innovation-related firms, reinforced by real estate, small business, and community lending to create the housing and mixed-use buildings these firms and their workforce need to thrive.

B. Smart Feds, Smart States

The federal government and states, to date, have not intentionally driven the rise of innovation districts and, for the most part, have not even been cognizant of the trend. Their active engagement and involvement could accelerate the growth of districts, provided it respects the organic and differentiated nature of this nascent trend. They have three important roles to play: spurring innovation and entrepreneurial growth, financing land and infrastructure improvements, and boosting human capital.

Spurring Innovation and Entrepreneurial Growth

It is simply impossible to imagine the late 20th century rise of "cities of knowledge" in Silicon Valley, the Research Triangle, or the Boston megalopolis without recognizing the foundational role played by federal investments in basic and applied science and state investments in public universities.[125] The federal and state governments, in short, have provided the institutional platform for innovation, the base for the generation and commercialization of ideas and the creation and expansion of companies.[126]

The federal and state governments do, however, play disparate roles. For example, the federal government dominates in research funding, with federal actual outlays for R&D in FY 2011 of $125.7 billion, compared to state (and local) governments which account for only 1 percent of national R&D expenditures, with $3.8 billion in 2011, most of which is for academic R&D at colleges and universities.[127] The federal government also supports the start-up, expansion, and trading activity of firms through the lending activity of the Small Business Administration and the Export-Import Bank. The states, by contrast, are major direct investors in public universities, advanced research aligned with state economic clusters and competitive advantages, and tax and spending investments in sophisticated building and equipment.

The general message to both the federal and state governments is to stay the course and continue to provide consistent platform funding and support for innovation. At a time of increasing fiscal austerity, maintaining the status quo would be victory enough. Yet there are several more targeted roles that the federal government and particularly the states should consider.

- ***The smart location of advanced research institutions:*** Given the shifting spatial geography of innovation, the federal government and states should consider locating new or existing advanced research facilities (or providing incentives for the location of such facilities) in innovation districts. The federal government achieved this when it located the first National Manufacturing Innovation Institute, focused on additive manufacturing, in the downtown of Youngstown, Ohio, close to the existing base of small and medium-size manufacturing firms.[128] The state of California achieved this when it located the Institute for Regenerative Medicine in the Mission Bay district of San Francisco.[129] As described earlier, the shifting of public university advanced research facilities to innovation districts (e.g., the location of UW Medicine in the South Lake Union district of Seattle) has become a recognized trend. In the next decade, states in particular would be wise to rethink the location of the research arms of institutions of higher learning to spur market creation and radically increase the return on state investment during a period of fiscal challenges.
- ***Targeted research funding:*** As federal funds for advanced research become scarcer, states would be wise to dedicate focused capital to advanced research efforts that builds on their special sector niches and competitive advantages. A recent Brookings paper noted the increased use of ballot box referendums for these purposes in California, Massachusetts, New Jersey, New York, and Texas.[130]
- ***Catalytic funding:*** States are often involved in particular tax and spending transactions that help grow the institutional platform for innovation in cities and metropolitan areas. The state of New York, for example, recently allocated $45 million to Buffalo to facilitate the expansion of the Columbus, Ohio-based Edison Welding Institute, one of the most advanced shared infrastructure facilities in the United States.[131] The state of Massachusetts, meanwhile, recently made a $5 million grant to facilitate the building of the LabCentral facility in Cambridge.[132] These kinds of targeted investments for capital projects complement the more routine funding that is available for basic science and applied research and, if located in strategic places, can promote synergy and rapid commercialization.

Financing/Regulating Land and Infrastructure

The federal government and states have traditionally played a large role in the financing and regulation of the physical realm of cities. To varied degrees, both levels of higher government make direct or indirect investments in transit, roads, other infrastructure, parks, housing, and other capital improvements. States also determine building codes and standards of construction, establish how tax delinquent properties can be foreclosed, and dictate the ground rules for using eminent domain.

As with innovation funding, federal and state funding for major physical assets have been unreliable in recent years, either due to revenue shortfalls in dedicated funds (e.g., the federal Highway Trust Fund) or partisan gridlock (e.g., the failure to reauthorize federal transportation laws on a timely basis). Thus, the first order of business is to make funding more reliable and predictable, and more flexible so that cities and metropolitan areas can apply the funding to the special needs of innovation districts.

But, several other focused engagements should be considered.

- ***Smart removal of infrastructure barriers:*** Many innovation districts, particularly those located near waterfronts and downtowns, still bear the scars of mid-20th century freeway construction that often divided communities and disrupted the organic street grid and connectivity of urban places. The removal and reconstruction of such infrastructure provides a means to spur innovative markets. The rise of the innovation district in the Boston Waterfront is, in many respects, a consequence of the Big Dig project to tear down and bury key highways, thereby re-connecting the waterfront to the broader city and metropolis. Similar efforts are underway in cities as diverse as Akron, Detroit, and Syracuse and will have enormous impact on investment and jobs once concluded.
- ***Smart use of tax incentives***: Innovation districts often house properties of historic value, which, if renovated and repurposed, could be a critical component of a district's brand and growth. They also tend to contain land parcels that are still contaminated by prior industrial use and require remediation that costs more than market value can bear. Targeted tax incentives for historic preservation, brownfield remediation, and land assembly have a high return on investment when applied in emerging innovation districts and should be encouraged and expanded. The Cortex district in St. Louis has already taken smart advantage of Missouri tax incentives and is a model in this regard.[133]
- ***Smart mortgage standards:*** Innovation districts thrive when housing, retail, and small-scale innovative activities are co-designed and co-located near transit stops and anchor institutions. In the past, federal government sponsored entities and other federal and state agencies disfavored such mixed- use developments, setting a platform instead for large scale financing of single family homes. As housing reforms take hold in the aftermath of the Great Recession, sensible standards around mixed-use development and multifamily housing would benefit the smart, fiscally prudent growth of innovation districts.

Boosting Human Capital

The federal government and states heavily influence the delivery of basic education and skills training in cities and metropolitan areas. The U.S. Department of Education spent some $68 billion in FY 2011, on both K-12 and higher education, plus another $29 billion in tax expenditures related to education. States spent $261 billion of their own funds for the same purpose, while local governments spent nearly $600 billion on education.[134] Relatedly, the U.S. Department of Labor spent $9.7 billion on employment and training programs in FY 2011.[135]

Innovation districts benefit when these large scale federal and state resources are applied in a way that can be customized to their special education and skills needs. To this end, several models are worth considering:

- **Apprenticeship Carolina** helps South Carolina firms in a handful of key industry clusters establish apprenticeship programs that provide effective on-the-job training opportunities for prospective employees. It is based out of the South Carolina Technical College System. Consultants from Apprenticeship Carolina provide assistance throughout the development process, working with firms to create apprenticeships that meet the requirements of the national Registered Apprenticeship system.[136]

- **Oregon's Career Pathways** initiative is focused on increasing the number of Oregonians with post-secondary certificates and degrees to prepare them for employment for jobs requiring more than a high school diploma but less than a Bachelor's degree. It is offered through the state's 17 community colleges and is designed to provide "stackable credentials" of academic certificates (12-44 credits) that can lead either to immediate employment or to the next academic credential within the career pathway, potentially leading to an associate's degree. At Portland Community College, the Career Pathways initiative includes courses and certificates in fields such as accounting, manufacturing, and medical coding.[137]
- **New York State Pathways in Technology Early College High School** (NYS P-TECH) initiative is an effort to prepare thousands of disadvantaged students for jobs in such sectors as technology, manufacturing, healthcare and finance. The model is a six year, "9-14" program that combines high school, college, and career training and involves close partnerships with core industries.[138]

The Path Forward

The potential for innovation district growth in the United States is exceptionally strong. Virtually every major city in the United States has an "anchor plus" play given the confluence of a strong central business district (mostly for the congregation of government and corporate headquarters, entertainment venues, and cultural functions), a strong midtown area (where advanced research institutions and medical campuses tend to concentrate), and a state-of-the-art transit corridor connecting the two.

Many cities and older suburban communities are also making progress on "re-imagined urban areas," repositioning underutilized sections of their community through investments in infrastructure (or infrastructure removal), brownfield remediation, waterfront reclamation, and transit-oriented development.

Lastly, a handful of "urbanized science parks" (and their adjacent suburban communities) are clustering development, encouraging density, and creating spaces to allow individuals and firms to network openly.

The rise of innovation districts seem perfectly aligned with the disruptive dynamics of our era: "crowd sourced rather than close sourced, entrepreneurial rather than bureaucratic, networked rather than hierarchical."[139] They also intensify the very essence of cities: an aggregation of talented, driven people assembled in close quarters, who exchange ideas and knowledge in what urban historian Sir Peter Hall calls a "dynamic process of innovation, imitation, and improvement."[140]

Innovation districts, in short, represent a clear path forward for cities and metropolitan areas. Local decision makers—elected officials and heads of large and small companies, local universities, philanthropies, community colleges, neighborhood councils and business chambers—would be wise to unleash them. Global companies and capital would be smart to embrace them. States and federal government should support and accelerate them. The result: a step toward building a stronger, more sustainable and more inclusive economy in the early decades of this young century.

Endnotes

1. Anchor institutions are research universities and research-oriented medical hospitals with extensive R&D.

2. Select excerpts in this and future sections came from the recent book, *The Metropolitan Revolution: How Cities and Metros are Fixing our Broken Politics and Economy,* Innovation Districts chapter, co-authored by Bruce Katz and Jennifer Bradley.

3. Pete Engardio, "Research Parks for the Knowledge Economy," *Bloomberg Businessweek*, June 1, 2009.

4. The term 'innovation ecosystem' is commonly defined and described in technology and business development magazines, newspapers, and on blogs. Brookings developed this expanded definition to incorporate a more extensive list of variables observed to contribute to the innovation ecosystem at the district scale.

5. Our observations are based on extensive interviews with practitioners and leaders on-the-ground, visits to more than a dozen districts in both the United States and Europe, reviews of other scholarly research on this trend and specific fields of study (such as the growing field of networking and the changing nature of physical planning), and a roundtable discussion held at the Brookings Institution in April 2013 with nationally-recognized urban development experts.

6. To learn more about 22@Barcelona, refer to the website: www.22barcelona.com. Another source was co-authored by the CEO of 22@Barcelona, Josep Miquel Pique'. Refer to Montserrat Pareja-Eastaway and Josep Miquel Pique', "Urban Regeneration and the Creative Knowledge Economy: the Case of 22@ in Barcelona," *Journal of Urban Regeneration and Renewal* 4 (4) (2011): 1-9.

7. Research Triangle Foundation of North Carolina, "Research Triangle Park: Master Plan" (2011).

8. Brookings research, supported by supplemental research by Wexford Science and Technology, identified three other "urbanized science park" examples: University Research Park at the University of Wisconsin-Madison, available at www.universityresearchpark.org/property/urp2/ (April 11, 2014); the University of Virginia Research Park, available at www.uvaresearchpark.com/the-park/park-map/ (April 11 2014); and the University of Arizona Tech, available at www.techparks.arizona.edu/parks/ua-tech-park/planning-development (April 11, 2014).

9. Mark Muro and Alec Friedhoff, "Metropolitan Jobs Recovery? Not Yet." Brookings, *The Avenue*, April 2014.

10. Brookings analysis of Census data.

11. For more, see Bruce Katz and Jennifer Bradley, *The Metropolitan Revolution: How Cities and Metros are Fixing our Broken Politics and Economy* (Washington: Brookings, 2014).

12. Lydia DePillis, "Dinosaur Makeover: Can Research Triangle Park Pull Itself Out of the 1950s?" *New Republic,* October 12, 2012. Available at www.newrepublic.com/article/108527/can-research-triangle-park-pull-itself-out-1950s (April 19, 2014).

13. Edward K. Muller and Paul A. Groves, "The Emergence of Industrial Districts in Mid-Nineteenth Century Baltimore" *Geographical Review* 69 (2) (1979): 159-178.

14. Ibid.

15. Ibid.

16. Asa Lindholm Dahlstrand and Helen Lawton Smith, "Science Parks and Economic Development." In Prasada Reddy, ed., *Globalization Of Technology: Issues In Technology Transfer And Technological Capability Building* (UNESCO-EOLSS).

17. Thomas Hutton, "The New Economy of the Inner City," *Cities* 21 (2)(2004): 89-108, p. 90.

18. Michael Jaroff, Dennis Frenchman, Francisca Rojas, "New Century City Developments Creating Extraordinary Value" (Cambridge: Massachusetts Institute of Technology, 2009).

19. George Bugliarello, "Urban Knowledge Parks Knowledge Cities and Urban Sustainability," *International Journal Technology Management* 28 (3) (2004): 388-394.

20. American Institute of Architects, "Cities as a Lab: The Innovation Economy" (2013), p. 2.

21. Richard Florida, "Startup City: The Urban Shift in Venture Capital and High Technology" (Toronto: Martin Prosperity Institute, 2014).

22. Personal communication from Dennis Lower, President and CEO of Cortex, April 16, 2014. See also, Innovation District Boston, "Boston's Innovation District: 3 years and counting," February 13 2013, available at, http://www.innovationdistrict.org/wp-content/uploads/2013/03/

InnovationDistrict_NewJobsReport-_2013-03-01_FINAL2_contact.pdf ;

23. Recent economic analysis conducted in the cities of Pittsburgh, New York and San Francisco gives further evidence to this shift into the urban landscape. For New York, the report was written by the Center for an Urban Future, "New Tech City" (2012). For Pittsburgh, the paper was written by Ernst & Young LLP and Innovation Works, Inc. "Building Momentum: Investing in Pittsburgh's Technology Sector" (2014). For San Francisco, the report was written by South Mountain Economics, LLC "A Balanced and Growing Economy: How San Francisco is Making the Transition to a Digital City" (2014).

24. Jonathan Rothwell, "The Hidden STEM Economy" (Washington: Brookings Institution, 2013).

25. Mark Muro, Kenan Fikri, and Scott Andes, "Powering Advanced Industries State by State" (Washington: Brookings Institution, 2014).

26. Her Majesty's Treasury and the Office of the Deputy Prime Minister, "Devolving Decision Making: Meeting the Regional Economic Challenge; The Importance of Cities to Regional Growth" (London: Office of the Deputy Prime Minister, 2006).

27. Gerald Carlino and Robert Hunt, "The Agglomeration of R&D Labs" (Philadelphia: Federal Reserve Bank of Philadelphia, 2012). Carlino's work is part of a much broader base of literature that exists pertaining to proximity and innovation. Stuart Rosenthal and William Strange, for example, have found that the intellectual spillovers that drive innovation and employment drop off dramatically as firms and people move further apart. Refer to Stuart S. Rosenthal and William C. Strange, "Evidence on the Nature and Sources of Agglomeration Economies," in *Handbook of Urban and Regional Economics*, edited by J. V. Henderson and J. F. Thisse (New York: Elsevier, 2004).

28. Kyungjoon Lee and others, "Does Collocation Inform the Impact of Collaboration?," *PLoS One* 5 (12) (2010), available at www.plosone.org/article/info:doi/10.1371/journal.pone.0014279 (April 10, 2014). Also refer to Katie DuBoff, "Close Proximity Leads to Better Science," Harvard Medical School at hms.harvard.edu/news/close-proximity-leads-better-science-12-15-10 (April 11, 2014).

29. Joe Cortright, "Making Sense of Clusters: Regional Competitiveness and Economic Development" (Washington: Brookings Institution, 2006).

30. Antonio Ciccone and Robert Hall, "Productivity and the Density of Economic Activity," *American Economic Review* 86 (1) (1996): 54-70.

31. William Hoffman, "The Shifting Currents of Bioscience Innovation," *Global Policy* 5 (1) (2014): 76-83.

32. South Mountain Economics, LLC, "A Balanced and Growing Economy: How San Francisco is Making the Transition to a Digital City" (2014), p. 4.

33. Ibid, p. 12.

34. Center for an Urban Future, "New Tech City" (2012), p. 9

35. Ibid, p. 10.

36. Henry Chesbrough, "The Era of Open Innovation," *MIT Sloan Management Review* 44 (3) (2003): 35-41.

37. Daniel Pacthod and Michael Park, "How can the US advanced-industries sector maintain its competitiveness?" (New York: McKinsey & Company, 2012), p. 2.

38. Suzanne Berger, *Making In America: From Innovation to Market* (Cambridge: MIT Press, 2013).

39. The increased emphasis on collaboration may even extend to the important interplay of innovation and production as the economy evolves and 3-D printing and other disruptive technology accelerate prototyping and enable small-scale and customized manufacturing. The first National Manufacturing Innovation Institute, which focused on additive manufacturing, is located in the downtown of Youngstown, Ohio, close to the existing base of small and medium-size manufacturing firms. The midtown Detroit location of the watch- and bicycle-making firm Shinola, close to the College for Creative Studies (known for industrial design), is further evidence of this trend.

40. Karen Weintraub, "Biotech Players Lead Boom in Cambridge" *The New York Times*, January 2, 2013. This reference reminds us that an economy driven by knowledge bestows new importance on institutions of knowledge such as universities, medical research centers, private research institutions and innovation institutes. These institutions tend to be disproportionately located in cities and other urban places. Over 1,900 colleges and universities, more than half the nation's total, are located in the urban core of metropolitan areas and account for roughly 74 percent of all research expenditures at U.S. research universities. Coalition of Urban Serving Universities, "Urban Universities: Anchors Generating

Prosperity for America's Cities," (Washington: Coalition of Urban Serving Universities, 2010). Research has also found a high correlation between the nation's leading biotech clusters and the strength (e.g., medical research capacity, NIH grants, PhD graduates) of local universities. Refer to Joseph Cortright and Heike Mayer, "Signs of Life: The Growth of Biotechnology Centers in the United States" (Washington: Brookings, 2002).

41. Quentin Hardy, "The Monuments of Tech" *New York Times*, March 1, 2014.

42. Personal communication from Randy Howder, Senior Associate, Workplace Strategist, Gensler, February 20, 2013.

43. Leigh Gallagher, "Tony Hsieh's new $350 million startup." *Fortune*, January 23, 2012.

44. United States Census Bureau, "Energy Boom Fuels Rapid Population Growth in Parts of Great Plains; Gulf Coast Also Has High Growth Areas, Says Census Bureau" (2014).

45. William H. Frey, "A Population Slowdown for Small Town America" (Washington: Brookings Institution, 2014). Available at www.brookings.edu/research/opinions/2014/03/31-population-slowdown-small-town-america-frey (March 2014).

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47. Jonathan Vespa, Jamie M. Lewis, and Rose M. Kreider, "America's Families and Living Arrangements: 2012: Population Characteristics" (Department of Commerce, United States Census Bureau, 2013). Available at www.census.gov/prod/2013pubs/p20-570.pdf (April 2014).

48. Arthur C. Nelson, *Reshaping Metropolitan America: Development Trends and Opportunities to 2030* (Washington: Island Press, 2013), p. 27.

49. Urban Land Institute, "America in 2013: A ULI Survey of Views on Housing, Transportation, and Community" (2013).

50. Nelson, "Reshaping Metropolitan America."

51. Richard Florida, *The Rise of the Creative Class And How It's Transforming Work, Leisure and Everyday Life* (New York: Basic Books, 2002).

52. Joseph Cortright, "Young and the Restless 2011" (Washington: CEO for Cities, 2011).

53. Urban Land Institute, "America in 2013" (2014).

54. Michael Kimmelman, "Building a Better City" *New York Times*, October 16, 2013. For shift in housing/location preferences for a particular metro, see Kinder Houston Area Study, conducted by Kinder Institute for Urban Research at Rice University.

55. During our research, some innovation districts were found to organize their assets into two categories: hard factors and soft factors. Hard factors are defined colloquially as the "hard stuff," such as the infrastructure and the physical structure of buildings that create the compact, urban form. Soft factors are the "soft stuff," such as firms, people, and the important connections between them. We broke these two factors apart into economic, physical, and networking assets to enunciate the range of disciplines at play.

56. In this paper, assets are neatly bucketed under one of these three categories although several important assets can actually fit under more than one category. Shared workspace provides the best illustration of this interchangeability. While clearly a physical asset, it is also an economic asset (as economic activity is generated there), and a networking asset (as networking with adjacent start-ups often occurs there).

57. Two sources are contributing to this observation. For the first, refer to William Hoffman, "The Shifting Currents of Bioscience Innovation," *Global Policy* 5 (1) (2014): 76-8. For the second, refer to South Mountain Economics, LLC., "Where the Jobs Are: the App Economy" (2012).

58. Research conducted by Hutton is particularly insightful with respect to the clustering of creative fields in urban enclaves. Refer to Hutton, "The New Economy of the Inner City."

59. In touring innovation districts across the country, Bruce Katz witnessed repeatedly the presence of small manufacturing firms that rely on advanced technology. For more, see Alicia Rouault, "City Made: the case for small urban manufacturers," CoLab Radio, March 26 2012, available at http://colabradio.mit.edu/city-made-the-case-for-small-urban-manufacturers/; See also Nisha Mistry

and Joan Byron, "The Federal Role in Supporting Urban Manufacturing," (Washington: Brookings Institution, 2011).

60. Luc Anselin, Atilla Varga and Zoltan Acs, "Local Geographic Spillovers between University Research and High Technology Innovations," *Journal of Urban Economics* 42 (1997): 422–448, p. 440.

61. Naomi Hausman, "University Innovation, Local Economic Growth, and Entrepreneurship" (Cambridge: Harvard University, Center of Economic Studies, 2012).

62. Aaron Chatterji, Edward Glaeser, William Kerr, "Clusters of Entrepreneurship and Innovation," Innovation Policy and Economy Forum, April 2013.

63. Personal communication from Kairos Shen, Director of Planning, Boston Redevelopment Authority, September 1, 2012.

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65. Michael Mandel of South Mountain Economics offers great detail in how to measure supportive industries. Please refer to South Mountain Economics, LLC. "Where the Jobs Are: the App Economy" (2012).

66. Personal communications from Ylva Williams, Chief Executive Officer, Stockholm Science City Foundation, April 2, 2014.

67. Christopher Leinberger, Nonresident Senior Fellow at the Brookings Metropolitan Policy Program has written extensively on the value of neighborhood-serving amenities as being one factor in creating "walkable urbanity." Refer to Christopher Leinberger and Mariela Alfonzo, "Walk this Way: The Economic Promise of Walkable Places in Metropolitan Washington DC" (Washington: Brookings Institution, 2012).

68. Thomas Hutton, "The New Economy of the Inner City," p. 93.

69. Joroff, Frenchman, and Rojas, "New Century City Developments Creating Extraordinary Value."

70. Ibid.

71. Ibid.

72. Personal communication from Josep Pique', CEO 22@ Barcelona, 22@Barcelona, September 12, 2013.

73. Papers citing the value of networking include: Tom Elfring and Willem Hulsink, "Networking by entrepreneurs: patterns of Tie-Formation in Emerging Organizations," *Organization Studies* (28)(2007): 1849-1866; Fabio Antoldi, Daniele Cerrato, Donatella Depperu, *Export Consortia in Developing Countries* (Heidelberg: Springer-Verlag Berlin, 2011); AnnaLee Saxenian, *The New Argonauts: Regional Advantage in a Global Economy* (Cambridge: Harvard University Press, 2006); Walter Powell, Kenneth Koput, Laurel Smith-Doerr, "Interorganizational Collaboration and the Locus of Innovation: Networks in Learning in Biotechnology," *Administrate Science Quarterly* 41 (1) (1996): 116–145; and OECD, "The Knowledge Based Economy" (1996).

74. On this subject, Saxenien explained that the differences between the Valley and Route 128 "have been overlooked by economic analysts or treated simply as superficial differences between "laid-back" California and the more "buttoned- down" east coast. Far from superficial, these variations demonstrate the importance of local social and institutional determinants of industrial adaptation. Refer to AnnaLee Saxenian, "Inside Out: Regional Networks and Industrial Adaptation in Silicon Valley and Route 128," *Cityscape: A Journal of Policy Development and Research* 2 (2) (1996): 41–60.

75. Personal communication from Bert-Jan Woertman, Marketing and Communications Director, High Tech Campus Eindhoven, September 5, 2013.

76. Josh Lerner, "Corporate Venturing," *Harvard Business Review* 91 (10) (2013): 86–94.

77. Mark Granovetter, "The Strength of Weak Ties," *American Journal of Sociology* 78 (6) (1973): 1360–1380.

78. David Krackhardt, "the Strength of Strong Ties: the Importance of Philos in Organizations." In Nitin. Nohria and Robert Eccles, eds., *Networks and Organizations: Structure, Form, and Action* (Boston: Harvard Business School Press, 1992).

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80. Personal communications from Dennis Lower, President and CEO, Cortex, October 3, 2013.

81. Eindhoven is not an innovation district, it is a regional economic cluster dedicated to advancing innovation-oriented sectors. Eindhoven was still used as a case given their emphasis on open innovation, entrepreneurial and small firm development, and networking.

82. Professor Etzkowitz, previously with Newcastle University in the UK, developed the Triple Helix after observing that innovation has shifted from a "hands off" linear model of innovation, which is an internal process within and among firms, to an "assisted" model of innovation that involves a coalition of three types of actors: industry, university and government. Its foundation was built on groundbreaking laws, such as the US Bayh-Dole Act of 1980 that permits universities, small businesses or non-profit institutions to pursue ownership of an invention funded by federal R&D dollars. This opened up the viability of universities transforming from a pure teaching institution to one of research and ultimately entrepreneurialism, an important shift that led to the Triple Helix. Sweden, developed a similar policy called "Teachers Exemption," which allows teachers/professors to own the right to their own patentable inventions even if they are made during working hours.

83. Personal communications from Donn Rubin, President & CEO, BioSTL, March 24, 2014.

84. In Houston, for example, the Texas Medical Center had for decades the primary purpose of managing the parking and facilities of the nation's most extensive medical campus. In recent years, under new leadership, the Center has expanded its role to include promoting collaboration on data and research across key member institutions.

85. Ajuntament de Barcelona, "22@Barcelona, the Innovation District," presentation to the Brookings Institution, 2011.

86. The ecosystem and physical landscape that developed in Cambridge (around MIT), for example, is quite distinct when compared to what developed in San Francisco (around the California Institute for Regenerative Medicine) in Seattle (around the University of Washington) or in Houston (around the Texas Medical Center). Each of these innovation districts, however, is deeply enmeshed in life sciences and the bio-medical field.

87. Technology Partnership Practice, Battelle Memorial Institute, "Plant and Life Sciences for St. Louis: The Technology Gateway for the 21st Century" (2000).

88. Dominique Foray and Xabier Goenaga, "The Goals of Smart Specialisation," Policy Brief Series 01/2013 (European Commission, 2013).

89. Personal communications from Ylva Williams, Chief Executive Officer, Stockholm Science City Foundation, April 11, 2014. For more information on this event, which will take place in August 2014, refer to www.digitalhealthdays.se (April 14, 2014).

90. Citing the case of Village of Euclid v Amber Reality Co, 272 U.S. 365 (1926).

91. Personal communications from Ylva Williams, Chief Executive Officer, Stockholm Science City Foundation, April 2, 2014.

92. Significantly, Philadelphia is contemplating a similar transformative intervention around 30th Street Station, a stone's throw from Drexel University and the powerful development along Market Street.

93. Personal communications from Dennis Frenchman, Leventhal Professor of Urban Design and Planning, MIT, March 21, 2014.

94. Research Triangle Foundation of North Carolina, "Research Triangle Park: Master Plan," p.11.

95. Cathy Stanton, *The Lowell Experiment: Public History in a Post Industrial City* (Massachusetts: University of Massachusetts Press, 2006).

96. Nick Leon, "Attract and Comment: The 22@Barcelona Innovation District and the Internationalisation of Barcelona Business," *Innovation: Management, Policy & Practice* 10 (2) (2008): 235-246.

97. Yvonne van Hest, Manager, International Labour Market Development, Brainport Development, Presentation "Talent Attraction and Retention in the Brainport Eindhoven Region (NL)".

98. Sasha Pasulka, "A Glympse of the future in Seattle's South Lake Union" *Geek Wire*, April 20, 2012. Refer to www.geekwire.com/2012/glympse-future-seattles-south-lake-union/ (April 17 2014).

99. Yvonne van Hest, Manager, "Talent Attraction and Retention in the Brainport Eindhoven Region (NL)".

100. Personal communications from Dennis Lower, President and CEO, Cortex, October 3, 2013.

101. Battelle Technology Partnership Practice, "Driving Regional Innovation and Growth: The 2012 Survey of North American University Research Parks" (2013).

102. Personal communications from Johannes Fruehauf, founder of LabCentral, Cambridge, MA, December 16, 2013

103. Personal communications from Dennis Lower, President and CEO, Cortex, March 15, 2014.

104. Personal communications from Josep Pique', CEO of 22@Barcelona, 22@Barcelona, March 27, 2013.

105. Jaroff, Frenchman, and Rojas, "New Century City Developments Creating Extraordinary Value."

106. Battelle Technology Partnership Practice, "Driving Regional Innovation and Growth: The 2012 Survey of North American University Research Parks".

107. Drexel Now, "Drexel and Key Partners Receive Grant in Support of New Public Schools in West Philadelphia," September 25, 2012; and Solomon Leach, "SRC approves the sale of eight school properties for $38 million," *Philly.com*, March 21, 2014.

108. Personal communications from Thomas Anderson, CEO, The Electrum Foundation and Kista Science City, April 2, 2014.

109. Personal communications from Dennis Lower, President and CEO, Cortex, October 3, 2013.

110. Johnathan Rothwell, "The Hidden Stem Economy" (Washington: Brookings Institution, 2013).

111. Personal communications from Lucy Kerman, Vice Provost, University and Community Partnerships of Drexel University, February 5, 2014.

112. The OECD defines informal settlements as "areas where groups of housing units have been constructed on land that the occupants have no legal claim to, or occupy illegally."

113. Personal communications from Jenni Young, Carlo Ratti Associati, Srl, October 16, 2013.

114. Personal communications from Lucy Kerman, Vice Provost, University and Community Partnerships of Drexel University, February 5, 2014.

115. City of Philadelphia, Office of the Controller, "Survey of the Current and Potential Impact of Local Procurement by Philadelphia Anchor Institutions" (2014).

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117. Cortex, "The History of Cortex: a Transformative Community Partnership" (2013).

118. "Danforth Foundation Shifts Focus, Cuts Staff," available at www.philanthropynewsdigest.org/news/danforth-foundation-shifts-focus-cuts-staff (April 19, 2014).

119. Personal communications from Donn Rubin, President & CEO, BioSTL, March 24, 2014.

120. Brock Parker, "Kendall Sq. zoning revamped," *Boston Globe*, April 9, 2013.

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Metropolitan Revolution

12 Principles guiding innovation districts

Julie Wagner, Scott Andes, Steve Davies, Nathan Storring, and Jennifer S. Vey September 8, 2017

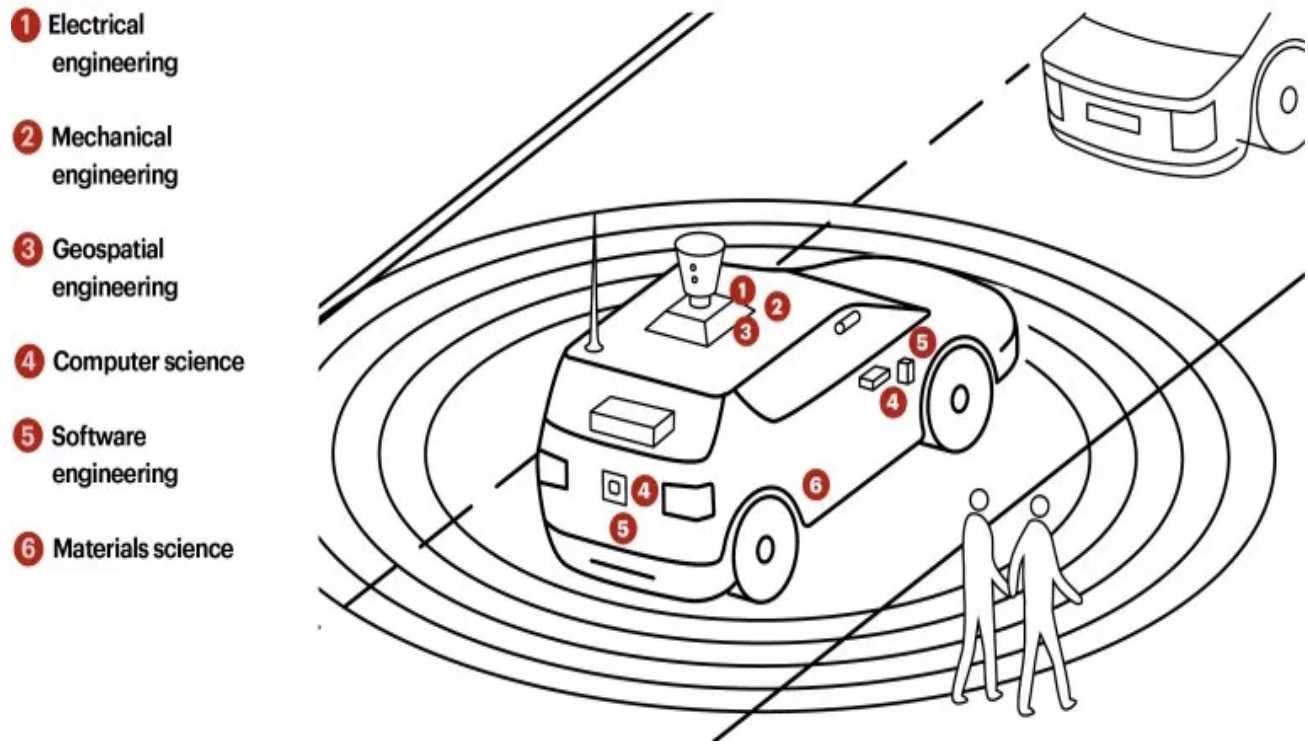
Ignited by emerging economic trends and demographic preferences, many cities across the United States, Europe, and other global regions are witnessing a new geography of innovation: innovation districts. Brookings documented their emergence in the 2014 research brief, the Rise of Innovation Districts. This work defined innovation districts as geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators. Districts are also physically compact, transit-accessible, and offer mixed-use housing, office, and retail.

Since then the Anne T. and Robert M. Bass Initiative on Innovation and Placemaking has conducted research to advance this emerging practice. In the paper How Firms Learn, we analyzed how firms and other institutions are altering their processes for innovating. In the paper Innovation Spaces: The New Design of Work, we observed how many innovation spaces are now being designed to reflect the increasingly collaborative and cross-sector nature of innovation. We also conducted deep engagements in burgeoning innovation districts, such as in Oklahoma City and Philadelphia, where, in concert with local actors, we developed strategies for accelerating their innovation ecosystems. Lastly, working with the US Conference of Mayors, we developed a handbook to support city leaders in their desire to facilitate this emerging geography of innovation.

Drawing on this and other work globally, we have developed these 12 principles to guide how innovation districts are to grow and evolve—a process that requires cities to take an integrated approach:

1. The clustering of innovative sectors and research strengths is the backbone of innovation districts. The concentration of innovative sectors and research strengths is what drives innovation districts from the start. Rather than government attempting to pick industry winners or developers focusing on a real estate play, districts thrive by concentrating and leveraging their city or regional economic strengths. For example, Oklahoma City's strengths include health care and energy, while in Eindhoven, The Netherlands, it is precision machinery. Bottom line: Cities need to grow their own firms and, when possible, recruit from elsewhere.

2. For innovation districts, convergence—the melding of disparate sectors and disciplines—is king. Many economic developers think about the world in terms of industry verticals (e.g., agriculture, aerospace, health care). But innovation platforms—IT, new materials, robotics—are technology enablers that serve many industries. As hubs of research and next-generation technologies, innovation districts are more aptly defined by these horizontal platforms than by sectorial silos. As such, district stakeholders need to build their capacity to connect seemingly dissimilar industries through collaborative research, conversation, and cross-cutting technologies.



A growing number of innovations—like the autonomous vehicle—were conceived through the convergence of disparate disciplines and sectors. Illustration credit: Brookings.

3. Districts are supercharged by a diversity of institutions, companies, and start-ups. The strength of innovation districts comes, in part, from this eclectic mix. Districts that are largely comprised of large institutions often lack the accelerated innovative growth that small, nimble firms provide. And districts characterized by a density of start-ups have fewer opportunities for well-funded partnerships and alliances. The "magic in the mix" comes from aligning incentives between these and other public, private, academic, and civic institutions.

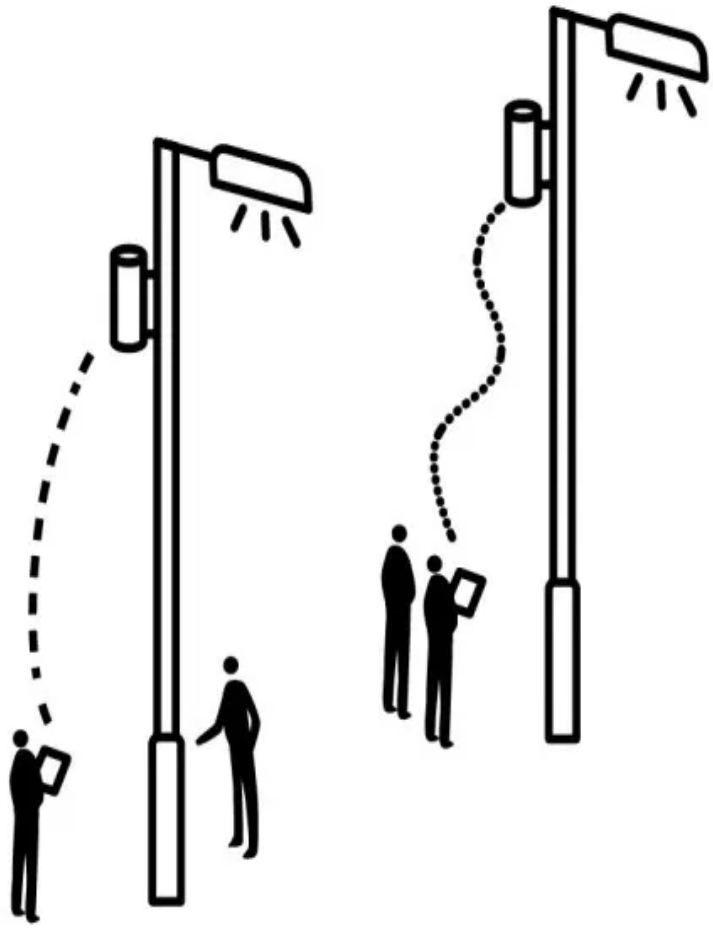
4. Connectivity and proximity are the underpinnings of strong district ecosystems. A well-connected district is paramount to its success—transit, bike paths, sidewalks, car-sharing, and high-speed fiber. Identify gaps and invest wisely. At the same time, districts should measure their success by steps not miles. The experience of proximity—or a physical concentration of firms, workers, and activities—is what differentiates a "buzzing" district from a boring one.

5. Innovation districts need a range of strategies—large and small moves, long-term and immediate. Innovation district development requires a mix of large investments (e.g., in transit, high-speed fiber, venture and other capital funds) and smaller strategies (e.g., reactivating a neglected park and programming spaces). These approaches are complimentary: Large-scale investments set the foundation upon which other activities can be layered, while short-term, community-led processes can inform bigger and lengthier undertakings and create crucial momentum.

6. Programming is paramount. Programming—a range of activities to grow skills, strengthen firms, and build networks—is the connective tissue of a district. A major misstep is to undervalue programming within and across the district, both indoors and out.

7. Social interactions between workers—essential to collaboration, learning, and inspiration—occur in concentrated "hot spots." A handful of social hot spots in a district will likely punch far above their weight in terms of building community. They may

be organic, like Silicon Valley's legendary Walker's Wagon Wheel, or designed, like Venture Café near the MIT campus. Districts should identify, analyze, protect, and support such exceptional places.



Some districts are testing innovations in public spaces, such as using light posts to analyze weather or traffic conditions. llustration credit: Brookings.

8. Make innovation visible and public. Daylighting innovation in public and private spaces helps inspire curiosity in aspiring innovators, start conversations between neighbors, and convey the story of an innovation district to potential recruits or investors. It also transforms public spaces into "living labs" to test prototypes. To help further, activities like hackathons (a sprint-like event encouraging collaboration generally on software/hardware development), symposiums, and health clinics, which typically occur

indoors, might accomplish more in the public realm. And finally, greater transparency at the ground level of buildings allows pedestrians to connect with the innovation activities inside.

9. Embed the values of diversity and inclusion in all visions, goals, and strategies. Innovation districts not only promote new technologies, they grow a range of new firms and new jobs with living wages. At a time of rising social inequality, innovation districts must become an avenue to economic opportunity for city residents—particularly for those in nearby neighborhoods that struggle with poverty and disinvestment. But growth alone is not enough. Only through intentional training, hiring, business development, and placemaking efforts can districts cultivate new local talent, encourage more diverse ownership structures, and help address poverty and disinvestment in surrounding communities.

10. Get ahead of affordability issues. Successful districts can, over time, drive up market pressures, impacting the ability of start-ups, maturing firms, and neighboring residents to remain in these areas. Smart districts respond early, getting ahead of the curve through a range of policy moves and strategic projects that preserve affordability and the diversity it engenders.

11. Innovative finance is fundamental to catalyzing growth. Most innovation districts require new finance streams to advance innovative and inclusive growth without straining existing and limited resources. As districts will likely receive less funding from states and the federal government to support their efforts, creative financing tools—including ways to leverage city-owned and district assets—should be explored with an eye toward sustaining financing over time.

12. Long-term success demands a collaborative approach to governance. An innovation district's work ethic and culture is "collaborate to compete." A bottom-up horizontal governance model—involving business, academic and civic institutions, government, workers, and residents—can best orchestrate what must be done collectively: Identifying assets; design, finance and strategic initiatives; public space management; and evaluating progress.

Innovation Districts: A Recipe

June 2, 2016

by Jeff Perlman

THIS WEEK'S FEATURED MEMBER POST COMES TO US FROM Jeff Perlman WHO BLOGS AT Your Delray Boca.

"Innovation districts embody the very essence of cities: an aggregation of talented, driven people, assembled in close quarters,

who exchange ideas and knowledge in what urban historians call a "dynamic process of innovation, imitation, and improvement."

— Peter Hall, Cities in Civilization

Photo by Mindaugas Danys

Boca Raton and Delray Beach have long championed the idea of creating "innovation districts", a term we hear about often but probably never slow down enough to define.

Over the years, there has been a desire to attract the "creative class" to downtown Delray Beach, build on Boca's rich history in medicine, education and technology (MedUTech) and create an innovation district along Congress Avenue. FAU's Research Park has achieved enviable success and now FAU's Tech Runway has a great opportunity to serve as a catalyst for creating an entrepreneurial ecosystem. There are also several examples of co-working and incubator space in both Boca and Delray.

A recent white paper by the Brookings Institute has gotten a lot of traction among policymakers interested in Innovation Districts. Perhaps one of the best things it produced was a simple definition of the term: geographic areas with synergistic relationships among people, firms and places, allowing ideas to be generated and commercialized. These districts are also physically compact, transit-accessible, technically-wired and offer a mix of uses: housing, office, and retail.

Bruce Katz and Julie Wagner of Brookings describe innovation districts as requiring entrepreneurs, educational institutions, start-ups, affordable housing and other urban amenities that are connected by transit and high-speed Internet.

Among the primary market forces driving innovation districts are private firms and universities seeking to be more efficient at innovation. The model that originated in Silicon Valley–where firms acted independently and were isolated on a campus or an industrial park–appears to be no longer in vogue. It is more effective to be located in places where people bump into each other by happenstance — at the office, in the coffee shop, at a music venue or at dinner. Ideas are shared at the office and away from the office, leading to more ideas and more innovation. This is a sea change from the model of the past 50 years where innovation happened in suburban office parks —accessible only by car. In that model, little to no thought was given to integrating work, housing

and recreation. Today, companies and their workers see quality of life as a pathway to productivity and innovative breakthroughs.

A trend that is simultaneously strengthening innovation districts is millennials' preference for urban living. According to the Council of Economic Advisors, 73 percent of college-educated 25- to 34-year-olds were living in large or mid-sized cities in 2011, compared to 67 percent in 1980. Primary drivers of this trend are the neighborhood-building amenities that a vibrant city offers.

Essential to the success of innovation districts are what are called "innovation cultivators," which support the growth of individuals, firms and their ideas.

Experts are pointing to downtown Eugene, Oregon as a good model for an emerging innovation district. Eugene offers lessons that may be useful for Boca and Delray. In downtown Eugene, innovation cultivators include Fertilab, which focuses on incubating early-stage entrepreneurship; RAIN, which helps new business ideas accelerate to market; and the Technology Association of Oregon, which focuses on inputs to growth for tech companies including high speed internet infrastructure, access to talent, and community events like Hack for a Cause. All of these organizations now have offices that are within walking distance of each other.

"The trend is to nurture living, breathing communities rather than sterile remote, compounds of research silos."

"The trend is to nurture living, breathing communities rather than sterile remote, compounds of research silos," said Pete Engardio in a recent article entitled "Research Parks for the Knowledge Economy," that ran in Bloomberg Businessweek. As the article explains:

> *Innovation districts have the unique potential to spur productive, inclusive and sustainable economic development. At a time of sluggish growth, they provide a strong foundation for the creation and expansion of firms and jobs by helping companies, entrepreneurs, universities, researchers and investors—across sectors and disciplines—co-invent and co-produce new discoveries for the market. At a time of rising social inequality, they offer the prospect of expanding employment and educational opportunities for disadvantaged populations given that many districts are close to low- and moderate-income neighborhoods. And, at a time of inefficient land use, extensive sprawl and continued environmental degradation, they present the potential for denser residential and employment patterns, the leveraging of mass transit, and the repopulation of urban cores.*

So what's the formula and do we have what it takes?

Brookings lists the following assets as key components:

Economic Assets

Photo by La Citta Vitta

These are the firms, institutions and organizations that drive, cultivate or support an innovation-rich environment. Economic assets can be separated into three categories:

1. **Innovation drivers** are the research and medical institutions, the large firms, start-ups and entrepreneurs focused on developing cutting-edge technologies, products and services for the market.
2. **Innovation cultivators** are the companies, organizations or groups that support the growth of individuals, firms and their ideas. They include incubators, accelerators, proof-of-concept centers, tech transfer offices, shared working spaces and local high schools, job training firms and community colleges advancing specific skill sets for the innovation-driven economy.
3. **Neighborhood-building amenities** provide important support services to residents and workers in the district. This ranges from medical offices to grocery stores, restaurants, coffee bars, small hotels and local retail (such as bookstores, clothing stores and sport shops).

Physical Assets

These are public and privately-owned spaces—buildings, open spaces, streets and other infrastructure—designed and organized to stimulate new and higher levels of connectivity, collaboration and innovation. Physical assets can also be divided into three categories:

1. **Physical assets in the public realm** are the spaces accessible to the public, such as parks, plazas and streets that become locales of energy and activity. In innovation districts, public places are created or re-configured to be digitally-accessible (with high speed internet, wireless networks, computers and digital displays embedded into spaces) and to encourage networking (where spaces encourage "people to crash into one another"). Streets can also be transformed into living labs to flexibly test new innovations, such as in-street lighting, waste collection, traffic management solutions and new digital technologies.
2. **Physical assets in the private realm** are privately-owned buildings and spaces that stimulate innovation in new and creative ways. Office developments are increasingly configured with shared work and lab spaces and smaller, more affordable areas for start-ups. A new form of micro-housing is also emerging, with smaller private apartments that

have access to larger public spaces, such as co-working areas, entertainment spaces and common eating areas.

3. **Physical assets that knit the district together** and/or tie it to the broader metropolis are investments aimed to enhance relationship-building and connectivity. For some districts, knitting together the physical fabric requires remaking the campuses of advanced research institutions to remove fences, walls and other barriers and replace them with connecting elements such as bike paths, sidewalks, pedestrian-oriented streets and activated public spaces. Strategies to strengthen connectivity between the district, adjoining neighborhoods and the broader metropolis include infrastructure investments, such as broadband, transit and road improvements.

Networking Assets

These are the relationships between actors—such as individuals, firms and institutions—that have the potential to generate, sharpen and accelerate the advancement of ideas. Networks fuel innovation because they strengthen trust and collaboration within and across companies and industry clusters, provide information for new discoveries and help firms acquire resources and enter new markets.

Networks are generally described as either having strong ties or weak ties. If you tally these assets up, Boca and Delray are positioned to have successful innovation districts. Many of the principles outlined by Brookings, were incorporated in a recent task force effort to jumpstart Congress Avenue in Boca. Lynn University, FAU, FAU Research Park, the Boca and Delray Chambers of Commerce, local hospitals and research facilities and private incubators and co-working spaces are all elements for success.

What's missing in my view are stronger ties, a need for more events, a lack of venture, seed and angel capital (but some bright spots are emerging) and more media attention to build the area's reputation. Possible headwinds also include a lack of imagination with some, Ok maybe most—but not all– new development—i.e. the same old, high-end condo's and sprawl in the Ag Reserve—and not enough political vision to push and incentivize developers to create something new, different, cool and forward thinking. There is a need for creative space in both cities. NIMBYism is another threat; we have to be forward thinking and ensure that our downtowns evolve beyond food and beverage.

Still, our quality of life, proximity to key markets, universities, recreation, cultural amenities etc., are awfully compelling. Yes, we can make this happen. The ingredients are there and abundant.

How to make it happen

Practitioners in leading edge innovation districts offer five pieces of advice:

1. Build a collaborative leadership network

Build a collection of leaders from key institutions, firms and sectors who regularly and formally cooperate on the design, delivery, marketing and governance of the district. In advanced innovation districts in Barcelona, Eindhoven, St Louis and Stockholm, leaders found the Triple Helix model of governance to be fundamental to their success. The Triple Helix consists of structured interactions between industry, research universities, and government.

2. Set a vision for growth

Provide actionable guidance for how an innovation district should grow and develop in the short-, medium- and long-term along economic, physical and social dimensions. Most practitioners cite the importance of developing a vision to leverage their unique strengths—distinct economic clusters, leading local and regional institutions and companies, physical location and design advantages and other cultural attributes.

3. Pursue talent and technology

Educated and skilled workers, and sophisticated infrastructure and systems are the twin drivers of innovation. Pursuing talent requires attraction, retention and growth strategies; integrating technology requires a commitment to top notch fiber optics (and, in some places, specialized laboratory facilities) to create a high quality platform for innovative firms.

4. Promote inclusive growth by using the innovation district as a platform to regenerate adjoining distressed neighborhoods

In addition, create educational, employment and other opportunities for low-income residents of the city. Strategies in places as disparate as Barcelona, Detroit and Philadelphia have particularly focused on equipping workers with the skills they need to participate in the innovation economy or other secondary and tertiary jobs generated by innovative growth.

5. Enhance access to capital

This could support basic science and applied research; the commercialization of innovation; entrepreneurial start-ups and expansion (including business incubators and accelerators); urban residential, industrial and commercial real estate (including new collaborative spaces); place-based infrastructure (e.g., energy, utilities, broadband, and transportation); education and training facilities; and intermediaries to steward the innovation ecosystem. Districts in Cambridge, Detroit and St. Louis have successfully re-deployed local capital to meet these needs.

(Top photo of Barcelona by Bastien Decueninck)

THE EVOLUTION OF INNOVATION DISTRICTS

THE NEW GEOGRAPHY OF GLOBAL INNOVATION

JULIE WAGNER, BRUCE KATZ, AND THOMAS OSHA
THE GLOBAL INSTITUTE ON INNOVATION DISTRICTS

The rise of innovation districts continues. In 2014, "The Rise of Innovation Districts: A New Geography of Innovation in America," documented an emerging urban geography of innovation that sits at the intersection of economy-shaping, place-making, and network-building.[1] The growth and rapid evolution of this new geography is in response to broader economic and demographic forces including the pervasiveness of technology.

Innovation districts are, in essence, the physical manifestation of a changing time where the inherent characteristics of the city are enablers of heightened connectivity and knowledge exchange. Unlike science parks and science corridors that use expansive greenways and parking lots to separate institutions and companies, innovation districts embrace the attributes of density and proximity to facilitate collaborative, "open" innovation and strong social networks. Inside these growing and ever-changing districts, workers learn new ideas from fellow workers, entrepreneurs learn from nearby mentors, and venture capital firms are more likely to wisely invest in a company they can observe.[2]

The reaction to the development of this new urban model of innovation was nothing short of astounding. It set off a wave of interest around the world that was both palpable and inspiring. Cities representing all global regions—cities with vastly different economic starting points, uniquely structured by national and state policies, and with distinctive economic and innovation strengths—reached out to validate the findings of the paper drawing on local empirical evidence.

In some cities, leaders offered detailed examples of how they, over the past five to 10 years, have been observing, if not gathering evidence on, the concentration of advanced sectors in physically compact geographies. In other cities, leaders illustrated how new partnerships across organizations and institutions in discrete urban geographies were amounting to a new "collaborate to compete" model. And then there were other cities, including smaller and mid-sized cities and regions, that saw the innovation district model as a new path forward. Here, local leaders looked to their most promising research universities, seeing how— through changes in policy and practice—they could precipitate the development of an innovation district.

Today, by conservative estimates, there are more than 100 innovation districts emerging around the world. In the United States alone, roughly 20 districts have reached a high level of sophistication, concentrating in close proximity a mix of research institutions, mature companies, start-ups and scale-ups, co-working spaces, and supportive intermediaries. Districts such as these are emerging as powerful economic engines in their cities and metropolitan areas, serving as platforms for research commercialization, firm formation, and mixed-use (often transit-oriented) development, as well as enhancing tax revenues and, in some cases, energy diversification. The Pittsburgh Innovation District, for example, has emerged as a global leader in robotics, machine learning, and immunology, thanks to the research prowess of Carnegie Mellon University and the University of Pittsburgh and the consistent support of well-endowed philanthropies.

In Europe, mostly concentrated in countries in the north, initial counts reveal more than 40 districts in emerging stages. Clusters of districts can now be found in the U.K., Denmark, Sweden, and the Netherlands—each with a unique set of specializations that commonly draw on its region's historic strengths and advantages. At the same time, new districts are advancing quickly in cities in Germany, Italy, and France with strong public and private involvement and support. Other countries such as Finland, Poland, and Ireland are capturing this moment and are places to watch.

Similarly, cities in Australia, Latin America, the Middle East, and Asia are observing the rise of innovation districts, building off specific innovation and research capacities. Appendix 1 offers an initial list of districts. Deeper research currently under way is revealing a longer and far more extensive list.

> **"Innovation districts are defined as geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators. They are also physically compact, transit-accessible, and technically wired and offer mixed-use housing, office and retail."[3]**
>
> ***Katz and Wagner, The Rise of Innovation Districts, 2014***

The potency of districts is, by their very nature, their complexity and their mixing or integration of what was previously separated and "siloed"—people, quality of place, and innovation. The ability for local leaders to braid together different disciplines and approaches is raising questions on how best to begin and what levers to push. The desire to encourage organic, evolutionary growth but also drive intentional, deliberate change is raising valid questions about how to lead, when to lead, and who should lead.

We have seen and are therefore deeply cognizant of these challenges in certain districts. It has, in turn, increased our sensitivity to innovative practice, processes, and policies and how those teachings can be scaled. Since the release of the 2014 paper, increased and deeper engagements with innovation districts across global regions have prompted the authors to offer new insights:[4]

FIRST, successful districts are reaching their full potential through the deployment of asset-based strategies that leverage a district's economic, physical, and social networking assets.

Most innovation districts begin organically through a collection of starting assets—economic, physical, and social networking assets—that constitute the raw materials of an emerging district. To realize their full potential, successful districts are leveraging all three assets to build an innovation ecosystem. In these cases, physical assets, for example, are used to strengthen the competitive advantage of a district, which is often considered a pure economic strategy. At the same time, economic assets are harnessed in ways to strengthen quality of place. This paper illustrates how districts are devising strategies where economic, physical, and social networking assets work in unison to create new synergies.

SECOND, successful districts rely on organizational strategies and structures, particularly a strong governance model and coordinated finance.

In cities like Houston, St. Louis, and Winston-Salem, the governance of innovation districts has evolved from the mere alignment of strategies to more sophisticated interventions around place-making, entrepreneurial support, and data collaboration. These cities and others are also using more sophisticated financing techniques and mechanisms to leverage their distinctive economic, physical, and networking assets. This paper describes these two organizational drivers in detail.

FINALLY, innovation districts are contending with the challenge of linking innovation and inclusion, which is leading to the development of inclusion and social innovation strategies to guide their growth.

In the United States in particular, a country experiencing deep economic divides, local leaders and residents have questioned whether innovation districts could ameliorate or exacerbate this complex and longstanding challenge. In response, the imperative for meaningful inclusion—where districts work for everyone—will stimulate what is likely to be a new set of inclusion and social innovation strategies to guide districts in the future. This paper describes this evolution in greater specificity.

As a result of these observations and market demand, the authors and others established a global not-for-profit dedicated to innovation districts. The last four years have revealed that a growing list of local actors are seeking deeper empirically grounded research and benchmarking to evaluate and strengthen their work. It has also helped illustrate the extent to which district leaders—from Australia to Asia to the Americas—are seeking more robust practitioner-led exchanges to share ideas and insights. This level of interest has prompted a small but growing assembly of researchers and practitioners to come together to create a dedicated organization on innovation districts: The Global Institute on Innovation Districts. This paper concludes with more on The Global Institute including its evolving agenda.

To conclude, our research reaffirms the outsized economic, fiscal, and sustainability role innovation districts can play in advancing city and regional prosperity. Their contribution is even more critical given that entrepreneurial dynamism is slowing, national and state investments in cities in many countries are contracting, divisions by income and wealth are expanding, and efforts to mitigate climate change and embrace clean energy solutions face political pushback. We urge the leaders of innovation districts—be they aspiring, emerging, or maturing—to approach their work with deeper intentionality, place greater emphasis on cross-organizational and structural reforms, and to experiment creatively in approaching all aspects of this work.

Innovation districts are the physical manifestation of a changing time where the characteristics of the city are enablers of heightened knowledge exchange. ***Photo Credit: Julie Wagner. The Central Innovation District in The Hague.***

WHO ARE THE GROWING LIST OF ACTORS?

As innovation districts have gained traction, the range of actors partially or wholly involved in their development has expanded. These actors include:

- Anchor institutions, such as advanced research universities and medical centers;
- Local, state, regional, and, increasingly, national governments;
- Community, civic, workforce development, and local-serving not-for-profit organizations;
- Anchor and growth companies, particularly those with research and development strengths;
- Start-ups, spin-offs, and scale-ups, which are increasingly eager to be engaged in the development of districts;
- Master developers and major land owners;
- Venture capitalists and other investors; and
- The growing number of intermediaries that work across actors or sectors.

INNOVATION DISTRICTS AND HOW THEY CAN ADVANCE REGIONAL PROSPERITY

A significant share of innovation districts emerging globally are adjacent to strong research institutions—universities, hospitals, and other research institutes—given the high level of translational research under way in areas such as life sciences, engineering, and computer science. Certain institutions focus more heavily on translational research, which builds on basic research and "translates" research findings into products, processes, and services for the market. As this research can have monetary value, institutions define and protect their intellectual property and execute agreements such as license agreements and partnership contracts to transfer knowledge to companies. Companies and firms make conscious decisions to locate near these research institutions to strengthen how they obtain—formally and informally—new insights to drive new products and services for the market. Companies and firms also value proximity for their own competitive positioning, including closer collaboration with other firms, actors within their supply chain, and customers.

With all the various channels now needed to innovate, research institutions, companies, and firms are physically clustering to strengthen their ability to exchange highly complex, technical information. Compared to other types of economic activity, innovation activity requires the highest level of knowledge exchange.[5]

Research shows that R&D activity is far more concentrated than employment, and R&D labs are highly concentrated—research labs in more than one-third of manufacturing industries see co-location benefits at less than a quarter mile or .40 kilometers.[6]

As the network of companies, small firms, and institutions grows, the physical clustering of economic actors can, and often does, evolve into something far more powerful and intentional. Rather than just an "innovation play," the true potency of districts lies in their ability to advance local and regional prosperity. In a world of growing income disparity and discontent with the outcomes of market capitalism, innovation districts can become a powerful vehicle for transforming research strengths and ambitions into an engine that generates new jobs and new income for the region. From Sydney to Phoenix to London, innovation district leaders are now undertaking more deliberate work to think through how research can indeed spark new jobs for residents and future residents. As this paper outlines, the growing imperative to successfully link innovative growth to inclusive growth will stimulate what is likely to be a new set of inclusion and social innovation strategies to guide districts in the future.

Graph 1: Hyper Localization of Knowledge-Intensive Sectors

KEY OBSERVATIONS: REDEFINING DISTRICTS

An emerging geography of innovation that offers new opportunities and avenues for shared growth in cities and regions is a provocative proposition. It has gained considerable traction across a wide cross section of leaders who, for the most part, are still grasping the inherent complexities and challenges in realizing its true potential. This is in part because the model is nascent—still unfolding and maturing within unique cultural and political contexts.

As this model continues to develop, it also means that the growing network of practitioners, researchers, and policymakers leading the development of districts are, themselves, paving new pathways of innovative practice and policy reform. Districts, by their very nature, are living labs where creativity and experimentation intersect with the precision of science. Districts are places that fan the flames of organic, evolutionary growth but also drive intentional, deliberate change. For leaders on the ground, such nuance and seemingly contrasting approaches to growth can lead to confusion, enabling a process to be co-opted by overbearing egos or to slowly erode if not disappear altogether.

We have seen, and are therefore deeply cognizant of, these challenges in certain districts. It has, in turn, increased our sensitivity to innovative practice, processes, and policies and how those teachings can be scaled. Described in this section are three key observations to help districts advance with greater agility and focus.

Today, by conservative estimates, there are more than 100 innovation districts emerging around the world.

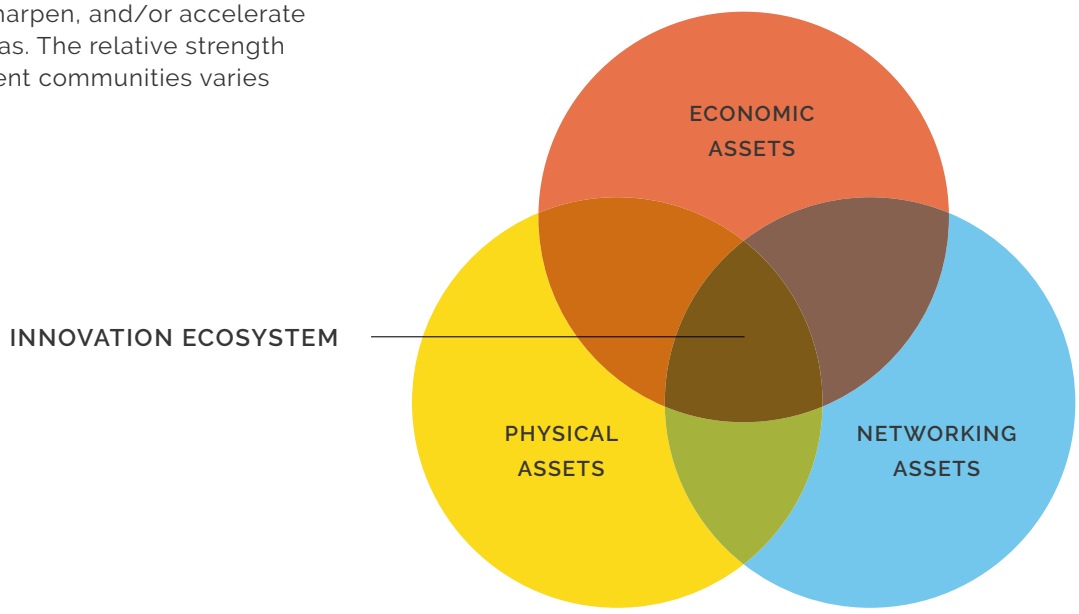
FIRST OBSERVATION: Successful districts are reaching their full potential through the deployment of asset-based strategies that leverage a district's economic, physical, and social networking assets.

The 2014 paper contrasted the rise of innovation districts and earlier models of innovation geographies such as science parks and science corridors. One notable distinction is that innovation districts possess a combination of economic assets, physical assets, and social networking assets. Specifically:

Economic assets are the firms, institutions, and organizations that drive, cultivate, or support an innovation-rich environment.

Physical assets are the public and privately owned spaces—buildings, open spaces, technologies, streets, and other infrastructure—designed and organized to stimulate new and higher levels of connectivity, collaboration, and innovation.

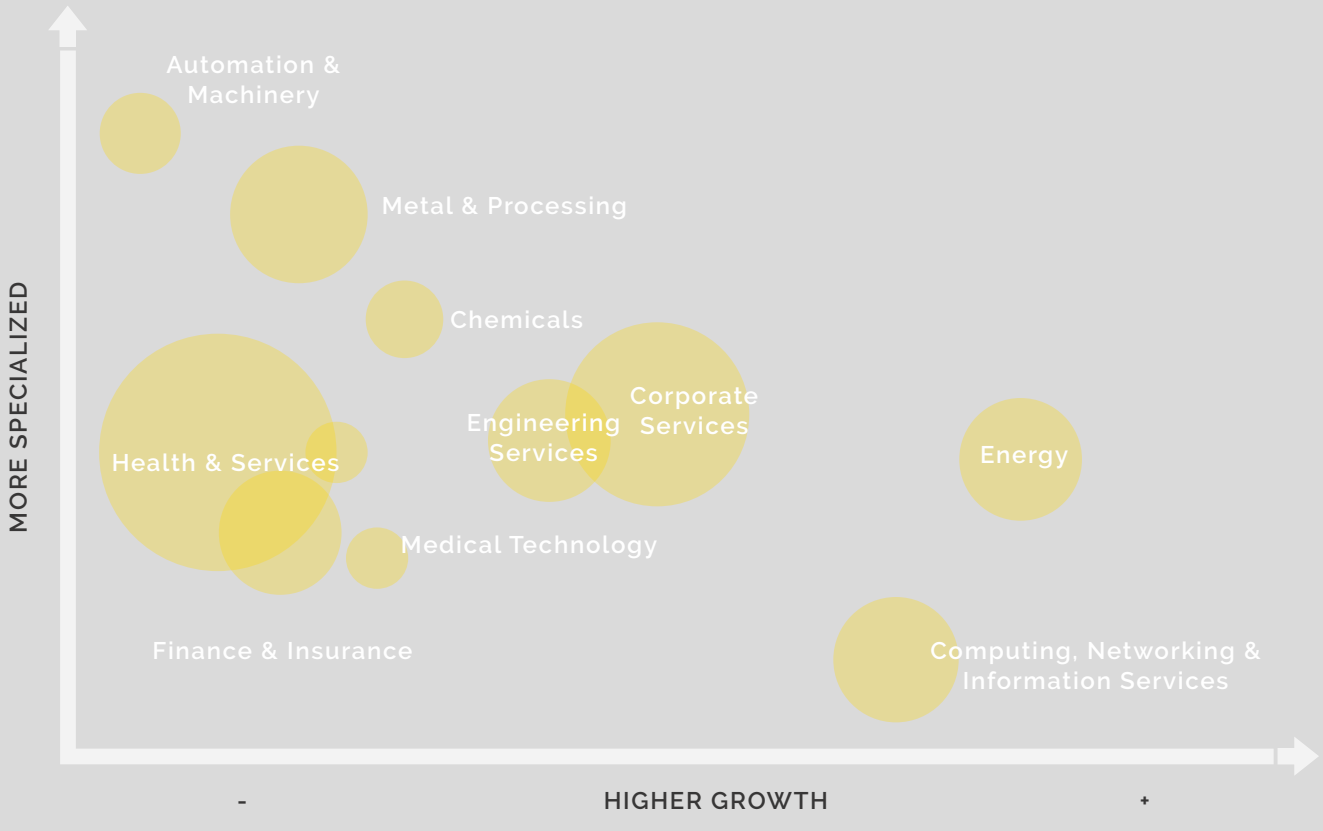
Social networking assets are the relationships between actors—such as between individuals, firms, and institutions—that have the potential to generate, sharpen, and/or accelerate the advancement of ideas. The relative strength of these assets in different communities varies considerably.



The simplicity of the above diagram, illustrating the relationship between these assets, continues to help local practitioners and policymakers understand the starting ingredients of a district.

Since 2014, deeper empirical analysis of a handful of districts helped establish a process for local leaders to understand or "audit" their starting assets.[7] An analysis of districts across several global regions has helped clarify how many aspiring or emerging districts simply do not understand which research and innovation strengths to leverage. Auditing assets in these districts is a useful, if not critical, first step.

At the same time, work with more advanced and successful districts revealed how they are becoming more sophisticated in devising strategies to strengthen their innovation ecosystem. Many of these districts are moving past pure "place-based" strategies or pure "innovation-based" strategies and are advancing at least five asset-based strategies that combine economic, place, and social networking assets. The strategies are: 1) creating a clear competitive advantage, 2) building critical mass, 3) facilitating convergence, 4) developing quality of place, and 5) orchestrating a "buzzing," connected community.



CREATING A CLEAR COMPETITIVE ADVANTAGE

A clear competitive advantage sets the focus, alignment, and value proposition for how a district can differentiate itself from other districts and other geographies of innovation. This begins by identifying the strongest avenues for translating research into new products and services that improve the quality of life for residents and workers of the city and region, and, potentially, have a positive impact on people and places across the globe.

A clear competitive advantage often means tightening an economic strategy from broad sectors to strong or emerging specializations. In 2016, for example, at least 54 nations boasted of possessing at least one biotechnology hub. North America alone has identified over 30 biotechnology hubs.[8] A review of the leading hubs for bioelectrics or immunotherapy in transplant or orphan drug development, for example, yields a much smaller list. This exercise alone demonstrates the value of identifying unique specializations and niches within the field of biotechnology to develop a clearer competitive advantage.

To find the best avenue to compete, many districts begin by conducting a regional audit analysis to understand both their strengths and weaknesses.[9] Several innovation districts, including Dublin, Milan, Oklahoma City, Philadelphia, and Pittsburgh, have recently employed such strategies to coalesce engagement and create a shared sense of purpose among actors, including research and development institutions, government officials, economic development professionals, innovation intermediaries and conveners, and private sector companies.

Fully leveraging a district's competitive positioning requires making important linkages between economic, physical, and social networking assets as illustrated below and on the next page.

Economic assets—specifically the district research and innovation strengths of institutions, intermediaries, companies, and firms—define a district's competitive advantage. Actors in one district could find their strength to be in precision nutrition while actors in another district could find their strength to be in machine learning.

An auditing process, which also evaluates the regional ecosystem, helps districts identify unique specializations, new processes for innovation and development, and/or technological platforms to advance.

Physical assets—the aggregate of individual buildings, the range of public spaces, technology, and other infrastructure—underpin the ability of a district to strengthen its competitive advantage.

A clear competitive advantage in precision nutrition, for example, and high-precision parts for power facilities, demand entirely different building stocks with unique specifications, technologies, and other infrastructure.

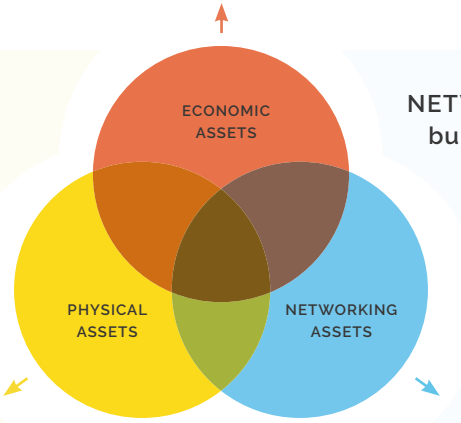
The growth of social networks—ranging from informal networking to formal external partnerships—means leveraging people, their know-how, and their relationships to advance a competitive position.

Clarity on which specializations to advance will also help determine what kinds of partnerships and networks to support and strengthen.

CREATING A CLEAR COMPETITIVE ADVANTAGE: HOW ASSETS TRANSFORM INTO STRATEGIES

ECONOMIC ASSETS: With clarity on research and innovation strengths if not specializations, district leaders can identify and then implement specific strategies to strengthen their advantage. Examples of strategies to strengthen competitive advantage include:

- New alliances, partnerships between actors (e.g., institutions and industry);
- A pooling of resources to advance promising research;
- New intermediaries to advance promising areas of research;
- Linking district and/or regional start-ups to emerging specializations (e.g., mentorship programs, contracts); and
- Creating strong talent-growth strategies to create a new competitive position with local and regional residents.



PHYSICAL ASSETS: Area actors will want to examine how place assets are strengthening the district's competitive advantage. This can include:

- Making key investments in specialized technologies;
- Ensuring close proximity among buildings and situating key researchers closer together;
- Opening up private labs to other district actors to expand their participation in competitive areas; and
- The mixing of uses, amenities, and high-quality place-making strategies to make these places desirable and people-centered.

Another role of the physical is to create a vibrant, open, and connective environment that attracts talent, firms, and the diversity of people who live in the region. This is essential irrespective of the competitive play.

NETWORKING ASSETS: Similarly, building off a competitive advantage, districts will want to make sure social networking is aligned and uniquely tailored. Examples of strategies include:

- Designing unique technological training courses and classes;
- Implementing tailored forums and structured work sessions to advance specializations;
- Creating network opportunities between top experts and start-ups and scale-ups;
- Orchestrating this alignment with workforce development programs; and
- Designing programs to help students (high school and college) learn/understand these specializations.

BUILDING CRITICAL MASS

Achieving critical mass means creating a density of economic (innovation-oriented) actors, talent, and technologies. This density of assets enables districts to systematically grow and leverage partnerships and transform ideas into products, processes, and services for the market. Beyond traditional research and development, districts should also be places that grow a critical mass of actors and intermediaries that strengthen economic inclusion.

Emerging innovation districts should first identify their competitive advantage and then create a critical mass around key specializations rather than compete against top districts on a general basis. Critical mass is built over time by first understanding the research and development focus of intellectual anchor(s) and/or major R&D companies, and then adding new economic actors, innovation infrastructure, and other investments essential to productive growth.

Building critical mass therefore requires making important linkages between economic, physical, and social networking assets as illustrated below and on the next page.

The collection of economic assets within the district must reach a sufficient threshold—well beyond the regional average—to more easily advance and commercialize research specializations. This issue of threshold varies significantly by specialization.

An inadequate level of critical mass, instead, can be enough to encourage companies, firms, and talent to re-locate elsewhere.

On the most basic level, physical assets such as the underlying zoning define the density, proximity, and accessibility, which helps define how a district achieves critical mass.

A critical mass of actors and firms in short walking distance will help strengthen knowledge exchange between people and firms—especially complex, highly tacit information.

A critical mass of physical assets also includes the necessary physical spaces (e.g., offices and laboratories), other innovation infrastructure, and technologies needed to advance specializations.

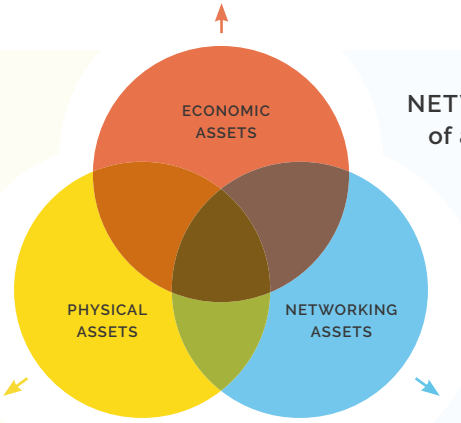
A critical mass of networks—relationships between people and firms—underpins a district's ability to reach its full potential. Physical proximity alone is often not enough.

A greater emphasis on growing and strengthening networks can transform a group of actors and buildings into an *innovation community.*

BUILDING CRITICAL MASS: HOW ASSETS TRANSFORM INTO STRATEGIES

ECONOMIC ASSETS: Once a district's competitive advantage is clear, analysis should determine what gaps exist in the value chain and also why actors will find strategic or operational value in physically locating in the district. This can set off highly tailored strategies such as:

- Creating a *private sector strategy* to motivate specific companies or R&D labs to move to the district;
- Designing an *institutional strategy* to lure institutions (e.g., satellite campuses) with a particular research strength;
- Orchestrating a *strategy around intermediaries* to attract or build those important cross-cutting actors;
- Devising a *talent attraction strategy* around unique specializations and niches;
- Shaping a *talent retention strategy* to ensure talent (and families) stay; and importantly,
- Designing a *talent growth strategy* to grow regional talent into these areas of specialization.



PHYSICAL ASSETS: Building off the strategies that strengthen the critical mass, physical strategies help reinforce this work and often include:

- Changing the underlying conditions of density and mixing (making possible higher concentrations of economic actors and a diversity of talent);
- Making key investments in innovation infrastructure (e.g., wet labs, dry labs, shared lab facilities) that match the needs the district;
- Opening restaurants and other amenities; and
- By means of both design and programming, creating shared and private meeting spaces that vary in size to accommodate a range of people and encourage a range of activities, including community events (organizations, citizen groups, private event users, regional businesses).

NETWORKING ASSETS: A critical mass of actors also means a critical mass of people and networks. This can often translate into developing a social networking strategy that engages this growing list of actors. This can include:

- Engaging people within the private sector with other actors such as institutions;
- Helping the range of researchers and thinkers work across institutions;
- Orchestrating efforts across intermediaries to be mutually supporting and not competing; and
- Creating programs and trainings to attract talent, grow talent, and retain talent. Dedicated efforts in these areas are often the only avenue to strengthen the connections between innovation actors and communities, residents, and local groups.

FACILITATING CONVERGENCE

The concentration of research and researchers in deep industry verticals undeniably strengthens the competitive advantage of innovation districts. Yet much of research driving new technology platforms, like next-generation energy, information technology, and new materials, is increasingly multidisciplinary.[10] New drugs come from interactions between chemists, biologists, big-data specialists, and computer science—a process of convergence where disparate sectors and disciplines come together as a means to innovate. A team of researchers at the Massachusetts Institute of Technology (MIT), for example, put forward a report arguing that solving health challenges will come only from convergence—a research strategy that integrates disparate disciplines such as biomedicine, computing, and mathematical sciences.[11]

Facilitating convergence means creatively encouraging multi-disciplinary approaches to problem-solving through informal and formal collaborations. This requires making important linkages between economic, physical, and social networking assets as illustrated below and on the next page.

While convergence often occurs organically, districts can accelerate convergence through intentional strategies and partnerships between economic actors.

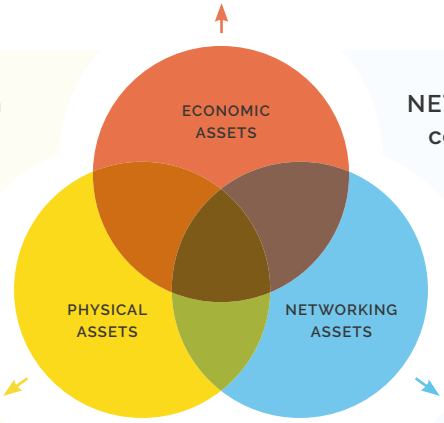
Physical assets facilitate convergence by creating new physical platforms for different actors and sectors to work horizontally as opposed to vertically.

Social networks are the life-blood for cross-sector work as convergence begins with new connections between people and firms across sectors. Sociologist Mark Granovetter described this as the development of "weak ties."[12]

FACILITATING CONVERGENCE: HOW ASSETS TRANSFORM INTO STRATEGIES

ECONOMIC ASSETS: Convergence can be supported through a range of economic strategies such as:

- Incentives to encourage institutions and industry to work together (e.g., changes in contracts);
- Intermediaries with the core mission to work across strong but disconnected sectors or specializations;
- Agreements across actors and sectors to work on cross-cutting initiatives (e.g., joint research agreements, pooling of resources); and
- Creative financial instruments that, for example, make possible the co-hiring of researchers between institutions and industry.



PHYSICAL ASSETS: Convergence can also be strengthened through place-based strategies. This can include:

- Changing the underlying conditions of density and mixing (which allow close proximity of firms and people);
- Physically co-locating a diversity of researchers to work on cross-cutting projects;
- Purchasing key technologies such as advanced computing;
- Creating open access to technologies for a range of stakeholders to use;
- Intentionally creating proximity between key buildings with a range of converging research activities; and
- Creating physical nodes or "hot spots" of convergence (e.g., a higher concentration of uses and activities within a one-block radius).

NETWORKING ASSETS: To facilitate convergence requires a number of social networking strategies. This includes:

- Well-designed programs that push disciplines together across the district;
- Informing researchers and others of the work under way in the district to help foster new connections; and
- Hiring a dedicated person to curate relationships across firms, institutions, and specializations.

DEVELOPING QUALITY OF PLACE

As described in the introduction, a fundamental distinction between innovation districts and other geographies of innovation is the physical landscape and the role it plays in advancing an innovation ecosystem. While enabling innovation is a central objective, the primal role is to *create quality places for people*. Innovation districts are a mix of uses and activities, including housing, neighborhood-serving retail, and community spaces, which make districts vibrant, open communities. The complexity inherent in "place" demands that the full range of assets contribute to what is an evolving process of place-building.

As outlined in a recent article for the Brookings Institution, Wagner noted how it is challenging to find a consistent quality of place across most districts. Part of the reason is that many districts are still undergoing the process of transformation, and more work still lies ahead.[13]

Developing quality of place requires making important linkages between economic, physical, and social networking assets as illustrated below and on the next page.

Economic actors with a physical footprint are directly contributing to the district's physical quality and feeling as a community. Their individual decisions on architecture, design, and ground floor use of buildings can either contribute to a district's quality of place or erode it.

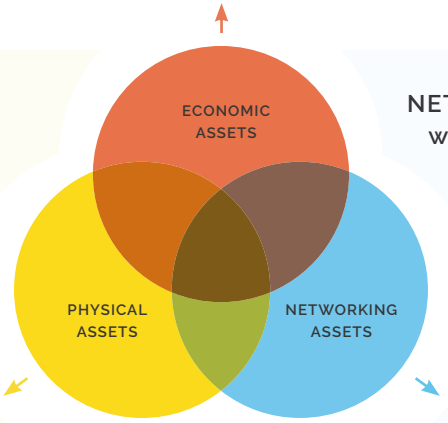
Physical assets play a central role in the development of quality of place. Many districts undergo a master planning process and engage master developers to create a more orchestrated built environment. Other districts take a more incremental approach.

Quality of place is also defined by those who can access and/or feel ownership in a space. People in a district who *feel connected* to other people within the district transform seemingly random buildings of real estate into a community.

DEVELOPING QUALITY OF PLACE: HOW ASSETS TRANSFORM INTO STRATEGIES

ECONOMIC ASSETS: Economic actors, including the community, have an important role to play in developing quality of place. This includes:

- Developers, individual owners, and prospective tenants demanding that buildings and the public realm contribute to quality of place and innovation porosity (e.g., the transparency of the skin of the building);
- Researchers and other workers being allowed, if not encouraged, to work in other spaces other than closed offices; and
- Engaging the public and district stakeholders in how to design and shape spaces to increase a feeling of ownership and usability.



PHYSICAL ASSETS: There are easily hundreds of large and small physical strategies necessary to create a quality of place that will attract a range of people to the district during different times of the day and on weekends.

Some of the driving principles that help guide these strategies:

- Strengthening accessibility within the region and within the district;
- Creating openness and porosity; making innovation more open and visible;
- Ensuring a high-quality walkable and "linger" experience;
- Providing a range of uses (e.g., housing) that draw a diversity of people;
- Avoiding cookie-cutter designs; and
- Valuing public spaces.

NETWORKING ASSETS: A powerful way to transform real estate into an innovation community is through programming. This is often achieved by:

- Developing unique programs to unique spaces and places such as public innovation halls, open spaces;
- Re-thinking how to program specific lobbies and ground floors within and across the district;
- Thinking through a district-wide approach to social networking (which can make the district a destination) as much as thinking about how to design programs within a particular node or "hot spot" (e.g., within a one-block radius); and
- Designing programs for residents, local workers, and others aiming to access the innovation economy.

ORCHESTRATING A "BUZZING," CONNECTED COMMUNITY

Social networks are an asset that defines innovation districts and for good reason. Research reveals how networks are increasingly valuable and prolific within innovation-driven economic clusters. Scholars cite numerous advantages of networks: They are important sources of new or critical information for new discoveries; they encourage experimentation and are a testing ground for ideas; they help firms acquire resources; they strengthen trust and collaboration within and across sectors; and they help firms enter new markets, including global markets.[14] Yet a review of the allocation of time and other resources reveals that this important asset class is the least supported or advanced. This section, therefore, goes a bit deeper to illustrate how social network strategies are valued.

Practitioners of maturing innovation districts have conveyed how the growth and development of networks through programming has transformed their real estate into innovation communities. "It's all about programming, choreographing 'spontaneous opportunities' for smart people to interact with each other," shared one district leader.[15] Interviews with architects and building managers revealed how today's innovation spaces are truly a seamless integration of design and programming.[16] "It's more than just design that builds a community and collaborative environment. It's the balancing of the programming, of spaces, such as labs and general spaces, such as the kitchen, that really create a special environment," shared an applied science start-up space.[17] For emerging districts, these innovation spaces become the beacon of an ecosystem in the making. It helps explain the power and potency of innovation centers such as District Hall in Boston, the Sydney Startup Hub in Sydney, and 1871 in Chicago. This value is particularly evident in St Louis, where the combined programming at Innovation Hall, the @4240 building, and Cortex Commons attracts approximately 800 to 1000 people a week.[18]

Over the past four years, district leaders are finding programming as essential as real estate and are hiring staff to design, manage, and implement such programs. The challenge has become ensuring a sustainable stream of funding for such programming without either overly burdening a building's operating costs or continually pursuing fundraising activities that detract from the power of programming. Some innovation district governance structures, such as the University of Maryland Research Park Corporation, University City Science Center, and Cortex, have chosen to implement an innovation district-wide charge against all square footage to be used for elements such as programming, community benefit, and other transformative programming.

Orchestrating a buzzing community can reach its true potential by making important linkages between economic, physical, and social networking assets as illustrated on the next page.

A critical mass of institutions, firms, start-ups, retail—and their people—are essential to create the "buzz."

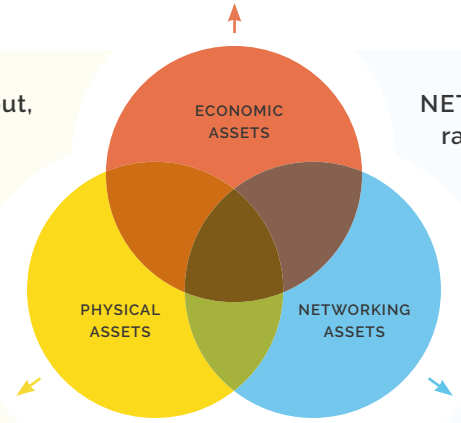
Physical density and proximity of buildings lay the groundwork for creating a community of connections. Physical investments in high-quality buildings, infrastructure, and public spaces are just as potent in creating the platforms for connections.

Social networking assets—when orchestrated, designed, and well-financed—are the linchpin to creating a highly networked, buzzing, and inclusive community. Many relationships simply will not be forged without some level of support or encouragement.

ORCHESTRATING A "BUZZING," CONNECTED COMMUNITY: HOW ASSETS TRANSFORM INTO STRATEGIES

ECONOMIC ASSETS: Specific economic actors can play an outsized role in developing and cultivating networks. These actors include:

- Intermediaries, which can include accelerators and incubators;
- Workforce development centers, which focus on creating connections between residents and work opportunities;
- One-stop-shop centers, which can help streamline processes and create new connections between people and organizations;
- Centers of research excellence; and
- Specific instruments and incentives adopted by institutions and companies to encourage workers to engage outside their organization.



PHYSICAL ASSETS: The design, layout, and overall relationship of buildings to the broader landscape play a critical role in creating a buzzing community. Physical strategies can often include:

- Building a public innovation hall and/or innovation centers (these require programs inside) to encourage networks;
- The development of concentrated nodes of programmed buildings (where there is high foot traffic) and adjacent public spaces;
- Buildings that can be easily reconfigured internally to empower people to use/change the spaces;
- The design of ground floors for open, community-oriented spaces or work; and
- Integrated public spaces, shaped by communities.

NETWORKING ASSETS: There are a range of strategies to strengthen "strong ties," which are more formalized networks and often within the same sector or discipline. These strategies include:

- Structured network events, training, targeted problem-solving sessions, targeted hack-a-thons, meetings with global experts, and much more.

There are also a range of strategies to strengthen "weak ties," which are networks of people who do not normally know each other and often have different experiences and education. These strategies include:

- Open, network events with guest speakers, technology training and new development workshops, cultural events, matching events, events between residents and researchers, and much more.

SECOND OBSERVATION: Successful districts rely on *organizational strategies and structures*, particularly a strong governance model and a coordinated finance structure.

The success or failure of innovation districts depends on key institutions and leaders governing with intentionality and unlocking and leveraging various forms of capital. This section explores these two essential organizational strategies: governance and finance. In both governance and finance, most of the models described are located in the United States as there are numerous models evolving out of a highly networked approach to leadership. In future papers, and as part of The Global Institute on Innovation Districts, new governance and finance models outside of the United States will be examined and explored.

GOVERNANCE

Over the last four years, one of the elements that has risen in importance and priority is governance. Innovation districts have distinct institutional and governance challenges that reflect their unique economic function, land use and ownership pattern, and socio-economic composition. Increasingly, stakeholders in mature and emerging districts are finding that they need strong organizations to a) leverage their economic, physical, and networking assets; b) maximize the inclusive potential of innovative growth; and c) create a sustainable funding model for non-economic elements such as public spaces and programming. Thus, the rise of innovation districts is catalyzing the formation of new (or reformed) institutions and governance models to carry out a range of functions that include real estate development, place-making, place management, and place marketing, as well as support for entrepreneurship, programming, and skills training.

Innovation districts, such as the Buffalo Niagara Medical Campus, can range quite considerably in size. While Buffalo is 142 acres or 57 hectres, others are easily twice this size. Variations in size mean these districts have to think differently about how to create critical mass.

Getting Started

In many cities, the first step toward establishing an innovation district is to pull together public, private, civic, and university actors which already have a presence in the area. Sometimes the national, state, or local government takes the lead in convening an initial gathering of key actors. This was the case for Australia's Sydney Technology and Innovation Precinct, for example, where the New South Wales state government organized a formal task force comprising a range

Buffalo Niagara Medical Campus (BNMC)
Buffalo, United States

Top Research/ Innovation Strengths:
- Genomics, big data & the microbiome
- AI & machine learning
- Next-generation technologies in vascular medicine

Key Anchor Institutions:
Roswell Park Comprehensive Cancer Center; University at Buffalo (UB) Centers of Excellence in Biotech and Life Sciences, Material Informatics, and Computational Research; Buffalo General Medical Center; UB Jacobs School of Medicine and Biomedical Sciences; Kaleida Health's Oishei Children's Hospital; Hauptman-Woodward Institute; Buffalo Medical Group; and Buffalo Hearing and Speech Center.

Number of companies and start-ups:
More than 150 private companies, including a dynamic and growing cluster of technology, life sciences, bioinformatics, energy, and social innovation companies, and not-for-profit organizations.

Housing:
Significant existing housing (all income levels) within three adjacent neighborhoods. Limited amount of market rate housing and low-income housing is found within district. Proposed student/ workforce apartment units within the district.

Public transportation:
Connected by the NFTA Metro Rail with two stations in the district and five bus routes through the district. Recently completed $500M transit-oriented development.

Amenities:
BNMC has over 20 restaurants, over 10 pieces of outdoor public art, a hotel, and urban greenspace. The district also has over 25 electric vehicle charging stations, and secure bike parking.

of government agencies, universities and medical institutions, industry, and a range of civic and non-profit organizations.[19] In the United States, the catalyst for convening is often the leading business organization and research institutions.[20] Other districts in Europe, organize themselves through the triple-helix or quadruple-helix model, where leaders across institutions, industry, government, and community come together to engage.

Putting regional variations aside, what fundamentally matters is that leaders—those with the clear mandate and ability to make key changes in policy, programs, and finance—are supportive of this new model of collaborative growth. Intensive work with dozens of innovation districts around the world reveals that many aspiring and emerging districts are getting mired in process. Large meetings or the wrong meetings are being held where decisions are simply not being made. A review of how mature innovation districts advanced in their initial stages reveals that early meetings included just a few top leaders to discuss a new "collaborate to compete" model and what this means for each leader and organization. To create a shared agenda, for example, could mean a sharing of research, a sharing of researchers, new intermediaries to assist, and shared investments in technological platforms. Deep conversations with leaders to discuss this approach simply cannot be skipped.

The goal of this initial organizing phase is often to conduct an assessment of the area's disparate economic, physical, and networking assets to ascertain the organic strength and distinctiveness of the innovation district and logical next steps forward. For districts backed by advanced research institutions, such assessments can be quite extensive and involve the hiring of consultancies or think tanks with deep expertise in innovation districts in general or particular economic sectors.[21] It is critical to understand the innovative strength, sectoral focus, and commercialization potential of university and corporate R&D, since the location of these economic assets will often drive the physical configuration of the district (along with other starting points like the existence of retail, residential, recreational, and cultural amenities).

It is tempting for government officials to designate and declare an area of a city an innovation district in hopes of attracting companies and activity to an underserved area or an area needing economic revitalization. Similarly, developers have flocked to old warehouses or factories, added co-working space, and quickly labeled these investments as innovation districts. The downside of these approaches is that they often focus exclusively on the physical development of real estate and miss the deeper dynamic that sets these districts apart from conventional office spaces found in a central business district or the suburban office park.

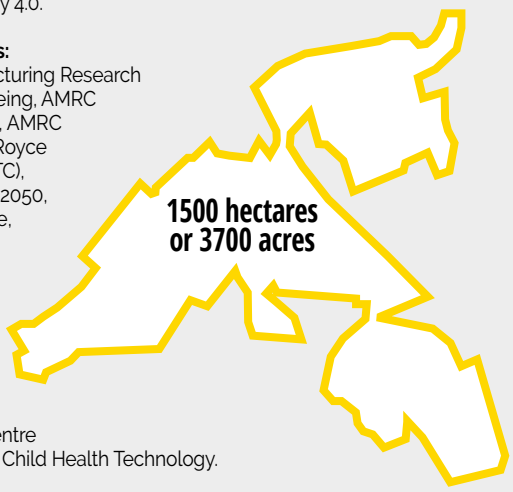
Advanced Manufacturing Innovation District (AMID)

Sheffield, United Kingdom

Top Research/ Innovation Strengths:

- Advanced materials with specializations in metals, composites, light weighting, and Industry 4.0.
- Energy generation, storage, management, and security
- Healthcare technology

Key Anchor Institutions:
The Advanced Manufacturing Research Centre (AMRC) with Boeing, AMRC Light Weighting Facility, AMRC Casting, Factory 2050, Royce Translational Centre (RTC), Nuclear AMRC, Energy 2050, AMP Technology Centre, Dynamics Laboratory for Verification and Validation (Dynamics LVV), Integrated Civil Infrastructure Research Centre (iCAIR), Advanced Wellbeing Research Centre (AWRC), and Centre for Child Health Technology.



Number of companies and start-ups:
100 companies across the research campus; more than 135 advanced manufacturing businesses across the wider AMID.

Housing:
The AMID is situated adjacent to the residential site of Waverley where over 4,000 new homes have been approved for construction.

Public transportation:
The AMID has 11 bus stops and three bus routes. Nearby tram connecting Sheffield and Rotherham.

Amenities: Café, conference/meeting facilities, Kidz@Work Nursery, and hotel.

All innovation districts, such as Sheffield's Advanced Manufacturing Innovation District (AMID), possess unique innovation specializations. While the AMID has specializations in advanced materials and energy, other districts are strong in life sciences, such as genomics or immunology.

Naming, Alignment, Development, and Marketing

As innovation districts take shape, the next logical step is to go from the informal to the formal and establish a mission-focused organization. This generally requires the creation of a governance structure that includes the key stakeholders, consensus around a core set of principles and functions, and the hiring of staff, particularly a CEO or executive director, with core competencies. Organizational functions generally include, at a minimum: a) naming an official innovation district; b) designing and delivering joint activities around programming and knowledge sharing; c) outlining a strategy and process for real estate development; and d) promoting or marketing the innovation district. Over the past several years, cities as diverse as Austin, Cincinnati, Oklahoma City, and Pittsburgh have created new entities to act as conveners and marketers in advance of the development of innovation districts.[22] In the case of the Melbourne Innovation District in Australia, this responsibility is jointly shared by the city of Melbourne, the University of Melbourne, and RMIT.[23]

As new innovation district organizations emerge, it is clear that realizing the full potential of a district differs from prior urban revitalization strategies or economic development initiatives. On one hand, the aim of an innovation district is to build an innovation community, not just a collection of buildings. Every district decision should, therefore, answer the fundamental question of how it contributes to growing an innovation community. On the other hand, even with a new approach to growth, it still requires staying focused on traditional real estate development activities such as master planning, setting design standards, outlining suitable use criteria, and establishing strong streets and good walkability as these functions contribute to the density, connectivity, and activation that promote a sense of place and community.

To grow and thrive, the institutions, firms, and other organizations that comprise an innovation district need to have access to other actors in the regional innovation ecosystem. A range of public transportation options, which can be found in the Melbourne Innovation District, unlocks this potential.

> **"… the aim of an innovation district is to build an innovation community, not just a collection of buildings."**

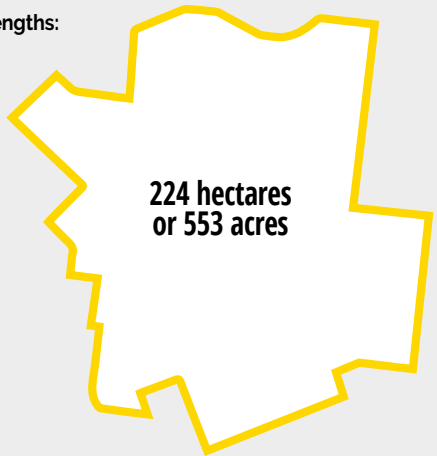
At the same time, one of the most compelling and challenging dynamics of innovation district strategies is the notion that, unlike past cluster strategies, the identification of the core area of technological competitive advantage has to at least some degree not be prescribed up front but rather emerge from the organic interactions that the district facilitates. Innovation districts embody a natural tension between some degree of upfront targeting and analysis of technical strengths with a continuous discovery model that evolves and iterates over time.

Melbourne Innovation District (MID)
Melbourne, Australia

Top Research/ Innovation Strengths:
- Biomedicine
- Digital, data and emerging technologies
- Advanced manufacturing

Key Anchor Institutions:
The University of Melbourne, RMIT University Melbourne, Royal Melbourne Hospital, Royal Women's Hospital, Children's Hospital.

Number of companies and start-ups:
As of 2017, the MID was home to approximately 2500 businesses.



Housing:
As of 2017, the MID had roughly 19,000 housing units with an additional 6000 housing units under construction, including 3000 student apartments. An additional 4200 housing units have been approved for development, which include 1900 student apartments.

Public transportation:
30 light rail stops, one heavy rail station and an additional two rail stations under construction with the Melbourne Metro.

Amenities:
Queen Victoria Market, Melbourne Museum, State Library Victoria, Lygon Street restaurant/cafe precinct.

Building Out a District

In a select number of districts, two discrete models have emerged to take an innovation district to a more sophisticated state. As noted earlier, the majority of these models are found in the United States. One possible reason for this is the extent to which innovation districts are conceived and led by non-governmental organizations, including universities, non-profit organizations, and/or a broad cross section of economic actors.

The "Dominant Player" Model

In several cities, one large anchor institution dominates land ownership and use in the innovation district, facilitating a streamlined approach to governance. Sometimes governance happens within the anchor institution via internal offices of real estate, facility management, or tech transfer. Purdue University, for example, first created the Purdue Research Foundation (PRF) in 1930 to facilitate getting the discoveries of the university into the hands of industry. Today, PRF manages a research park, several technology incubators, and its emerging innovation district, Discovery Park, located on its main campus in West Lafayette, Indiana. The PRF model is exceptionally comprehensive in that it includes all elements of innovation, from discovery disclosure to technology transfer, business creation and incubation, corporate engagement, and innovation place-making and programming, within its purview.[24] Other similar successful models include the Stanford Research Park, Imperial College London's White City Campus, and King Abdullah University of Science and Technology in Jeddah, Saudi Arabia.[25]

In some cases, it makes sense for an institution to charter a new entity for governance. For example, in 1998 the Wake Forest Baptist Medical Center partnered with civic and business leaders in Winston-Salem, N.C. to envision a biotechnology-focused innovation district on the edge of downtown. Initially named the Piedmont Triad Research Park, and today known as Innovation Quarter, it consisted of a building owned by the medical center. However, the entity was a perfect conduit for R.J. Reynolds to donate their tobacco factory buildings and 38 acres to create an innovation district of scale and impact. Today the Innovation Quarter consists of 1.9 million-square-feet of lab and office space, a conference center, park, and over 1100 units of housing with another 600 under construction.[26] The build-out of Harvard University's Allston campus could follow a similar route.[27]

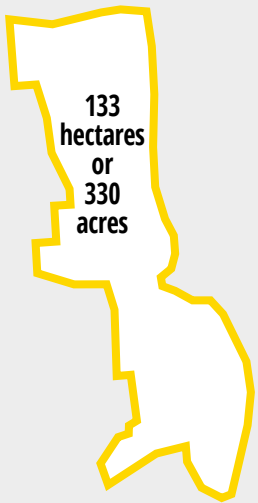
Wake Forest Innovation Quarter
Winston-Salem, United States

Top Research/ Innovation Strengths:
- Regenerative medicine
- Digital/consumer analytics
- Biomedical engineering

Key Anchor Institutions:
Wake Forest School of Medicine,
Wake Forest University,
Inmar, Inc.

Number of companies and start-ups:
The Innovation Quarter is home to 143 companies and 65 start-ups.

Housing:
There are over 1,100 units of housing within the Innovation Quarter.



Public transportation:
Connected by the Piedmont Area Regional Transit lines. The Innovation Quarter is also within walking distance of the Winston-Salem Multimodal Transportation Center—a modernized hub that connects people to numerous transit lines.

Amenities:
Amenities include: Bailey Park, a 1.6-acre publicly accessible green space for hosting community events; the Long Branch Trail, a 1.7-mile paved trail that connects to the city's 30 miles of greenway system; Coal Pit, a 14,000-square-foot entertainment venue behind the renovated Bailey Power Plant; five restaurants within the district; and 116 restaurants/bars/clubs within walking distance.

Innovation districts, such as the Wake Forest Innovation Quarter, offer a range of housing choices for residents. Housing helps create an important mix of people and creates the 24/7 activity that makes districts thrive.

The "Multi-Stakeholder" Model

When multiple anchor institutions co-locate, intermediaries have emerged to design and deliver collaborative efforts on activities that enhance the performance of the district as a whole. Some of these intermediaries have been in existence for several decades and have evolved over time to take on new responsibilities. One of the first organizations to undertake this was the University City Science Center in Philadelphia, Penn. First established in 1963 by the University of Pennsylvania, Drexel University, Children's Hospital of Philadelphia and 27 other research and educational institutions, today it governs a 24-acre innovation district, named uCity Square, which is part of the larger University City District. It comprises 16 buildings, and manages several entrepreneurial assets and programs, including the Quorum, Phase One Ventures, and First Hand, a community-oriented STEM program.[28]

This is also what has occurred at Houston's Texas Medical Center, where an entity originally created with a narrow purview (overseeing parking) has now taken on more expansive innovation-related activities (e.g., forging a data collaborative across multiple health research institutions, working with Rice University on a new innovation campus in Midtown Houston, and establishing a series of accelerator programs at TMC-X and with Johnson & Johnson's JLabs).[29]

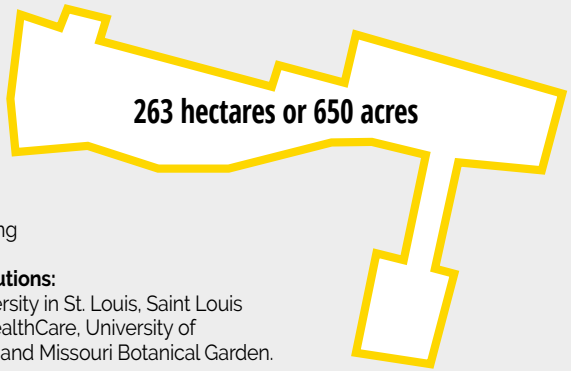
As innovation districts evolve, stakeholders are creating new organizations to manage, market, and oversee the development of substantial sub-geographies. Like Philadelphia's Science Center, these organizations can have an outsized economic impact, especially in secondary cities. The Cortex Innovation Community in St. Louis is one of the best examples of these organizations at scale. The district's origin and evolution are recounted in the original 2014 district paper by Katz and Wagner and in *The New Localism: How Cities Can Thrive in the Age of Populism.*[30]

In 2002, a group of anchor institutions—Washington University, Saint Louis University, the University of Missouri-St. Louis, BJC HealthCare and the Missouri Botanical Gardens—collectively established a non-profit corporation to oversee the development of a 200-acre innovation district in the heart of St. Louis. The district is known as the Cortex Innovation Community (Cortex is an acronym for the Center of Research, Technology and Entrepreneurial Exchange). The state and the city granted the corporation several critical powers: the power of eminent domain, the power to abate taxes, and the power to approve or reject building plans.

In 15 years, Cortex has become the St. Louis area's largest innovation hub, generating 4,200 tech-related jobs and more than $550 million in investment. Taking advantage of the proximity of major research universities, Cortex has leveraged the creative mix of university talent, mature companies, start-up firms, and research labs.

Cortex Innovation Community
St Louis, United States

Top Research/ Innovation Strengths:
- Neuroscience
- Genomics
- IT/cyber
- Aerospace
- Ag-Tech
- Advanced imaging



Key Anchor Institutions:
Washington University in St. Louis, Saint Louis University, BJC HealthCare, University of Missouri-St Louis, and Missouri Botanical Garden.

Number of companies and start-ups:
415 start-ups, established corporations, and ancillary retail and professional service organizations. Since 2010, 380 additional tech-related businesses and support organizations are in the district.

Housing:
The core district has 1,000 existing and proposed multi-family units with over 20,000 multi-family and single family units in the surrounding neighborhoods.

Public transportation:
Connected by the MetroLink commuter rail line with a station in the center of the district and multiple Metro Bus lines.

Amenities:
The district has 11 restaurants in and immediately adjacent to the district. There are three hotels, and over 40 restaurants and bars in the surrounding neighborhoods.

Innovation districts, such as Cortex, are shaped by anchor institutions, which develop cutting-edge research and can play a leadership role in advancing district goals. Anchor institutions are research-intensive universities, hospitals, and other research-oriented institutions.

In particular, Cortex has created six innovation centers, each with its own community and programming; in several cases, Cortex has attracted nationally known intermediaries such as the Cambridge Innovation Center to base facilities in the district.

16 Tech in Indianapolis, Ind. and Cleveland's Health Tech Corridor are two innovation districts that have the capacity to follow the Cortex model.[31]

Irrespective of the selected model, several observations emerge from the pace of institutional transformation under way in innovation districts. Given the range of potential functions that institutions must perform, strong organizations must have internal capacity, as well as public sector relationships, community standing, and private sector credibility, to effect change. This is particularly true given the growing imperative to complement innovation moves with inclusion strategies.

Given the complexity of discrete functions and the multi-phase, multi-year timeframes, some institutions are choosing to import expertise by partnering with organizations that have proven track records. Cortex (St. Louis), uCity Square, which is part of the University City District (Philadelphia), and Innovation Quarter (Winston-Salem) have partnered with private developers to provide innovative real estate strategies and development.

We anticipate seeing a number of new models conceived in Europe, Israel, and Australia that build off a common governance structure, such as a development corporation, and expand its mission and purpose to developing and financing important aspects of growing innovation ecosystems.

The University City District in Philadelphia is supported by a 'multi-stakeholder' governance model. ***Photo credit: Halkin/Mason Photography, courtesy of Drexel University.***

FINANCE

This section covers the finance structures being employed by a number of districts. Like governance, the majority of models are based in the United States. Future research aims to uncover new finance models evolving in other countries as part of The Global Institute on Innovation Districts.

Realizing the full potential of an innovation district entails leveraging the economic, physical, and networking assets that a district possesses. This requires investments in a broad range of activities and projects, each of which has a distinct financing convention. However, they all are still subject to the laws of economics, especially when it comes to the development of the real estate that comprises their physical places.

Leveraging economic assets, for example, requires angel, seed, and venture investments in companies, as well as capital and operating expenses for intermediaries that provide mentoring and other support.

Leveraging physical assets, for example, necessitates access to layered finance (debt, subsidy, and equity) for real estate development (particularly when it entails the adaptive reuse of historic properties) as well as capital for infrastructure improvements (e.g., transit, bike lanes, complete streets, parks). And as more innovation districts are becoming mixed-use in nature, each asset class—lab/office, innovation/co-working, housing, hospitality, retail, amenity, public space—may utilize a different capital stack.

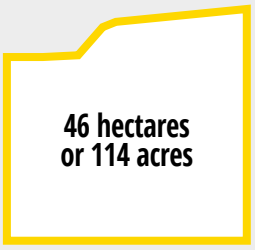
Leveraging networking assets requires the financial ability to activate public spaces as well as provide constant and relevant programming. More often than not, these elements are not financially sustainable without a significant degree of public subsidy, private philanthropy, or cross-subsidization.

Therefore, financing such a broad and disparate range of activities and projects is a complex enterprise and requires a blend of public, private, and civic capital as well as mature financing mechanisms. The nature of the mix is dependent on several factors, including the size and robustness of the local real estate market (e.g., weak, moderate, or strong); the balance sheets and financing sophistication of the anchor institutions and development community, the strength and risk appetite of local investors, the capacity of local government and philanthropy, and the existence of stable funding mechanisms that can raise revenue and capture value for key investments.

Anchors hold outsized sway in this environment. Many universities have extensive real estate holdings adjacent to their campuses or in other desirable urban and suburban locations. In a strong market, the anchor can ease the cost of land acquisition, making the project more affordable for innovation uses that support their mission (as opposed to high-end condominiums), and in weaker markets the institution can leverage its space needs to act as a catalyst to get a project started. For instance, Duke University is widely credited with acting as the stimulus for the rebirth of downtown Durham; the same can be said of Arizona State University in downtown Phoenix and Imperial College London in White City.[32]

Amsterdam Innovation District Zuidas
Amsterdam, Netherlands

Top Research/ Innovation Strengths:
- Human health and life sciences
- Information science
- Neuroscience
- Oncology
- Imaging



Key Anchor Institutions:
Vrije Universiteit Amsterdam, VUmc (VU Medical Centre), Inholland (University of Applied Science).

Number of companies and start-ups:
40 companies including 22 start-ups.

Housing:
Future development will include 1200 student housing units and 600 housing units for families and singles.

Public transportation:
Connected by railway, metro, buses, and tram.

Amenities:
Sport facilities, restaurants, bars, science café, shops, and a campus square.

Innovation districts, such as the Amsterdam Innovation District Zuidas, are not just centers of innovation; they are also walkable locales where people can eat, shop, play, and relax. Quality of place and place-making are important attributes of districts, and a core strategy for districts.

Since market dynamics, building type, use and condition, programming, community engagement, and other elements of an innovation district can vary widely from market to market, practitioners must be adept at understanding and applying a variety of financing mechanisms to achieve financial viability.

Government, at all levels, plays critical roles across the financing spectrum. In the United States, for example, federal and state governments often provide foundational support for basic science and applied research, the platform for transformative innovation, as well as various forms of financing and tax incentives for start-up companies.

On place-making, federal programs in the United States (such as Historic Preservation Tax Credits, Low-Income Housing Tax Credits, New Market Tax Credits, and Opportunity Zones) bring with them vehicles for new sources of capital to facilitate creating community benefit such as affordable housing, community centers, or innovation spaces. Many states and provinces have specific programs to assist with adaptive reuse of historic structures. For example, North Carolina's Mill Credit program made it feasible to redevelop 1.2 million square feet of former R.J. Reynolds Tobacco factory buildings in Winston-Salem, thereby saving these beautiful buildings while providing a unique sense of place for the Innovation Quarter. Similar programs have been successfully employed in Durham, N.C., Providence, R.I., Pittsburgh, Pa., and Cleveland, Ohio.

On networking, the federal government and many states also provide funding for strengthening local innovation ecosystems. At the federal level, the Economic Development Administration provides funding for enhancing capacity; states like Missouri provide support for both incubators and innovation programming on an annual basis through the Missouri Technology Corporation (MTC).[33]

Municipalities also have a role to play through incentive programs such as TIF districts, tax abatements, and PILOT programs; all of these can be utilized to help innovation districts develop elements and amenities that might not be market viable, but nonetheless are essential to the quality of place and program.

As with competitive advantages, innovation districts have distinct starting points on investment capacity and potential. Research universities, for example, are not created equal in the size of their endowments or in their access to conventional (e.g., bonding authority, bank debt) or unconventional (e.g., alumni gifts) funding. Innovation district institutions, likewise, have different abilities to raise reliable funding and different levels of discretion to deploy such funds.

The Milan Innovation District (MIND)

Milan, Italy

Top Research/ Innovation Strengths:

- Precision medicine/precision nutrition
- Advanced manufacturing
- Advanced technologies and automation
- Life sciences
- Prop tech

Key Anchor Institutions:
Galeazzi Hospital,
The University of Milan,
The Human Technopole Research Institute.

Number of companies and start-ups:
MIND is planned to develop spaces for over 100 companies and start-ups. This will include dozens of new laboratories and imaging facilities.

Housing:
The current plan anticipates 3500 residents, who will live in a range of housing types and densities. This includes 1100 student housing beds and 1000 units of housing.

Public transportation:
Connected by the M1 Metro light rail line with one stop located in the District.

Amenities:
Retail, restaurants, coffee shops, a small grocery store, and other amenities are planned.

Innovation districts, such as the Milan Innovation District, are working hard to create a mix of activities and users right from the start. In this case, Milan is looking to create new innovation spaces, housing, retail, and new parks within steps of each other. This "magic in the mix" is what many mature innovation districts have achieved.

THIRD OBSERVATION: Innovation districts are contending with the challenge of linking innovation and inclusion, which will lead to the development of *inclusion and social innovation strategies* to guide their growth.

The rise of innovation districts is occurring during a period of dramatic demographic transformation and economic restructuring, which are combining to create enormous income, wealth, and health disparities both within and across cities in the United States and beyond. The goal of the "inclusive city"—a city that expands educational and employment opportunities, creates wealth, shares prosperity, and engages residents as co-creators and problem solvers—is becoming more and more elusive. As a result, innovation districts are increasingly subject to heightened political and community scrutiny, requiring closer links between innovation and inclusion to be articulated, designed, financed, and delivered.

Innovation districts have the potential to drive inclusive outcomes for multiple reasons. First, innovation districts can create employment opportunities for disadvantaged residents who live in or near the target area. Second, innovation districts can provide increased tax revenues for local governments, which can then be reinvested in projects and services that directly benefit disadvantaged people and places. Finally, innovation districts can bring innovative practices and new players and resources to bear on challenges that have systemically bedeviled low-income communities (e.g., absence of neighborhood-serving businesses, high unemployment, underperforming schools, and endemic health and wealth disparities).

At the same time, mixing top-down and bottom-up approaches to innovation, scientific, technological, and cultural/artistic activities, while facilitating exchange between newcomers and surrounding communities to enhance levels of collective wealth and well-being, can advance the attraction and competitiveness of innovation districts.

The interplay between innovation and inclusion has a particular geographic intensity in the United States. Unlike traditional U.S. research or business parks, which tended to be situated in rural and suburban areas, innovation districts are disproportionately located in the cores of cities, often surrounded by neighborhoods challenged by economic disenfranchisement and high unemployment. The physical proximity between innovation activities and economically disadvantaged communities is not nearly as stark in Europe or Australia, although economic disparity indeed exists and is an important area of discussion and public policy debate. The new spatial geography of innovation offers intriguing opportunities to be seized and serious threats to be averted. Innovation has the potential to be inclusive and enhance the living conditions and livelihoods of places and people without the downside consequences of displacement that many times accompany gentrification. Similarly, inclusion can be innovative, creating new ways of tackling traditional problems via technological advancement and entrepreneurial dynamism.

Linking innovation and inclusion draws heavily from the theory and practice of social innovation that has emerged over the past decade. President Obama established The White House Office of Social Innovation and Civic Participation when he took office in 2009. In 2010 the European Union launched its Europe 2020 strategy, with social innovation being defined in the Innovation Union Flagship Initiative as "an important new field which should be nurtured. It is about tapping into the ingenuity of charities, associations, and social entrepreneurs to find new ways of meeting social needs which are not adequately met by the market or the public sector. It can also be about tapping into this same ingenuity to bring about the behavioral changes which are needed to tackle the major societal challenges, such as climate change. As well as meeting social needs and tackling societal challenges, social innovations empower people and create new social relationships and models of collaboration. They are thus innovative in themselves and good for society's capacity to innovate."[34]

> **"The new spatial geography of innovation offers intriguing opportunities to be seized and serious threats to be averted."**

The application of social innovation in innovation districts is still in a nascent, experimental phase. There are, in general, more declarations of aspiration and intent than actual models and initiatives ripe for replication and adaptation. Many innovation districts tend to focus on one or two aspects of inclusion, rather than designing and deploying a comprehensive response.

Yet two early frameworks for positive intervention are emerging that deserve serious focus and attention, by researchers and practitioners alike. On one hand, cities are slowly inventing a practice of inclusive innovation to ensure that innovative growth advances inclusive outcomes, particularly for residents living in or near an innovation district. At the same time, cities are experimenting with multiple forms of innovative inclusion, to bring new kinds of community-led, anchor-supported (as well as technology- and entrepreneurial-driven) problem-solving to low-income communities.

OPEN LABS at Science Gallery Trinity College Dublin is part exhibition, part experiment – showcasing DIY culture across design, research, technology, and activism. It examines both "exploring and disrupting processes" where a lab can be set up in the kitchen, the forest, the bedroom, or the street. *Courtesy of Science Gallery Dublin.*

INCLUSIVE INNOVATION

Inclusive innovation aims to share the benefits of the innovation economy broadly. It seeks to create pathways to labor market participation with specialized education and customized job training. It strives to build wealth via expanding the ownership of homes and businesses. And it tries to create a new model of responsible neighborhood regeneration, where neighborhood improvement can occur without displacement.

Labor Demand/Job Growth: Innovation districts can use the economic power of anchor institutions to drive job growth in areas of deprivation and catalyze the formation of community businesses, minority-owned businesses, and social enterprises. Since the early 2000s, for example, there has been increased focus on using the purchasing power of anchor institutions to create stable demand for the creation or growth of minority-owned businesses.[35] In Cleveland, for example, the Evergreen Cooperative Initiative was established in 2008 to create living-wage jobs in the low-income neighborhoods surrounding the University Circle area, home to Case Western Reserve University, the Cleveland Clinic, and University Hospitals. One initiative—the Evergreen Cooperative Laundry—serves the aggregated laundry needs of several hospitals and medical buildings in the area and provides a replicable model for a minority-worker-owned cooperative business. The Evergreen model, therefore, both grows incomes by giving local residents decent jobs and builds wealth by giving them an equity stake in new companies.[36]

Labor Supply/Education and Skills: Innovation districts have a unique potential, particularly in the United States given the localization of education and many skills initiatives, to focus on giving residents who live either within or near these hubs the ability to access existing and future employment opportunities. The educational requirement for many industries continues to increase and it is still estimated that less than half of the jobs in the economy will require an associate degree or less; in life sciences and health districts, the percentage approaches 50 percent.[37] This dynamic opens up opportunities to work with communities to create pathways to these well-paying, middle-skilled jobs. At the same time, access to first-class education institutions and more informal learning opportunities offered through programming activities can strongly contribute to broadening access to higher education and better job opportunities for disadvantaged communities.

The West Philadelphia Skills Initiative is one example of a place-based workforce training program. *Photo Credit: Ryan Collerd, courtesy of University City District.*

Community College Co-Location: In Baltimore, Maryland, the University of Maryland Baltimore, Wexford Science and Technology, and the office of Senator Barbara Mikulski worked together to expand the Baltimore City Community College's Life Sciences Institute and relocate it in the UMB BioPark. The program works with the Baltimore Public School system, the University of Maryland, and both established and start-up companies throughout the BioPark to ensure every student has internship opportunities and a pathway to employment after graduation. It is interesting to note that the average age of students is 29, which is a function of both young adults entering after high school and older adults working to train for new economy jobs created in the BioPark.[38]

Secondary Schools: In a growing number of cities, anchor institutions have taken responsibility for opening elementary or secondary schools that have special curricula designed around STEM (Science Technology Engineering and Math) in general or specific sectors in particular. Phoenix has a Biomedical High School in the Phoenix Biomedical campus that works with both the University of Arizona and Arizona State University;[39] there is also Bravo Medical Magnet School in East Los Angeles, adjacent to the USC Health Science Campus, that USC works with on numerous programs.[40] In St. Louis, Cortex has created the Collegiate School of Medicine and Bioscience, a magnet high school.[41] Students come from all over the region, representing the largest spread of ZIP codes of any regional public school.

Workforce Development: In Philadelphia, Pennsylvania, the University City District ("UCD"), a partnership of anchor institutions, small businesses, and residents, has evolved from its original mission of making the area "clean and safe" to providing skills training to local residents. UCD established the West Philadelphia Skills Initiative ("WPSI") to help resolve a complex challenge: "too many unfilled or high-turnover jobs at some of Philadelphia's largest employers and too many unemployed West Philadelphians." Employers in West Philadelphia partner with WPSI when they need to resolve recruitment, high-turnover, or performance quality issues. WPSI then creates training cohorts of eligible residents and designs a customized curriculum that responds to specific hiring needs. Since 2011, the initiative has connected 93 percent of its graduates to employment and generated $15.4 million in wages for previously unemployed West Philadelphians.[42]

Construction and community engagement: In Milan, Italy, Lendlease, the developer of the Milan Innovation District (MIND), has created an initiative to train and employ ex-offenders for construction jobs, in close partnership with local, national, public, and private stakeholders. A socio-economic impact framework has been designed to monitor the outcomes of the initiative with a view of making it sustainable and scaling it up from 2021 onward. At the same site, MIND Education was launched by Arexpo in 2017 and is now supported by all the anchor institutions.[43] The initiative aims at engaging students—from primary schools to universities—to designing MIND according to their needs and priorities and/or to coming up with solutions for urban regeneration and project-specific challenges. These may include communicating the project, bringing together scientific activities with artistic and creative approaches, managing the use of water, or building magnetic public spaces. At the same time, students are provided with new skills such as project management, creativity, and critical thinking, as well as with training opportunities and career advice for secondary and tertiary education students.[44]

Neighborhood Revitalization: In Buffalo, N.Y., the Buffalo Niagara Medical Campus has been involved in efforts to partner with residents and community organizations in adjoining neighborhoods to address issues such as "housing density, neighborhood sustainability, transportation and parking, and economic opportunity."[45] The city government has also taken steps to mitigate gentrification and avoid displacement in the adjoining Fruit Belt community by transferring vacant lots to the community-led Fruit Belt land trust.[46] The University of Maryland Baltimore and the University of Southern California are working with their respective cities to implement neighborhood home ownership programs adjacent to their innovation districts.

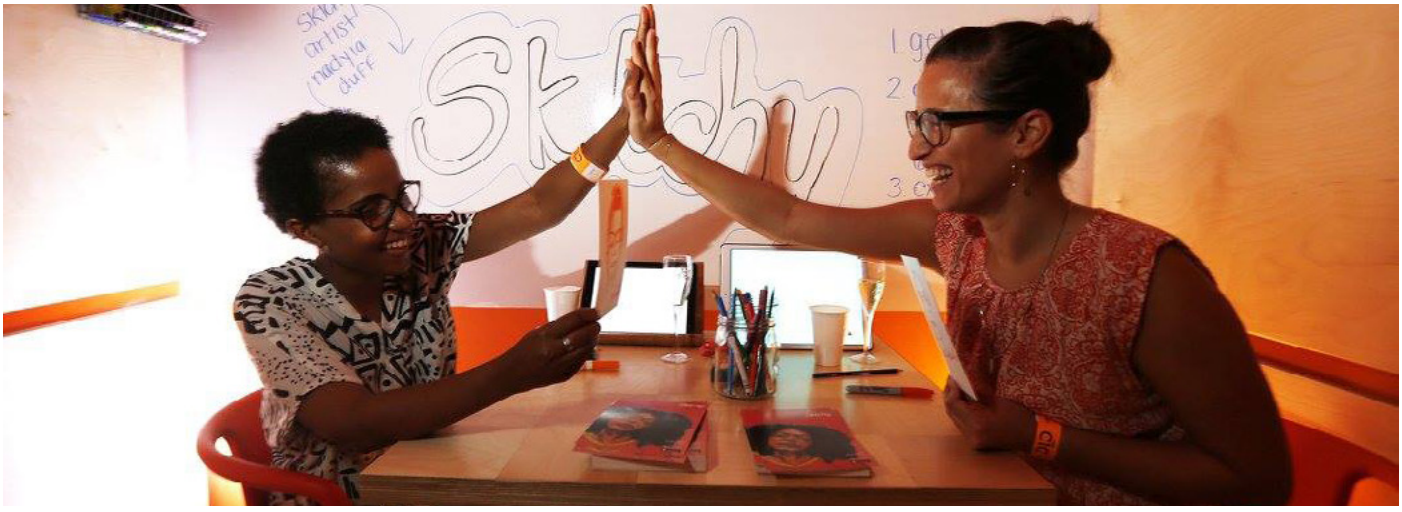
INNOVATIVE INCLUSION

While inclusive innovation increases access to the benefits of the innovation economy, innovative inclusion empowers whole communities to solve problems in a different way. This approach is a function of both proximity and the fact that grand challenges and hackathon style activities are a common tactical feature of innovation districts, given their value in catalyzing cross-disciplinary, open innovation, and system integration breakthroughs. These kinds of tactical interventions are well suited to tackling long-standing social and economic challenges.

Civic Engagement: In Philadelphia, Pennsylvania, Drexel University has embraced a vision to become the most civically engaged university in the United States. The university has created the Dornsife Center for Neighborhood Partnerships as an "urban extension center: It offers various programs to place Drexel students, faculty, and staff alongside community members to solve problems in West Philadelphia."[47] Drexel has brought the same long-term focus to both market development and social innovation. The university's signature physical development, the $3.5-billion Schuylkill Yards innovation campus, will be built out over 20 years, creating thousands of high-quality jobs. That gives the university 20 years to make sure that a child born today in the nearby high-poverty Mantua community is able to get those jobs. To that end, the university has laid out an ambitious "cradle to career" pathway for children and their parents, striving to link its place-based, innovation, and community work into one coordinated effort.

Minority Entrepreneurs: The low share of minority entrepreneurs and minority-owned businesses remains a serious challenge to wealth building. To that end, the growth in entrepreneurial support intermediaries in innovation districts has also naturally led to efforts to extend the services offered for tech start-ups (e.g., mentoring and legal, accounting, and financing advice) to local, minority-owned businesses, as well as providing outreach for local students. In Miami, for example, Overtown Connect, a program of Venture Café Miami, works to leverage the social network of Venture Café to create new connections among minority entrepreneurs and the business and support community and provide access to talent, capital, and resources for local entrepreneurs in this historic minority community. Other replicable examples include MORTAR in Cincinnati, the Youngstown (Ohio) Business Incubator, and Innovation Depot in Birmingham (Alabama).

Health Disparities: Many innovation districts, particularly in the United States, have competitive advantages in the bioscience sphere, given clusters of hospitals, health care institutions, and advanced research institutions. These areas are often surrounded by communities that exhibit the highest health disparities in their city and region, as measured by multiple metrics. Finding new ways to reduce health disparities at scale is a logical area for extensive investment and experimentation. Innovation districts in Buffalo and Philadelphia have been leaders on this score.[48]



Advancing minority entrepreneurs at CIC Miami through strong programs, access to capital, and other resources. *Photo credit: Alexia Fodere.*

> **"… innovative inclusion empowers whole communities to solve problems in a different way."**

It should be noted that a growing number of efforts around innovative inclusion are occurring outside formal innovation districts but can be captured and codified for replication and adaptation. In Santiago, Chile, for example, IF (the Ideas Factory) has spawned a series of entrepreneurial companies that are designed to solve pressing challenges facing low-income families and neighborhoods (e.g., the high cost of food) through new businesses and market mechanisms.[49] In Louisville, Ky., Village Capital and Access Ventures have invested equity in and provided loans for a growing number of minority owned businesses as part of a comprehensive economic development strategy that builds wealth. These firms and others are actively pursuing expanding these investment strategies as part of the recently enacted Opportunity Zone tax incentives.[50]

In Europe, interesting experiments are ongoing to support artists and small creative firms and cultural organizations by encouraging multi-disciplinary, open innovation processes. With a festival, a prize, a laboratory, and a museum, Ars Electronica involves the whole city and has been instrumental in turning Linz into a UNESCO city for New Media Arts. The FutureLab, working with private companies, is the research and development motor of Ars Electronica that attracts corporate funds to think creatively about the challenges posed by innovation, presenting them in the form of prototypes, art-pieces, and installations which are then showcased and used by the festival and the museum.[51]

The Science Gallery, pioneered by Trinity College Dublin and now a network which will include eight cities by 2020, is a platform of universities, which fosters collaboration between scientists, designers, artists, and entrepreneurs to engage 15- to 25-year-olds with science via exhibitions and educational activities. The themes of the exhibitions are selected based on online feedback with the help of the "Leonardo group," a group of around 50 artists, scientists, designers, and entrepreneurs who are appointed every two years to act as a brain trust of the Science Gallery. The galleries are supported by a mix of public funding, grants, and corporate sponsorships.[52] At the policy level, the European Commission is supporting these collaborations through its STARTS (Science, Technology and Innovation + the Arts) program.[53]

At FutureLab, "SimLinz" is an interactive data pool that links historical and current city maps, statistical data, and photos. Linz's central supply lines—electricity grids, district heating, public transport lines, and much more—are also becoming visible. *Photo Credit: rubra, courtesy of FutureLab.*

AMBITIONS MOVING FORWARD: A NEW GLOBAL INSTITUTE

The rise of innovation districts indeed continues—in absolute numbers, in the number of actors engaged in their development, and in the range of challenges they ambitiously take on. They embody both the preferences and conditions of the early 21st century, which, interestingly if not ironically, place great weight on physical contact and connection between people and firms during a time of increased digitization, automation, and the machine.

The arc of this paper offers a helpful narrative about the evolution of both practice and research on the rise of innovation districts thus far. Initial observations outlined in 2014 have become sharper through deeper analytics and on-the-ground practice. Innovative practice in a subset of districts is now pushing the paradigm forward, offering a useful guide for governance and finance. And finally, shifting global trends and changing imperatives will likely lead to an important re-make of the innovation district paradigm, offering new inclusion and social innovation drivers. The evolution of districts, in other words, continues to unfold as we—the practitioners, researchers, and policymakers—work to both realize and globally scale this innovation framework. It also marks a turning point where greater empirical grounding and intentionality are warranted.

With more than 100 innovation districts emerging across the globe, and the potential for easily 200 more, the demand to have stronger empirically grounded metrics that define and differentiate districts will become more pertinent for practitioners and policymakers. With the growing network of government, philanthropic, and private sector leaders engaged in developing districts, the demand for robust, sophisticated exchanges will grow. And with shifting trends and changing imperatives, the demand for new insights and innovative practice will expand.

These and other anticipated trends have armed and aligned a small, but growing, group of practitioners and researchers to establish a new global non-profit dedicated to innovation districts: **The Global Institute on Innovation Districts**. The scope of The Global Institute is to:

- Identify and monitor the growth of innovation districts across global regions
- Capture and dissect their main challenges as well as their successes
- Provide detailed evidence-based strategies and data to accelerate their work
- Support communication and shared learning across districts; and
- Foster collective engagement on top priorities—such as access to capital or IP protections—creating norms around growth, finance, and governance

The Global Institute is driven by a clear ambition to help cities and metropolitan regions grow and advance their local and regional economies. Local decision makers—elected officials and heads of large and small companies, local universities, philanthropies, community colleges, neighborhood councils, and business chambers—would be wise to unleash them. Global companies and capital would be smart to embrace them. States and national governments should support and accelerate them. And now, a growing network of innovation districts will be further armed to advance them.

APPENDIX 1.

CURRENT LIST OF INNOVATION DISTRICTS

This appendix offers an initial and incomplete list of innovation districts across several global regions. Note that this list does not distinguish between emerging and maturing innovation districts as there is currently no set of defined variables to make this determination. **Deeper research under way has identified approximately 160 innovation districts world-wide although not all districts have been confirmed**. Please reach out to iozeran@giid.org to help contribute to this list.

The United States:

1. Albuquerque, New Mexico: Innovate ABQ (https://innovateabq.com)
2. Atlanta, Georgia: Tech Square ATL (http://www.techsquareatl.com)
3. Austin, Texas: Capital City Innovation (https://www.capitalcityinnovation.org)
4. Baltimore, Maryland: University of Maryland Biopark (http://www.umbiopark.com)
5. Birmingham, Alabama: Birmingham Innovation District
6. Buffalo, New York: Buffalo Niagara Medical Campus (https://bnmc.org)
7. Cambridge, Massachusetts: Kendall Square/ MIT (https://kendallsquare.mit.edu/)
8. Chattanooga, Tennessee: Innovation District of Chattanooga (https://www.chainnovate.com)
9. Chicago, Illinois: Fulton Market Innovation District
10. Chicago, Illinois: Illinois Medical District (http://medicaldistrict.org)
11. Cincinnati, Ohio: Uptown Innovation Corridor (https://www.uptowninnovationcorridor.com)
12. Cleveland, Ohio: Cleveland Health-Tech Corridor (https://www.healthtechcorridor.com)
13. Durham, North Carolina: Durham Innovation District (http://durhamid.com)
14. Erie, Pennsylvania: Erie Innovation District (https://www.erieinnovationdistrict.com)
15. Houston, Texas: Texas Medical Center (http://www.tmc.edu)
16. Madison, Wisconsin: University Research Park (https://universityresearchpark.org)
17. New York City, New York: Brooklyn Navy Yard (https://brooklynnavyyard.org)
18. Oklahoma City, Oklahoma: OKC Innovation District (http://www.okcinnovation.com)
19. Philadelphia, Pennsylvania: University City District (https://www.universitycity.org)
20. Phoenix, Arizona: PHX Core (http://phxcore.com)
21. Pittsburgh Pennsylvania: Pittsburgh Innovation District (https://www.pittsburgh-id.com)
22. Portland, Oregon: Portland Innovation Quadrant (https://www.portlandiq.org)
23. Providence, Rhode Island: Providence Innovation & Design District (https://www.195district.com)
24. Raleigh, Durham, Chapel Hill, North Carolina: The Research Triangle Park (https://www.rtp.org)
25. San Francisco, California: Mission Bay
26. St. Louis, Missouri: Cortex Innovation Community (https://cortexstl.com)
27. Winston-Salem, North Carolina: Wake Forest Innovation Quarter (https://www.innovationquarter.com)

APPENDIX 1. Current list of Innovation Districts

Canada:

28. Kitchener: Kitchener Innovation District (http://www.kitchenerinnovationdistrict.com)
29. Montreal: Quartier De L'Innovation (http://quartierinnovationmontreal.com)
30. Toronto: MaRS Discovery District (https://www.marsdd.com)
31. Vancouver: North Shore Innovation District (https://www.nsidlands.ca)

Latin America:

32. Buenos Aires, Argentina: Distrito Tecnologico Parque Patricios (https://www.buenosaires.gob.ar/economiayfinanzas/distritoseconomicos/distritotecnologico)
33. Medellin, Colombia: Distrito de Ciencia, Tecnología e Innovación de Medellín (http://www.distritomedellin.org)
34. Monterrey, Mexico: DistritoTec (http://distritotec.itesm.mx)
35. San José, Costa Rica: Ciudad Tec - T24 (https://www.tec.ac.cr)

Europe including the UK:

36. Amsterdam: Kenninskwartier VU
37. Barcelona: 22@(http://www.22barcelona.com/)
38. Copenhagen: Frederiksberg Science City (https://frederiksbergsciencecity.dk)
39. Copenhagen: Lyngby-Taarbæk Vidensby City of Knowledge (http://vidensby.dk/en/home/)
40. Copenhagen: Ørestad Innovation City (https://oicc.dk/en/)
41. Copenhagen: Copenhagen Science City (https://copenhagensciencecity.dk)
42. Dublin: Grand Canal Innovation District (https://www.tcd.ie/innovation-district/)
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53. Milan: MIND Milano Innovation District (http://www.mindmilano.it)
54. Newcastle: Newcastle Helix (https://newcastlehelix.com)
55. Paris: Paris Saclay Innovation Playground (https://paris-saclay.business)
56. Porto: Porto Innovation District (https://web.fe.up.pt/~studyresearch/life-at-feup/innovation_district/)
57. Rotterdam: RDM Rotterdam Innovation District (https://www.rdmrotterdam.nl)
58. Sheffield: Sheffield Advanced Manufacturing Innovation District
59. Stockholm: Kista Science City (http://www.kista.com/)
60. Stockholm: Stockholm Science City (https://ssci.se)
61. The Hague: Den Haag Central Innovation District (https://www.ciddenhaag.nl)

APPENDIX 1. Current list of Innovation Districts

Australia:

62. Adelaide: Tonsley Innovation Precinct (https://tonsley.com.au)
63. Liverpool: Liverpool Innovation Precinct (https://www.liverpoolinnovation.com.au)
64. Melbourne: Melbourne Innovation District (https://mid.org.au)
65. Melbourne: Fishermans Bend (https://www.fishermansbend.vic.gov.au/precincts/general-motors-holden-catalyst)
66. Melbourne: Melbourne Biomedical Precinct (https://www.melbournebiomed.com)
67. Monash: Monash Science Technology and Research Innovation Precinct
68. Sydney: ANSTO Innovation Precinct (https://innovation.ansto.gov.au)
69. Sydney: Macquarie Park Innovation District (http://mpid.com.au/)
70. Sydney: Sydney Innovation and Technology Precinct (https://www.industry.nsw.gov.au/business-and-industry-in-nsw/innovation-and-research/tech-precinct)
71. Sydney: UNSW Innovation Precinct
72. Sydney: Westmead Innovation Precinct (http://www.westmeadproject.health.nsw.gov.au/precinct/westmead-precinct)

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THE GLOBAL INSTITUTE ON INNOVATION DISTRICTS

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Kim Hart Sep 25, 2019

How some cities are luring startups with real estate developments

Illustration: Rebecca Zisser/Axios

startup-friendly co-working venues.

The big picture: Not so long ago, it was a big deal for a co-working space to open up in smaller or "second-tier" cities because it signaled there was finally enough demand from newcomers looking for a cool place to work.

- Now the focus is to create bigger, branded, physical places to attract more companies, entrepreneurs and investment, according to a new "Rise of the Rest Ecosystem Playbook" put out by Revolution.
- **Between the lines:** These developments are using the "if you build it, they will come" strategy, hoping to lure people wanting to escape the high prices of the usual hot spots.

The playbook breaks down four archetypes that are being built across the 43 cities that Steve Case and Revolution have visited during Rise of the Rest tours over the past 5 years.

"[E]very city, without fail, is trying to figure out how to retain the talent they have, encourage people who have left to return, and recruit new people to consider moving there," Case emailed.

1. Anchor Tenant: A key company that attracts others to cluster around it (like in a mall).

- **Detroit:** Quicken Loans moved it's headquarters from the suburbs to struggling downtown Detroit, and CEO Dan Gilbert opened a real estate arm (Bedrock) to acquire properties in the central business and financial district to house regional offices of Amazon, Twitter, Google and others.

2. Innovation District: A cluster of startups, incubators and companies, sometimes in partnership with local government.

- **York, Pennsylvania:** The city is re-developing a 2-acre site to house robotics research, labs, alternative manufacturing, offices and temporary housing.

3. Vertically Integrated: Complex or high-rise with space for accelerators, labs, co-working and corporate offices, designed to let startups move through "stages" in one place.

- **Columbus:** An old shoe factory was turned into a 65,000 square-foot facility for working areas, classrooms and workshops. The tenants were curated to house venture capital firms,

4. Work-Live-Play: Mixed-use development that includes residential, commercial and entertainment and is pedestrian-friendly.

- **Orlando**: Health-focused Lake Nona is a master-planned community that houses operations for Johnson & Johnson, Veterans Health Administration, and Nemours Children's Hospital.

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