HOWARD KOZLOFF AND CHRISTINA CALABRESE

TECH CITIES: FROM Silicon Valley TO Silicon Prairie

The technology sector is not only reshaping economies and work environments. It is also reshaping the physical environments of cities large and small.

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THE DRIVING FORCE OF THE INDUSTRIAL Revolution fundamentally defined cities in the United States by concentrating people and commerce in particular locations, sparking transformations in land use organization, transportation, and public health. Over time, these cities came to be physically differentiated according to their strengths in particular sectors—finance in New York City, automobiles in Detroit—yet no single sector has shaped the built environment on a national scale. The tech revolution, however, is shaping urban and suburban environments on an unprecedented scale.

From longstanding tech capitals such as the San Francisco Bay area to cities only recently embracing tech, such as Chattanooga, Tennessee, communities are embarking on economic development and urban planning initiatives related to infrastructure, employment-center locations, housing choices, and amenities—such as high-speed internet access—that specifically target recruiting, expanding, and sustaining the tech workforce. In turn, success has compelled tech companies, whether through their own volition or through planning policy, to address broader community needs, such as transportation and affordable housing.

SAN FRANCISCO BAY AREA

"Our challenge as planners is striking the right balance between the needs of the burgeoning tech sector and the established elements of the city that are feeling the pinch. Historic buildings have been painstakingly refurbished, new towers have risen in place of vacant lots and forlorn gas stations, and whole neighborhoods have been revitalized. At the same time, new-economy offices have taken the place of blue-collar neighborhoods and jobs, and well-paid tech workers voraciously snap up housing, thus exacerbating our affordable housing crisis."

—DANIEL SIDER

No other community embodies this dynamic more than the San Francisco Bay area. Over nearly half a century, the area has garnered the distinction as the epicenter of tech startups and entrepreneurship, coming a long way from the cluster of computer-chip companies that set up shop in the 1970s, giving rise to the now globally recognized Silicon Valley. Tech giants like Intel, Apple, Google, and Facebook are just a handful of the global powerhouses based here.

As technology evolves and industries in the sector become increasingly differentiated, so, too, have the infrastructure and development associated with tech companies. Suburban office parks in Silicon Valley are still being conceived—including Apple's 2.8 million-square-foot (260,000 sq m) "Spaceship Campus" in Cupertino, designed by Foster + Partners and currently under construction with completion set for 2016, and Google's ongoing expansion of its 26-acre (11 ha) Googleplex in Mountain View.

With these campuses have come extensive amenities and transportation systems catering to millennial employees, as well as increasingly robust community benefits packages. As part of the approval for its East Campus in Menlo Park, for example, Facebook provided 15 affordable housing units in the city, and established local job

Google encourages employees to bicycle between buildings at its Mountain View, California, headquarters.

CORBIS

CORBIS

Solar panels cover the roof at the Google corporate headquarters, called the Googleplex.

training and science, technology, engineering, and math (STEM) education programs. With each expansion effort, these companies are increasingly compelled to contribute directly to the provision of city services and public programs.

At the same time, increased attention has been paid to tech migration into downtown San Francisco, with companies trading office parks for converted industrial warehouses and Class A office buildings near existing transit, housing, and entertainment centers.

Tech giant Salesforce is expected in 2017 to become the majority tenant of San Francisco's Salesforce Tower, occupying 714,000 square feet (66,000 sq m) of the 1.4 million-square-foot (130,000 sq m) skyscraper previously known as Transbay Tower. (Full coverage of the Transbay project begins on page 74.) Twitter's decision in 2012 to lease 295,000 square feet (27,000 sq m) in the

city's Tenderloin district for its headquarters has sparked an influx of tech companies to the neighborhood.

In fact, more than 80 percent of the city's new office demand over the past two years was driven by technology companies, according to Colin Yasukochi, director of research and analysis for northern California at CBRE, as reported by Bloomberg Business.

From an investment perspective, San Francisco has the largest amount of venture capital funding in technology in the United States—over $15.7 billion in 2014—according to the National Venture Capital Association. Its proximity to high-profile tech institutions like Stanford University ensures the area's ability to attract new talent, which is a key factor in the sector's continued growth and

locational trends. For instance, between 2012 and 2013, the number of tech jobs in San Francisco increased 18 percent, according to JLL Real Estate Services.

The challenge to the tech sector's continued growth in San Francisco, and in the Bay Area more broadly, rests on the ability of the private sector to work dynamically with the public sector to anticipate the reverberant, if positive, impacts of tech-sector growth on the systems and neighborhoods on which it relies. With ever-pressing issues of affordability, Silicon Valley will also need to apply innovation to providing housing choices necessary for a robust and diverse workforce.

NEW YORK CITY

Whereas Google occupies 2 million square feet (186,000 sq m) across 26 acres (11 ha) at its headquarters in Mountain View, the company spent nearly $2 billion in 2010 to acquire nearly 3 million square feet (279,000 sq m) of office space on a single city block in Chelsea. With the site providing multiple transit lines nearby and an already varied and substantial residential, retail, and entertainment environment in place, Google was able to establish a significant presence within a high-quality-of-life neighborhood, and, did so in a city that can accommodate this type of commercial density.

Google's New York City location at 111 Eighth Avenue, in the Chelsea neighborhood.

GLOBAL CITIES LIKE NEW YORK have quickly risen to join the ranks of this elite group because of unparalleled access to capital, the presence of a skilled workforce, and the elements of a high quality of life—culture, entertainment, and recreation, among others—desired by the tech workforce. The city's population density and extensive transportation network offer a high concentration of entrepreneurs and opportunities for clustering tech resources. Combined with Wall Street's investment capital, the city's physical and financial infrastructure provides a variety of resources allowing tech firms to grow.

The accelerated success of the tech sector in New York is credited in no small part to the leveraging of the city's track record in other established industries. According to *New Tech City,* a report prepared by the Center for an Urban Future, by "applying technology to traditional industries like advertising, media, finance, fashion, and health," the sector has spawned rapidly growing companies like Buzzfeed, Etsy, Foursquare, Rent the Runway, and Appnexus.

New York City's tech scene is primarily clustered in Manhattan's "Silicon Alley"—a broad area stretching from Midtown Manhattan into the Lower East Side along Broadway—and the Brooklyn Tech Triangle, which stretches from DUMBO (Down Under the Manhattan Bridge Overpass) through downtown Brooklyn and into the Brooklyn Navy Yard. With a high tolerance for density, the city has been able to quickly accommodate the tech sector's growth in these areas.

Whereas Google occupies 2 million square feet (186,000 sq m) across 26 acres (11 ha) at its headquarters in Mountain View, the company spent nearly $2 billion in 2010 to acquire nearly 3 million square feet (279,000 sq m) of office space on a single city block in Chelsea, giving the company 3.5 million square feet (325,000 sq m) of space in the city. With the site providing multiple transit lines nearby and an already varied and substantial residential, retail, and entertainment environment, Google was able to establish a significant presence within a high-quality-of-life neighborhood and did so in a city that can accommodate this type of commercial density.

The Next Generation

For all of the benefits that clustering resources in these cities affords, rising real estate and business costs, combined with decreasing supply of available land and space, have given some tech companies pause when considering where to locate. While the established tech capitals attract a variety of imported talent, an increasing number of tech companies are evaluating the benefits and tradeoffs of being home-grown—aging in place within the diverse set of communities that supported their early-stage ideas.

Whereas tech capitals have primarily reacted to the influx of residents and businesses—rapidly trying to develop and deploy housing, transportation, and commercial solutions—the next generation of tech cities is proactively combining economic development strategies, housing, amenity planning, and development tools to leverage existing assets, advance city growth, and reposition city economies in place-specific, provocative ways.

The following are some examples from this cohort, which, despite not having the "gateway city" label, are advancing to become national players in the tech scene.

DENVER

> **"***We've noticed an even higher level of talent in the employee pool that comes to Denver because of its reputation as a new hub of innovation and growth, not just a great place to live and work.***"**
>
> —DAVID MILES

ACROSS THE BOARD, DENVER has positioned itself as one of the most innovative cities in the United States. Whether spearheading the legalization of medical and retail marijuana or the use of crowdfunding to finance civic amenities, the city has fostered a progressive environment that resonates well with the culture of tech businesses and their young, talented workforce, who are equally attracted to the city's world-class access to the outdoors.

While 300 days of sunshine annually may be a significant reason for recent graduates to consider locating in Denver, a thriving jobs market and high-quality housing options are significant reasons for workers to consider staying. Mayor Michael B. Hancock envisions Denver as the nation's hub of the "ideas economy" and has made a concerted effort since his election in 2011 to craft public policy, incentives, and partnerships to support this vision.

KIMBERLY WOLFF
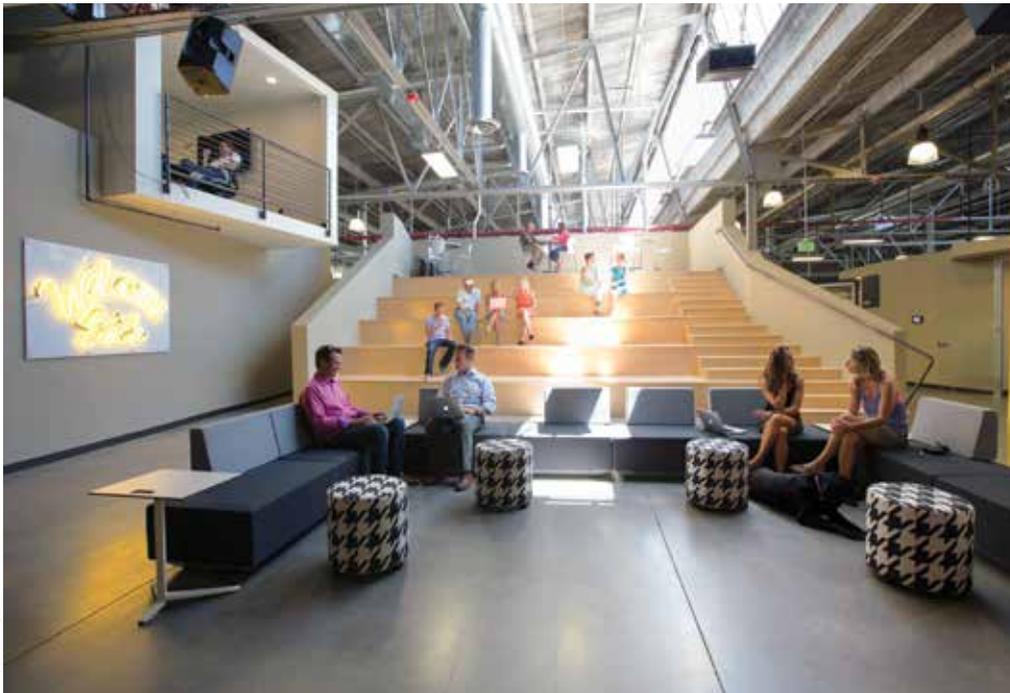
KIMBERLY WOLFF

Above and left: The city of Denver supported redevelopment of a former depot to create Industry Denver, a 120,000-square-foot (11,000 sq m) office space accommodating 400 tech and creative-sector workers. It also has three restaurants and more than 250 housing units. Below: Battery 621 is a redevelopment of a vacant 30,000-square-foot (2,800 sq m) building as flexible office, conference, and event space, located one block from Denver's Santa Fe Art District.

CHANDLER KIM

"We've noticed an even higher level of talent in the employee pool that comes to Denver because of its reputation as a new hub of innovation and growth, not just a great place to live and work," says David Miles, a senior vice president with Denver area–based 20/20 Tax Resolution, a tax solutions consulting firm.

The city, working in collaboration with the state, has cultivated an increasingly robust entrepreneurial environment through a combination of policies and initiatives that are both specific to tech growth and broadly applicable to city-building efforts.

Gathering space inside Industry Denver.

On the business side, Colorado offers a variety of state-level funding opportunities that are tailored to small, medium-sized, and large organizations according to the life cycle stage of the organization—idea, startup, second stage, growth acceleration, or mature. For companies in the idea or startup phases, for example, the state's Venture Capital Authority offers seed money and early-stage capital investments, as well as an Advanced Industries Acceleration Program. Second-stage or mature companies may consider applying for the job growth incentive tax credit or job training grant programs.

At the local level, Denver's Office of Economic Development offers a Business Incentive Fund that is tailored to a business's needs and opportunities, and the city's Business Investment Program offers a business personal property tax credit to encourage startups and existing businesses to expand operations and facilities.

The results are evident in a recent study prepared by Mark Schill, research director at Praxis Strategy Group, who analyzed tech and STEM employment data from the 52 largest metropolitan statistical areas in the United States from 2004 to 2014. Denver is ranked 11th in tech-industry job growth, experiencing a 34.5 percent increase between 2004 and 2014; 7.3 percent of its jobs are in tech industries.

On the real estate side, the city has made deliberate, significant strides over the past ten years in the areas of transit, housing, and mixed-use development. During the administration of Denver's previous mayor, John Hickenlooper (now governor), the region launched the FasTracks program, an ambitious plan to establish 121 miles (195 km) of commuter and light-rail tracks, bus rapid transit, and park-and-ride locations. With all these transportation modes, the city will be connected by public transit to the airport and major employment centers in the region. Working in collaboration with the Greenway Foundation, links to bike trails, walking trails, parks, and riverways are also planned.

In the face of Denver's increasing popularity, Hancock is targeting the production of 600 affordable housing units annually over the next five years for a total of 3,000 as part of the city's strategic economic plan, Jumpstart 2015. The plan is buttressed by neighborhood, business, and workforce development initiatives to create a mutually reinforcing strategy to help residents and the economy continue to thrive. To address gentrification, the city is studying how many businesses started in targeted redevelopment neighborhoods employ neighborhood residents.

Within this framework, Denver has already seen its share of mixed-use projects arise that are driven by the entrepreneurial and creative tech-based economy.

Following the success of Battery621, a redevelopment of a vacant 30,000-square-foot (2,800 sq m) building as flexible office, conference, and event space, located one block from Denver's Santa Fe Art District, the city supported development of Industry Denver.

This 120,000-square-foot (11,000 sq m) office space in a former depot has 350 to 400 tech and creative-sector workers and three restaurants, with more than 250 affordable and market-rate housing units. The location in the River North neighborhood was previously identified by the city as a catalyst site for the neighborhood's revitalization. The city provided a $1 million acquisition loan to the Industry Denver development group to purchase the nine-acre (3.6 ha) former depot site. The city's Office of Economic Development has spurred more than $100 million in investment around the project site, according to the *Denver Post*.

Because it has developed a framework within which growth can occur, the city has the fortunate challenge of managing the type and scale of growth it welcomes so that it can continue to provide a high-quality environment to existing and potential residents and businesses.

KANSAS CITY, MISSOURI

The launch of Google Fiber has conveyed an opportunity—and some may argue an expectation—to compel Kansas City to join the ranks of the standout tech capitals.

WHEREAS DENVER has been on various top ten lists ranking quality of life and best business climate for quite some time, Kansas City, Missouri, has been comparatively off the radar except for one important fact: in 2011, the city, along with Kansas City, Kansas, was the first in the United States to receive Google Fiber access.

"There's a benefit to being first," says Jonathan Robinson, senior program officer in entrepreneurship at the locally based Ewing Marion Kauffman Foundation. Robinson cites a series of cascading actions that have since occurred within Kansas City which, while not all specifically linked to the power of this technology, point to its ability to contribute to investment and momentum. In particular, energy has extended down Main Street from downtown through the Crossroads and West-port neighborhoods to Country Club Plaza.

The buzz surrounding Google Fiber, and the unparalleled speed with which users can access the internet (it is 100 times faster than the average connection), has compelled many tech companies, particularly startups, to locate in Kansas City, pushing the boundaries of these companies' ideas relative to this capability.

In short order, the Kansas City Startup Village was formed by entrepreneurs as a collaborative resource for the rapidly growing startup community. Though operating out of a variety of facilities across several Kansas and Missouri neighborhoods, the coworking studio and event space known as Village Square in downtown Kansas City is at the intellectual and physical heart of Startup Village, with the nearby Homes for Hackers offering three months of free rent, utilities, and Google Fiber access.

The launch of Google Fiber has conveyed an opportunity—some may argue an expectation—to compel Kansas City to join the ranks of standout tech capitals.

"Fiber is profile-raising. Four years ago, Kansas City wouldn't have been in a conversation with New York City, but it is in those conversations now," says Robinson. The city currently ranks 15th in the Metropolitan Tech–STEM Growth Index prepared by Schill, experiencing a 46 percent increase in tech industry growth between 2004 and 2014, and 16.5 percent growth in the number of STEM jobs.

The relatively low cost of living—median gross rent in Kansas City was $798 per month in 2011, according to the U.S. Census Bureau, compared with $920 in Denver, $1,345 in San Francisco, and $1,460 in San Jose—has supported an affordable startup culture. But the greatest measure of success will be the city's ability to translate the proliferation of startups into a sustainable tech ecosystem that supports a vibrant business and physical environment for innovation and collaboration.

The Kansas City, Missouri, skyline with Union Station in the foreground.
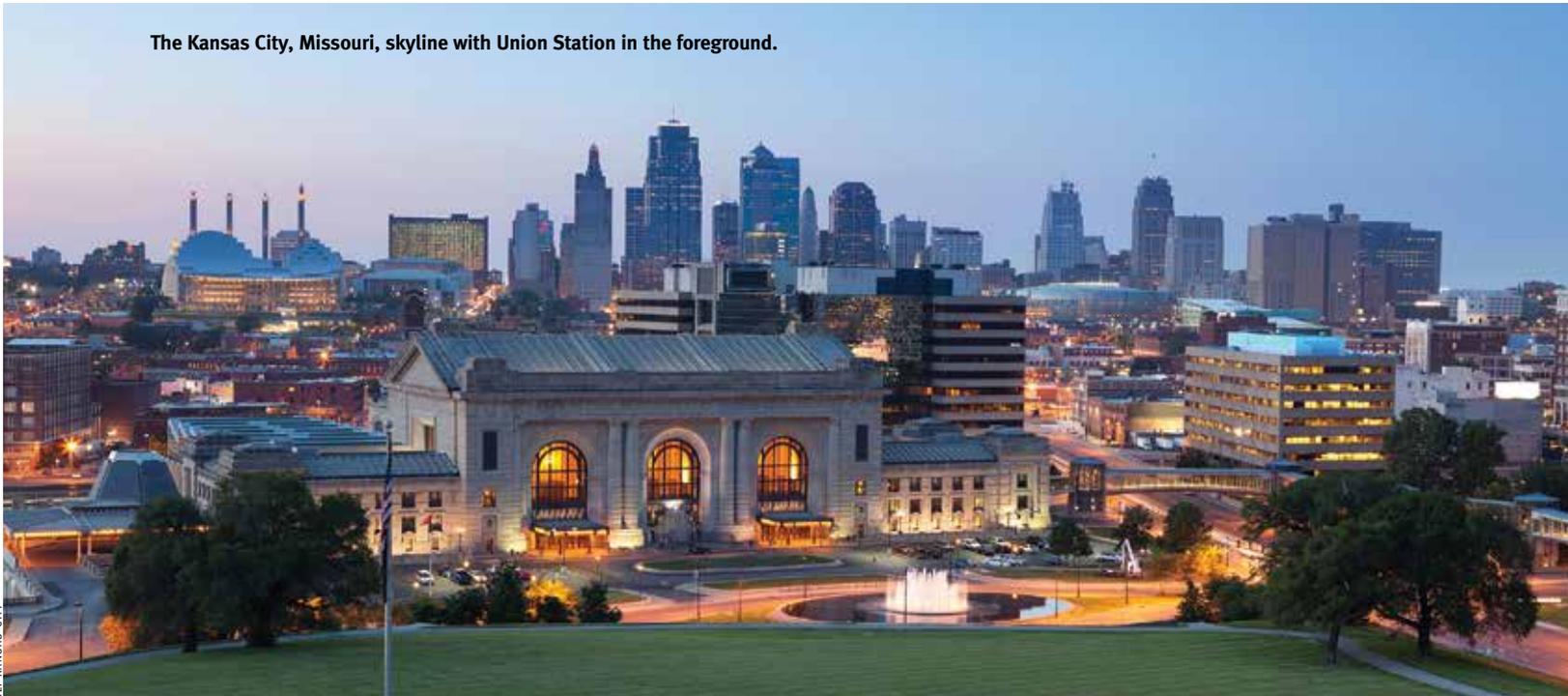
CHATTANOOGA, TENNESSEE

A series of initiatives currently planned by the city is intended to capitalize on the momentum created by Google Fiber. In September 2011, Kansas City, Missouri, Mayor Sly James and Kansas City, Kansas, Mayor Joe Reardon appointed the Mayors' Bistate Innovation Team to create a playbook for how to leverage Google Fiber to create economic and community growth and development.

Identified priorities include ensuring universal access and capacity to empower underserved and lower-income neighborhoods; expanding economic opportunity by centralizing the innovation and tech workforce; leveraging university research capacity and educational resources; and fueling government innovation and smart city leadership. These efforts align with the Greater Kansas City Chamber of Commerce's Big 5, a series of projects intended to do the following: build the area's workforce through early education; revitalize urban neighborhoods; make Kansas City America's most entrepreneurial city; make Kansas City a nationally recognized center for translating research discoveries into treatment for serious disease; and bring the University of Missouri–Kansas City arts program downtown.

Meanwhile, the city is leveraging partnerships to improve its physical infrastructure and connectivity. Cisco is supporting Kansas City's 2.2-mile (3.5 km) streetcar line, which will provide free rides between River Market and Union Station. The investment is part of Cisco's Smart + Connected Communities venture, offering free public wi-fi, community information kiosks, and a data-driven lab to support innovation. Kansas City Power and Light plans to build 1,000 electric-vehicle charging stations and is soliciting input from residents on preferred locations.

With a variety of public, nonprofit, and private stakeholders behind these efforts, the city is poised to launch itself into the next level of national tech players.

> **"You have to create an environment in which a $1 billion company can grow.***"*
>
> **—JODA THONGNOPNUA**

CHATTANOOGA'S BALANCE of infrastructure investment, intimate startup scene, and access to nature is enough to cultivate a tech environment that is homegrown.

Though a city with only about 170,000 residents, Chattanooga thinks like a major tech capital: it is the only city in the United States to offer 1 gigabit-per-second internet speed—the equivalent of Google Fiber speed—not just to "fiberhoods" (Google's term for the neighborhoods where it provides Google Fiber), but to every home and business in the community through a public utility. And the service is being offered to low-income households at $26.99 per month (compared with $70 per month for unsubsidized service), which covers the cost to operate the service. Google Fiber, which is not available in Chattanooga, also costs $70 where it is available—Austin, Charlotte, Kansas City, Nashville, Provo, Raleigh-Durham, Salt Lake City, and San Antonio.

Beyond internet access, this fiber-optic network also runs Chattanooga's smart grid, allowing the city's electricity distribution system—system components, utility employees, and customers—to communicate with one another in real time, creating a more resilient, sophisticated power grid.

"You have to create an environment in which a $1 billion company can grow," says Joda Thongnopnua, communications director of Chattanooga-based Lamp Post Group, a venture capital firm and incubator active in the local market.

In this sense, Chattanooga is one of the most entrepreneurial among the next generation of tech cities.

Volkswagen's assembly plant in Chattanooga.

JAMES R. MARTIN

Beyond innovative infrastructure, the city has married its manufacturing heritage with forward-focused economic development efforts, in 2011 securing the first Volkswagen plant in the United States, which became the first LEED Platinum–certified auto plant in the world, as well as the automaker's engineering and planning center. Local, state, and federal subsidies for the plant were estimated at $577 million, with Volkswagen investing about $1 billion. Through a combination of state and local tax incentives and workforce training assistance, Chattanooga also secured a distribution facility for tech giant Amazon in 2010, creating an estimated 1,425 new jobs for the area.

The startup scene, while still fairly young, receives the same focused efforts as these global companies from a variety of public, private, and nonprofit actors. Similar to the approach in Kansas City, Chattanooga's Mayor Andy Berke led the establishment of a "gigabyte-focused" Enterprise Center, an organization charged with leveraging the city's technology resource.

The Enterprise Center has announced the creation of an Innovation District in downtown Chattanooga to serve as a physical center for the tech community. With venture capital firms and tech companies already located downtown, the organization is seeking to define a neighborhood that will in turn market the assets of being near venture capital firms, other tech companies, and the amenities that tech company employees prefer—living and working in the same neighborhood; the ability to walk to coffee shops, retail businesses, and entertainment; and the like.

As part of that effort, the Enterprise Center has also been charged with identifying an Innovation Center—a landmark building for the district where the Enterprise Center and tech companies will be located—to define a centralized space for technology in order to promote and attract investment and attention.

The city also created a Growing Small Business cash grant of $10,000 per company for small businesses (those with 100 or fewer employees) that undertake a substantial workforce expansion. For civic startups,

Startup CHA is a city-run program that allows companies to pitch ideas at a monthly CHA council meeting; if a company has an idea for how to work with or for the city on its infrastructure or in another area, it can meet with the city instead of waiting for a request for proposals (RFP)—a worthwhile approach because cities are not always in the business of innovation, and RFPs are more reactive than proactive in nature.

The city has also launched a local version of the TechHire initiative, led by the Obama administration, which pairs local government officials with private sector partners to match employer needs with the recruitment and training of workers.

Venture capital dollars, though less available in Chattanooga than in most tech capitals, have been strategically deployed to attract and maintain talent in provocative ways. For example, Lamp Post Group is exploring the creation of a real estate arm as it focuses on developing startup office space and residential units for its tech workforce.

"We're working on the infrastructure that makes startups successful," says Thongnopnua. The company is redeveloping a 120-year-old building downtown into 43 micro-units of 300 square feet (28 sq m) each for startup and entrepreneurial employees. The building will have common facilities and ground-floor retail space. While the project serves to attract talent, it equally attracts attention and investment downtown.

"If we inject 43 brilliant people in the middle of the city, within walking distance of everything, including work, . . . that does a lot for the tempo of the city. Density is such a huge piece of developing any sort of hub," says Thongnopnua. The building epitomizes Lamp Post's approach to startup investment. "If you haven't created a value path in the seed stage, you're not going to be able to build anything truly sustainable at the hub," says Thongnopnua.

Through each initiative, an emphasis on collaboration and innovation resonates from a city that has repositioned its economy toward a vibrant future. Chattanooga's commitment to this effort may prove to serve as a

model not only for other cities of comparable size and stature, but also for tech capitals at more mature stages of growth and with a more established track record.

Emerging and Evolving

The maturation of tech companies has physical, social, and economic implications for, and associations with, city growth and redevelopment. While Denver, Kansas City, and Chattanooga represent the next generation of tech-oriented cities, other communities across the United States are looking for ways to attract and accommodate tech companies as a way to reposition and revive their economies. These three cities have achieved varying degrees of relatively early success, fostering early-stage tech startups through provision of a variety of coworking, incubator, and accelerator spaces.

For these cities to be truly successful, however, they need to consider where a startup goes when it has outgrown its startup phase. Only by addressing and improving the built environment can cities compete in creating the physical, financial, and social energy that maturing tech companies need. Companies also sustain distinct competitive advantages when they remain in a community, maturing in place. For Denver, Kansas City, and Chattanooga, the early nurturing phases also provide opportunities for enterprise growth at home.

Though working globally in cyberspace, tech companies are born in physical neighborhoods, clustering energy and resources in their diverse spaces and bringing disposable income and the desire to build relationships. A sense of place matters to the tech sector; much like Wall Street is synonymous with finance, Silicon Valley remains synonymous with tech. The existence and brand of New York City's Silicon Alley, Los Angeles's Silicon Beach, and the Midwest's Silicon Prairie are no accident.

But the authenticity of place matters more than branding because the tech sector has a remarkable capability to thrive by leveraging surrounding resources. Whereas one startup community may progress by virtue of its

proximity to outdoor recreation, for example, another may be sustained through a strategic university partnership. Civic leaders must identify, harness, and champion these key connections as mutually reinforcing relationships that produce community-wide benefits.

The ability of a city to remain flexible and agile as the tech sector grows and evolves is a true measure of its ability to produce sustained value. Smaller cities such as Denver, Kansas City, and Chattanooga can exploit their ability to be nimble and responsive to tech sector needs and desires.

Daniel Sider, senior adviser for special projects at the San Francisco Planning Department, sums up the department's predicament: "Our challenge as planners is striking the right balance between the needs of the burgeoning tech sector and the established elements of the city that are feeling the pinch. Historic buildings have been painstakingly refurbished, new towers have risen in place of vacant lots and forlorn gas stations, and whole neighborhoods have been revitalized. At the same time, new-economy offices have taken the place of blue-collar neighborhoods and jobs, and well-paid tech workers voraciously snap up housing, thus exacerbating our affordable housing crisis."

Whether it is New York City's ability to grow denser or the Bay Area's knack for uncovering new neighborhoods, major tech capitals also need to ensure they are creating environments that attract top talent and, in turn, bring major companies that are looking to hire that talent. **UL**

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