An aerial night photograph of a city, likely Singapore, showing a dense urban landscape with numerous skyscrapers and residential buildings. A multi-lane highway runs diagonally from the bottom right towards the center, with long-exposure light trails from vehicles. Overlaid on the image are several white, glowing arcs that connect various points across the city, resembling a network or data flow diagram. The sky is dark with some clouds.

A MaRS WHITE PAPER

# THE RISE OF THE HUB

*How innovation  
is moving downtown*

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## About MaRS

MaRS Discovery District is a not-for-profit innovation hub dedicated to driving economic and social prosperity by harnessing the full potential of innovation. MaRS works with entrepreneurs and investors to launch and grow companies that have broad economic and societal impact, and convenes governments and industry stakeholders to enable widespread adoption in complex markets and systems. For more information, please visit [marsdd.com](http://marsdd.com).

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Published March 2017

#### COVER IMAGES

FRONT: ISTOCKPHOTO  
BACK: MaRS/HOLLY SISSON

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Innovation can improve our lives, improve our society, and produce jobs for millions. But it is less and less a product of random factors.

These days, **where innovation can best be nurtured matters hugely.**

We can not only influence that outcome, but we are further along in doing so than many of us, even in Toronto, realize.

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# 01/ INNOVATION'S NEW PERSPECTIVE

The nature of innovation – how it happens, how we can foster it – is changing everywhere.

Long recognized as the springboard for economic growth, it has, like the weather, been much discussed in Canada. In repeated reports and studies, we have lamented our failings and scrutinized government policies and the corporate record for the reasons why we have lagged, always in search of solutions.

Right now that quest is more pressing than ever. Ottawa and the provinces are scouring the economic landscape for the best ways forward, seeking avenues they should endorse in the public interest.

If anything, the search leads to a crucial conclusion – that innovation demands a new perspective – as well as an observation that will startle many: Canada has solutions already at work and may, in fact, be leading the way on some fronts.

And the new perspective? A recognition that, around the world, innovative activity is on the move. The pioneers who once blazed trails while perched on the periphery –

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Innovation is taking place where different fields intersect, for example in digital health or financial technology.

”

closeted in suburban research parks – are heading downtown. Those of the leading edge are finding homes in the heart of major cities.

Conducting research on the outskirts worked when innovation was largely confined to information technology. Today, it can span several sectors and relies for its success on a network of supporting activities that needs the variety found only in a downtown environment. Increasingly, innovation is taking place where different fields intersect, for example in digital health, bio-informatics, financial technology (fintech) and the internet of things.

Researchers in all these fields need the facilities offered by universities and major hospitals; they need to mingle and interact with others doing work that complements their own; they need people who can help to finance early-stage work and, if ready to bring that work to the market, they need those who can

provide advice and venture capital. Most of all, they need diverse, international talent – the kind of people increasingly drawn to large cities around the world.

As for that startling observation, all this is already taking place. Not just in Boston, Beijing, New York, London, Stockholm and San Francisco, but in Toronto too, where the MaRS Discovery District has sprung to life.

The trend is visible in Montreal and Vancouver as well, but this paper examines why Canada's largest city could be among the leaders of the global innovation economy. It opens a serious discussion about how Canadians can best respond to the changing nature of this economy – how we can make a difference.

Innovation touches almost every aspect of day-to-day living. It can improve our lives, improve our society, and produce jobs for millions. But it is less and less a product of random factors. These days, where innovation can best be nurtured matters hugely. We can not only influence that outcome, but we are further along in doing so than many of us, even in Toronto, realize. ■

## 02/ CITIES AS ECONOMIC DRIVERS

Innovation is more than just discovery – “eureka” moments for researchers working in labs or hunched over computer screens.

If their breakthroughs cannot be converted into something people want to buy, researchers are left with little more than interesting results; they have not innovated.

This is a task for which cities are ideally suited. They bring together clusters of people with different skills in downtown research districts that can stimulate innovation. Increasingly, new products are not the standalone results of concentrated focus in a laboratory or technology research facility. Rather, they occur when many threads of thought, findings and insights can be woven into new cloth. Bringing together people who can contribute the threads and figure out how to combine them is what a modern city core does far better than anywhere else.

The iconic Jane Jacobs contributed greatly to our understanding of urban environments, and her analysis of cities as centres of innovation has stood up over time. Now researchers are blending her ideas with those of economist Joseph Schumpeter, whose work on growth and innovation stressed the need for “gales of creative destruction,” meaning the new ideas, products and ways of doing things that sweep aside the old.

The process was captured perfectly in a recent paper from the Martin Prosperity Institute at the University of Toronto’s Rotman School of Management: The city is not just where innovation happens; it is an essential ingredient – the incubator where people mingle and different strains of thought cross-fertilize in a way that would simply not occur on a single-focus suburban research campus.

The city is “the ultimate enabler of innovation, entrepreneurship and growth,” because it “collects skills, firms, physical capital, and provides a physical platform for them to be recombined into new and productive forms.”<sup>1</sup>

Central to the shift downtown is the fact that innovation is no longer driven purely by technology. It is about convergence: technology combining with marketing and design to tackle complex, multi-dimensional challenges.

Silicon Valley is a case in point. For decades the world’s preeminent innovation

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1. Richard Florida, Patrick Adler, Charlotta Mellander: The City as Innovation Machine. Martin Prosperity Institute, Rotman School of Management, University of Toronto, 2016, p. 11.

“

California's latest generation of innovators has set up shop not in the valley, but a 40-minute drive away in downtown San Francisco

”



powerhouse, it symbolizes the era of the suburban research park. It is the home of Stanford University and an array of major technology firms: Hewlett-Packard in Palo Alto, Google in Mountain View, Facebook in Menlo Park, Oracle in Redwood City.

This is changing. California's latest generation of innovators has set up shop not in the valley, but a 40-minute drive away in downtown San Francisco, now home to the likes of Airbnb, Dropbox, Twitter, Uber and OpenTable, among others.

The same shift can be seen in Toronto. Tech companies like Facebook, Autodesk, Google and Cisco have all located downtown, as have companies in other industries. Telus, Coca-Cola, Corus, Maple Leaf Foods, Deloitte and SNC Lavalin have migrated from the suburbs into the heart of the city in search of young talent.

Analysts worldwide are bringing a new focus to the role of cities as catalysts for development and innovation. A recent study by the Brookings Institution and JPMorgan Chase described cities as “the critical drivers of global economic growth and prosperity”; the world's 123 largest metro areas, with just over one-eighth of the world's population, generate almost one-third of global output.<sup>2</sup> They also account for almost half (44 per cent) of the most important research universities, generate 65 per cent of all patents, and attract 82 per cent of all venture capital.<sup>3</sup>

In the years ahead, global talent and capital will almost certainly concentrate in a group of leading cities. Will any of them be in Canada?

Our three biggest cities – Toronto, Montreal and Vancouver – clearly have the most potential, followed by Calgary, Edmonton and Ottawa. Collectively, these cities are home to 40 per cent of Canada's population and over half of GDP.

2. Jesus Leal Trujillo, Joseph Parilla: Redefining Global Cities: The Seven Types of Global Metro Economies. Brookings Institution, 2016, p. 1. 3. Ibid, p. 14.

IMAGE: ISTOCKPHOTO

Brookings Institution's Redefining Global Cities report classes Toronto in a group of "international middleweights," a collection of mid-sized cities that includes Montreal and Vancouver as well as Melbourne and Sydney in Australia and Köln-Düsseldorf in Germany. Toronto's rankings among the 123 cities studied are solid on key measures of innovation including foreign direct investment per capita (15th), university research impact (33rd) and venture capital investment per capita (31st).

Toronto's place in the international ranking appears to be about right: it is a long way from the "global giants" like New York and London, but comparable to cities like Berlin and Madrid.

Toronto has some important assets, and should aspire to be more than a "middleweight." Not only is its talent more diverse and youthful than that of many others, Toronto now ranks third in consultant PwC's annual Cities of Opportunity report, behind London and Singapore, but ahead of Paris, Amsterdam and New York.<sup>4</sup>

Many reports rank countries, but the growing popularity of those that rank cities reflects a recognition of where the real action is in terms of economic development. PwC's rankings go beyond competitiveness, with 10 broader measures of city health – such as intellectual capital and innovation, technology readiness, transportation and infrastructure, health, safety and security, demographics and livability.

Of the 30 cities surveyed, PwC says, "Toronto ranks in the top 10 in seven of 10 indicators but does particularly well in those categories that speak to the daily needs and concerns of urban residents."<sup>5</sup>

Canadians may be unaccustomed to big ambitions, but these studies suggest that the Greater Toronto Area can be a leader in the global innovation economy. Yet the region is up against jurisdictions that are investing heavily in talent, research and new ventures through incentive and risk-capital programs.

Just as Canada needs an innovation strategy that recognizes the key role played by its cities, Toronto needs to do more. It requires a coordinated effort on the part of government, industry and academe. ■

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<sup>4</sup>. Cities of Opportunity 7. PwC, 2016, p. 7, 8. <sup>5</sup>. Ibid, p. 10.

## 03/ THE NEW GEOGRAPHY OF INNOVATION

With the move downtown, a pattern is unfolding in major cities with the creation of what are increasingly called innovation districts.

They have been defined by Bruce Katz and Julie Wagner in another Brookings report 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.”

All this appeals to innovators because “our most creative institutions, firms and workers crave proximity so that ideas and knowledge can be transferred more quickly and seamlessly.”<sup>6</sup>

Kendall Square in Cambridge, Mass., was one of the first innovation districts to emerge. It sprang up as tech firms were drawn to the area around the Massachusetts Institute of Technology to access talent and the latest thinking.

MaRS has identified more than 30 innovation districts globally, of which data on 23 are presented in this paper.

### TYPES OF INNOVATION DISTRICT <sup>7</sup>

 Urban  Suburban  Either

#### ANCHORED BY INSTITUTION

Mixed-use neighbourhood with an anchoring institution(s) such as a university or innovation hub at its core. Most often found in downtowns.

#### REVITALIZED NEIGHBOURHOOD

Urban renewal projects often transforming former industrial or port areas into mixed-use neighbourhoods.

#### URBANIZED SCIENCE PARK

Often in suburban or exurban areas. Originally these developments were isolated and sprawling but are increasingly being turned into mixed-use areas with new facilities.

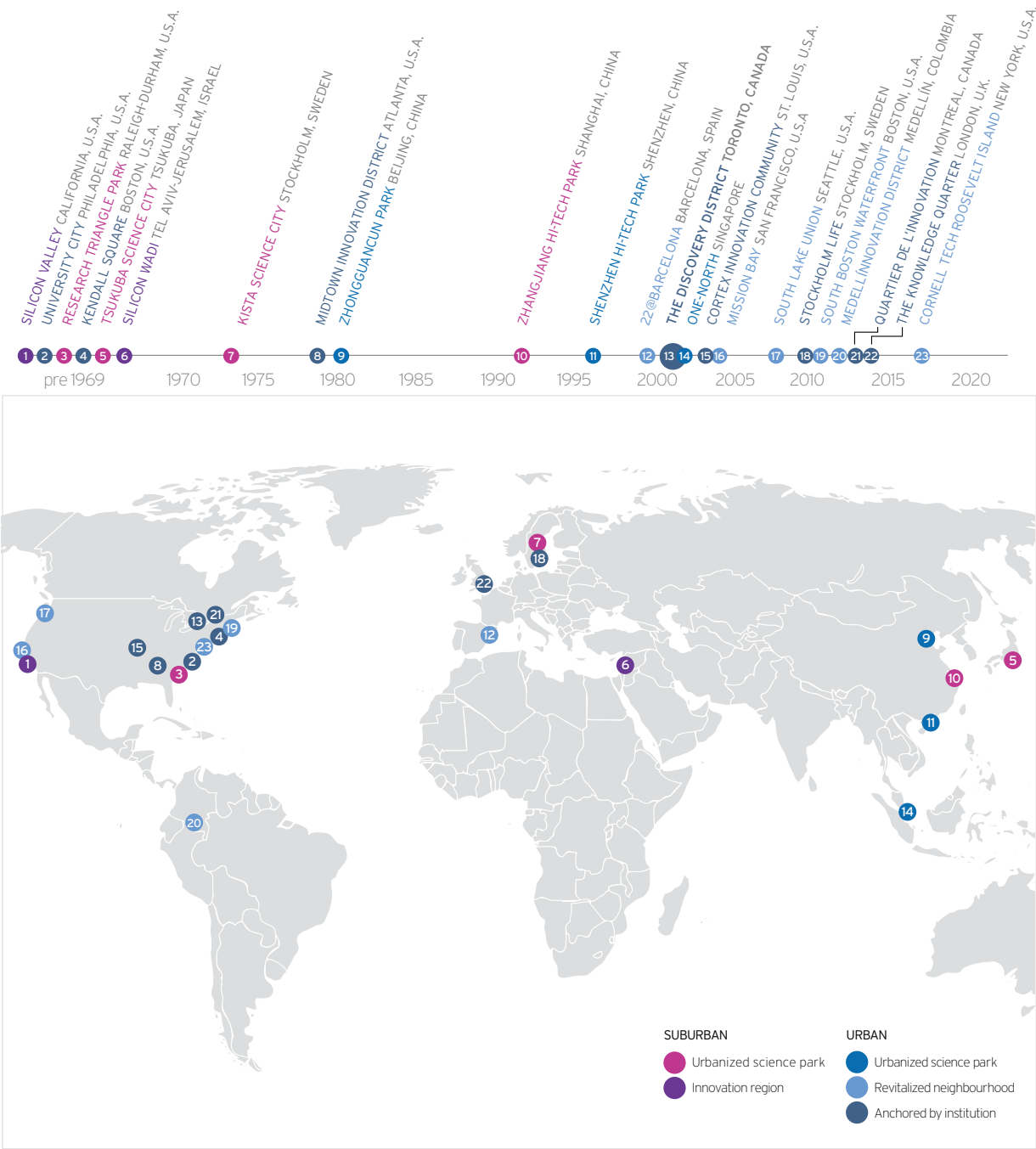
#### INNOVATION REGION

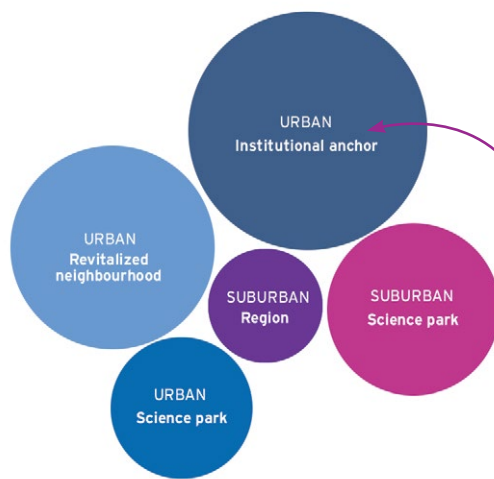
Broad geographical areas of sprawling innovation that include concentrations and clusters of high-tech industries.

<sup>6</sup> Bruce Katz, Julie Wagner: The Rise of Innovation Districts: a New Geography of Innovation in America. Brookings Institution, 2014, p. 1. <sup>7</sup> Based on definitions in Brookings report. For clarity, we have chosen to rename “Anchor-plus” as “Anchored by institution” and “Re-imagined” as “Revitalized neighbourhood.” “Innovation district” is new.

THE MOVE DOWNTOWN

Innovation is moving from suburban to urban centres. MaRS data shows the last decade has seen the rapid creation of innovation districts in major cities.





## DISTRIBUTION OF INNOVATION DISTRICT TYPES

Urban innovation districts often spring up around an **anchor institution** like a university. More recently, innovation hubs have appeared and begun to take on this role.

Singapore has created One-North, where biomedical, tech and media firms cluster around the National University and a research hospital. Tech firms such as Amazon and Google have been drawn to Seattle's South Lake Union area, once an expanse of warehouses now a lively urban neighbourhood with restaurants and bars.

In Stockholm, a life-sciences-focused innovation district was created around the Karolinska Institute partly out of fear that rapid expansion in the city's core would push its universities into the suburbs.

Amsterdam is about to join the list. A decommissioned military base in its old city centre is being converted into an area that will combine research facilities with space for startups, as well as housing, shops and eateries.

These districts bring together all the ingredients required for the discovery and commercialization of new goods, services and ways of doing things.

All such districts contain economic, physical and networking assets that encourage the generation of ideas and accelerates commercialization. Katz and Wagner argue innovation districts "constitute the ultimate mash-up of entrepreneurs and education 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."<sup>8</sup>

The people who work in these districts are not part of the same corporate family. Rather, they are neighbours who like – indeed, who need – to talk to each other to drive their own work forward. They covet the company of others doing similar or complementary work or whose skills are needed to commercialize the outcomes of innovative research. And since many are young, they like the sheer livability of an urban core, with its restaurants, theatres, concert halls and pubs.

<sup>8</sup> Bruce Katz, Julie Wagner: The Rise of Innovation Districts: a New Geography of Innovation in America. Brookings Institution, 2014, p. 3, 4.

Dozens of cities worldwide are creating or expanding these innovation districts, most often in the downtown or midtown of the city where universities and businesses are key neighbours.

## Toronto's innovation district

So what about Canadian cities? Well, here comes the beauty of it: Toronto already has an innovation district, which is one of the strongest in the world.

Toronto's Discovery District stretches out around the city's broad, tree-lined University Avenue. More than 7 million square feet of facilities are crammed into a handful of city blocks in the downtown, creating one of the highest concentrations of research institutions in the world. Within a few minutes' walk you can pass the University of Toronto's main campus, more than 30 medical and related research centres – including Princess Margaret Cancer Centre and the Hospital for Sick Children – as well as the MaRS Centre.

This is where inspiration meets realization. Insulin was discovered here, so too were stem cells. And machine learning, as we are coming to know it, sprang from advances in neural networks at the University of Toronto. ■

### TORONTO DISCOVERY DISTRICT & surrounding areas

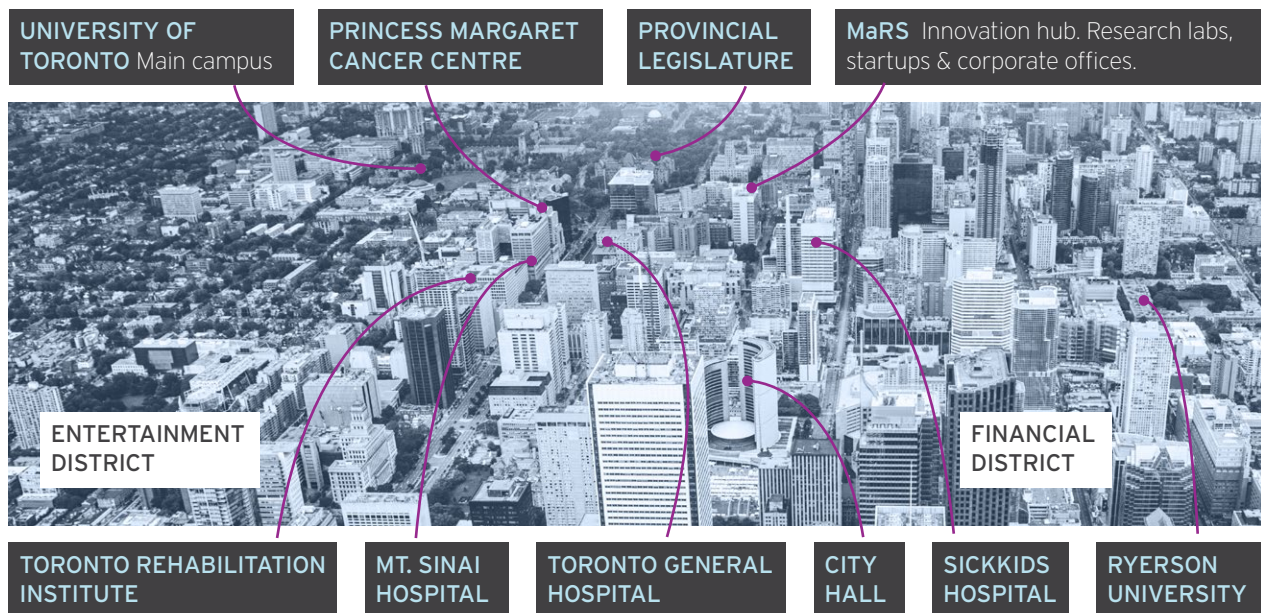









IMAGE: ISTOCKPHOTO

## INNOVATION DISTRICTS COMPARED

Sectors & institutions

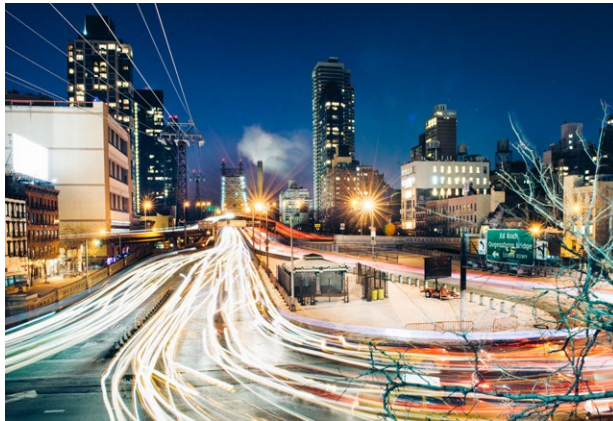
SECTORS										
 Bioscience	 Cleantech	 Advanced materials and manufacturing	 Work & learning							
 ICT	 Fintech	 Other tech								

## 04/ THE RISE OF THE HUB

There is an anchor institution at the heart of many innovation districts.

It can be academic, such as the University of California, San Francisco, in Mission Bay or corporate, such as General Electric's new global headquarters in Boston's Seaport Innovation District. A more recent trend, however, sees the rise of the innovation hub as anchor.

Hubs go beyond accelerators or incubators, the traditional methods to force-feed



innovation; they amplify the convergence of all the ingredients needed for innovation by bringing them all together in one spot and acting as a catalyst for their interaction. They are communities of innovators and entrepreneurs where chance encounters can spark creativity. A life sciences researcher can run into an old pal from grad school in the coffee shop and wind up with a new collaborator. Or a patent agent on her way to see a client can cross paths with someone else she knows who says, "I have to talk to you."

A hub can take many forms, but its fundamental

Cornell Tech will open The Bridge, a new innovation hub, on New York's Roosevelt Island (above) in 2017.

job is to support and encourage people who are in the business of innovation by bringing together the disparate skills needed to move goods and services from researchers to market.

It can be based in a building in the core of a large city, where it might house scientists, entrepreneurs and large global companies, and offer programs to support startups or provide space for meetings, trainings and conferences. Alternatively, it might be an organization that not only helps to build a stronger supply of innovation (by supporting commercialization or startups or both), but also works to create demand for innovation (by removing barriers for adoption, connecting corporations with innovators or encouraging better regulation). Hubs come in many sizes. District Hall in Boston, bills itself simply as a gathering place for the city's innovation community, while The Bridge

IMAGE: ISTOCKPHOTO



“ Walk through MaRS and you’ll encounter more than 250 tenants, some still moving in and hiring staff. By mid-2017, some 6,000 people will work in the complex. ”

in New York, scheduled to open in 2017, will be Cornell Tech’s US\$2-billion campus on Roosevelt Island, with three buildings explicitly designed to promote the chance encounters that might lead to future collaboration.

## The Toronto advantage

Within its broader innovation district, Toronto has one of the largest urban innovation hubs in the world - one building with everything under one roof.

MaRS occupies 1.5-million square feet in the heart of Toronto’s Discovery District. It is within easy walking distance of major hospitals with renowned medical research labs, the University of Toronto and a major financial district. These are key ingredients for the commercialization of innovation.

While other districts are just ramping up, MaRS has been around for more than a decade. The hub is built and the building full of tenants realizing their potential. MaRS has gone through its growing pains and begun to broaden its ambitions.

IMAGE: MaRS

MaRS has a four-way focus – on health, energy & environment, finance & commerce and work & learning – all areas that touch human lives. As well as the future of our economy, the very nature of society depends on them.

Walk through MaRS and you'll encounter more than 250 tenants, some still moving in and hiring staff. By mid-2017, some 6,000 people will work in the complex. They will be working for a diverse array of organizations, including:

- the Ontario Institute for Cancer Research, which is finding new ways to detect, diagnose and treat cancer;
- the Structural Genomics Consortium, which is determining the 3D structure of the proteins and creating research tools for drug discovery;
- JLABS, the brainchild of Johnson & Johnson Innovation, a health startup incubator that provides lab space and state-of-the-art equipment for up to 50 startups, along with access to scientific, industry and capital funding expertise;
- over 100 startups that are based at the MaRS;
- global tech giants like Facebook, Airbnb, PayPal, Autodesk and Etsy, which have housed their Canadian operations in the building, and large corporates like CIBC, Manulife and IBM, which have placed innovation teams here.

That is just a representative few, but it's easy to see that MaRS, with convergence now the key to innovation, is convergence writ large – researchers, entrepreneurs, venture services and government support all under one roof.

But it is much more than a building. Each year, more than 100,000 people participate in events, training and conferences, all related to innovation. Over 1,000 delegations from around the world come to MaRS to learn about and get connected to Canadian innovation.

The hub also excels at:

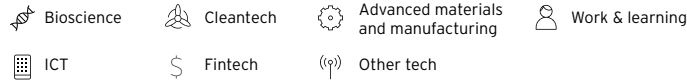
- venture services that strengthen innovation's supply pipeline by helping researchers, startups and corporations bring new ideas to life;
- programs that generate added demand for innovation by removing barriers to the adoption of new thinking and creating better regulation.

MaRS aspires to be among the world's top five innovation hubs, and is in a strong position to do so. In the process, Toronto, Ontario and Canada will become global leaders in the advancement of humanity. ■

## INNOVATION HUBS COMPARED

Sectors & institutions

### SECTORS



Incubator  
 Accelerator  
 Mentors  
 Networks  
 Events  
 Academic partnership  
 Resident ventures  
 & partners  
 Co-working  
 Office space  
 Lab space  
 Access to capital  
 Systems change  
 programming

University City Science Center	Philadelphia, U.S.A.	1963		•	•	•	•	•	•	•	•	•	•	•	•
Birmingham Science Park Aston	Birmingham, U.K.	1982		•		•	•	•	•	•	•	•		•	
OsloTech	Oslo, Norway	1984	Any innovation sector	•			•	•	•	•	•	•	•	•	•
EFPL Innovation Park	Lausanne, Switzerland	1991		•	•	•	•	•	•	•	•	•	•	•	
Berlin-Adlershof Science and Technology Park	Berlin, Germany	1991		•	•	•	•	•	•	•	•	•	•	•	
Amsterdam Science Park	Amsterdam, The Netherlands	1996		•	•	•	•	•	•	•	•	•	•	•	
Karolinska Institutet Innovation System	Stockholm, Sweden	1998		•		•	•	•	•	•	•	•	•	•	•
Nesta	London, U.K.	1998	Any innovation sector				•	•						•	•
Génopôle	Évry, Ile-De-France, France	1998		•		•	•	•	•	•		•	•	•	
Cambridge Innovation Center	Boston, Cambridge, Miami, St. Louis, U.S.A. & Rotterdam, The Netherlands	1999				•	•	•	•	•	•	•			
Hong Kong Science and Technology Parks Corporation	Hong Kong, China	2001		•	•	•	•	•	•	•	•	•	•	•	
Lindholmen Science Park	Gothenburg, Sweden	2001		•		•	•	•	•	•		•	•		•
Digital Media City	Seoul, S. Korea	2002		•		•	•	•	•	•		•	•	•	
The Digital Hub	Dublin, Ireland	2003		•			•	•	•	•	•	•			•
TechTown	Detroit, U.S.A.	2004		•	•	•	•	•	•	•	•	•	•	•	
MaRS Discovery District	Toronto, Canada	2005		•	•	•	•	•	•	•	•	•	•	•	•
Science + Technology Park at Johns Hopkins	Baltimore, U.S.A.	2006		•			•		•	•		•	•		
BioBay	Suzhou, China	2007		•	•	•	•	•	•	•		•	•	•	
Ruta N	Medellín, Colombia	2009		•		•	•	•	•	•		•	•	•	
Skolkovo Innovation Center	Skolkovo, Russia	2010		•		•	•	•	•	•	•	•	•	•	
1871	Chicago, U.S.A.	2012		•	•	•	•	•	•	•	•	•		•	
District Hall	Boston, U.S.A.	2013	Any innovation sector				•	•							
The Francis Crick Institute	London, U.K.	2016				•	•	•	•				•		•
The Bridge at Cornell Tech	New York, U.S.A.	2017		•	•	•	•	•	•	•	•	•	•	•	

# 05/ CONCLUSION

Innovation is important for us all. Today's prosperity rests on the innovations of yesterday.

We don't notice because the earlier innovations that created today's jobs and living standards are simply part of our everyday life. Likewise, today's innovations will produce the industries, companies and jobs that will one day be part of the ordinary landscape of millions of people.

The stakes are high, the field is global, and we are smaller than many of our rivals, so we need to be smarter and more nimble. We need to concentrate our efforts on areas with the biggest payoff, rewards that will enrich the entire country.

Part of our job at MaRS is sizing up how the brave new world of innovation districts applies to Canada. How we can win at this game?

Our focus, naturally, is on Toronto – which has undeniable potential but, as the PwC and Brookings studies make clear, is fighting for the lead within a pack of cities all vying for talent and financing. We need to know the competition and learn from it. What are we doing well? Where do we lag? What can we do better?

This is no fad. It has captured the imaginations of people worldwide who realize that innovation is too critical to our future to be left to chance. Governments, corporations and research scientists alike recognize that to compete on the world stage, they must invest in these urban clusters of activity.

There is a large measure of serendipity to successful innovation, but hubs create the conditions for it – the collaboration and convergence that cities need to get the most from their innovation performance and to capture the social and economic returns locally from global innovation.

Place matters. Let's be bold. ■



# PLACE MATTERS