THE LOGIC OF **INNOVATION LOCATIONS**

CATAPULT Future Cities

Understanding the drivers that enable cities to host innovation economies

A report by The Business of Cities and Future Cities Catapult
May 2017

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ABOUT THIS REPORT

Prepared for decision makers and stakeholders looking to identify or promote innovation locations, this report by **Dr Tim Moonen** and **Prof Greg Clark** at The Business of Cities is intended as a practical guide to key issues, and is based on insights by thought leaders in multiple locations worldwide.

FOREWORD
HELPING **CITIES** FOSTER **INNOVATION**

The ambition to create truly innovative cities has been around for decades, but with rapid urbanisation and the global challenges facing us today, that ambition is stronger than ever. We know that some cities become centres of innovation while others don't. Understanding how this happens will help cities set realistic ambitions and realise them. Why does innovation happen in some places and not others? How can we create environments that marshal our ideas and resources to deliver the best outcomes for our cities over the long term? How can we plot a steady investment course while allowing for the disruption that so often accompanies successful innovation?

We asked a team of world-leading urbanists at The Business of Cities to investigate these questions in an international study. They invited a wide range of stakeholders – from asset owners to policy makers – to explore what factors have helped and hindered the emergence of innovation spaces in their cities. This report is the result. It directs city stakeholders towards what has worked while alerting them to what hasn't. With this knowledge, when cities set out to create spaces for innovation they will be more successful, more often.

Global in reach and with a uniquely practical focus, the survey sits within our remit to promote innovation, help UK companies succeed and make cities better. We hope you will look at, learn from, and ultimately challenge our report in the light of experience, engaging with us in a spirit of open innovation.

Scott Cain
Chief Business Officer
Future Cities Catapult

EXECUTIVE SUMMARY
WHAT DOES IT TAKE TO HOST THE **INNOVATION ECONOMY?**

Across the globe, municipal governments, landowners, planners and developers are seizing the momentous opportunities presented by innovation and disruption in advanced, high growth industries. In over 100 cities worldwide, buildings and districts are already being designated future centres of innovation within the urban, regional or national economy. And more and more cities are catching on to this trend.

Yet not all cities have the assets, ecosystem or expertise to make a new location for innovation work. This report draws on the recent experience of more than 30 cities around the world in order to understand the demand preconditions, the location requirements, and the interventions or catalysts that enable cities to host innovation economies successfully across different formats and scales.

Factors underpinning innovation

Innovation economies at every scale are most likely to emerge in cities which experience specific drivers and in which the required conditions have been fostered as part of a wider ecosystem.

In this survey we identify 12 fundamental drivers, including business competitiveness, market proximity, investor appetite and institutional knowledge. We also identify 20 ecosystem attributes in areas including infrastructure, skills, business environment and investment framework. If these attributes are not developed or enhanced, and their progress monitored, many locations will fail to succeed as innovation hubs or hotspots, regardless of the physical quality of the location itself.

Also underpinning the rise in innovation locations is a mindset change among public and private landowners. This change is characterised by a shift from an 'asset owner' to a 'service provider' model, a readiness to adapt to rapidly evolving marketplace needs, and a willingness to adopt a 'total place' view that has an eye on the needs of start-ups.

Nine types of innovation location

The report identifies the typologies for nine innovation location formats to have emerged in the last decade, each of which is capable of delivering a range of specialised functions within the wider ecosystem. The nine location formats are: (1) hub building; (2) quarter; (3) vacated site; (4) campus; (5) district; (6) triangle; (7) park; (8) zone; and (9) corridor.

Each of these nine configurations has its own success model, detailed in this report. Across all nine, the following key conditions were identified:

- Quality and depth of collaboration between innovators, mentors, investors, established business, and local leaders
- Management systems and skills for hosting the innovation community and establishing a positive identity and visibility
- Conditions for anticipating how the community will grow, including 'grow on' space and synergies with other locations
- A whole place perspective to attract innovation-oriented firms and talent
- Proactive engagement with local skills supply and future skills demands
- Matching of ambition and resources to the size of the location

1 INTRODUCTION

ROOTING TODAY'S INNOVATION 'BUZZ' IN **INSIGHT AND EXPERIENCE**

Innovation and entrepreneurship are widely acknowledged as critical ingredients in the long-term success of cities. The innovation economy is a driver of local employment – attracting global talent, business and capital – and a source of fresh ideas or smart solutions to help cities become more efficient, productive and 'liveable'. Innovative firms and sectors are also increasingly active in repurposing underused urban land. It's no surprise, then, that more and more cities are looking to host a bigger slice of the innovation economy where they can.

Municipal governments, as well as private landowners and developers, are responding to the new opportunities of the innovation economy by releasing increasing amounts of space for development or conversion. Across the UK, and around the world, underused buildings, sites and locations are being pro-actively or pre-emptively designated innovation centres using a range of descriptive labels.

But not all cities have what it takes to host a new location for innovation. Many examples exist historically of projects calling themselves 'technology parks' or 'creative quarters' or 'enterprise zones' in the hope of attracting a certain quality of company or innovative activity. As early as the 1980s, analysts had judged most of these projects to have 'failed', in many cases because 'little effort was made to determine what these conditions [conducive to high technology firms] really are' [1]. The failure of many such projects to create a cluster of high-value activity meant their lofty labels came to be viewed as a triumph of marketing over market, of style over substance.

Although there is currently a huge amount of buzz around innovation, and a corresponding appetite for creating a new centre of innovation on every potential site, it's essential that cities and city leaders understand what is *possible, desirable and realistic.*

The risk inherent in pre-emptive nomination of a location as a hub for innovation is that it may not fulfil expectations. The danger is that too many cities try to copy the current trend for designating 'innovation districts' without a proper rationale or a genuine market demand, giving rise to wasted effort and resources.

This report aims to identify firstly the fundamental growth drivers and ecosystem requirements needed for an innovation economy to exist in a city, and secondly the factors likely to support the successful development of a specific innovation location once these conditions are met.

Drawing on a range of international examples, the survey sets out to help public and private sector decision-makers understand where and how they can contribute most effectively to facilitating and fostering the innovation economy. Arguments and insights are developed in the light of consultation work with more than 30 cities worldwide on their innovation location projects, some of which have been described in two reports for Urban Land Institute Europe – *Technology, Real Estate and the Innovation Economy* (2015) and *Building the Innovation Economy* (2016).

WHAT IS THE INNOVATION ECONOMY?

Innovation is more than a single 'tech sector' or 'start-up scene' – it's a way of describing how whole portions of an economy embrace technologies and change. Economists use the term 'innovation economy' to describe what is fuelled or accelerated by the impacts of technology and talent on advanced and high-growth industries, many of which overlap and reinforce one another. Rapid technology disruption and adoption is having a cross-sector impact on business models, capital systems, products, services, real estate, and productivity across these industries, redefining established sector boundaries along the way.

Which sectors are evolving within the innovation economy? The Innovation Institute defines the innovation economy as including advanced materials, biopharmaceuticals, business services, advanced manufacturing, financial services, healthcare, scientific instruments, software and communications, among other sectors.

These established industries experience new pressures and opportunities as a generation of technologies emerges embracing IT, robotics, data analytics, materials, artificial intelligence, and new infrastructure systems in energy, waste, water, distribution and transport.

In fact, the innovation economy has always been with us. Today, however, it exists at a bigger scale and is spread across more industries. Countries around the world, from Australia to Chile and China, are now looking at how to harness the innovation economy. The number of patents filed worldwide has increased from under a million a year in 1990 to three million today, while the number of innovations produced through global collaboration has increased from 1,600 to 11,000 in the same period. Venture capital investment over the last 30 years has soared from less than $20bn to more than $120bn a year. There are an estimated 20 million innovation economy employees in the US alone, and well over 100 million worldwide, all making 'intensive use of human capital and human ingenuity'.

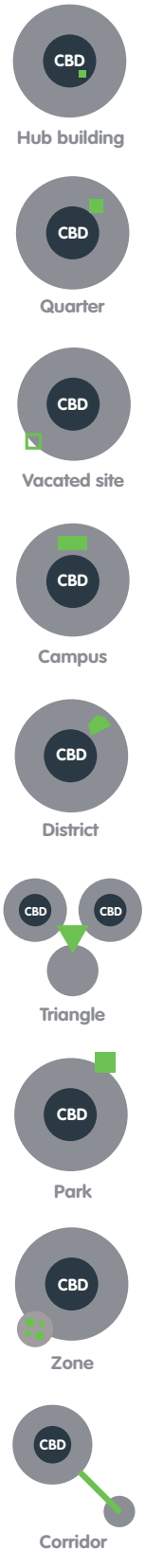
Opportunity of the innovation economy for cities

The innovation economy has become a hot topic for cities because the innovation models of industries noted above depend substantially on proximity between firms and institutions, and the innovation economy talent pool benefits from larger urban markets, urban environments and lifestyles. Attracting and accommodating the innovation economy has become an important priority for many cities, for several reasons:

- The need to diversify the base of jobs, talent and tax revenue after the 2008 financial crisis
- The structural imperative to shift from a shrinking industrial economy to one built around services and innovation.
  The innovation economy can produce powerful multiplier effects – jobs in the innovation economy more than double the demand for local professional and non-professional services compared to those in the industrial economy
- The desire to leverage technology-enabled products and services in order to address urban challenges of sustainability, well-being and city management

Sources[2]

Figure 1: Simplified typology of innovation location



Note: CBD indicates Central Business District

Our report – the first to develop a typology of location formats to have emerged in the last ten years – is driven by this set of questions:

- What does the innovation economy need in terms of locations and property?
- Can all cities host an innovation hub? Can some cities host more locations? If so, why?
- What are the key elements that enable different types of innovation location to succeed?
- What is 'market driven' and what is 'policy enabled' in these spaces?

The report is also distinctive because it looks at innovation at a variety of scales and in a range of formats (see Figure 1), including:

- Single buildings, purpose built or converted for innovative use
- Organic developments in mature urban neighbourhoods
- Campuses or 'parks' with a single 'original' land use, where firms and institutions often share assets and facilities
- Multi-purpose innovation districts that combine business and scientific activity with other institutions, amenities and residential space
- Corridors that span multiple neighbourhoods, districts and cities

These formats are typically located within a wider area that enjoys a common ecosystem of innovation within a city, regional or national geography. Although these local concentrations host certain specialised functions of the broader ecosystem, lending identity, visibility and accessibility to the innovation in question, they rely ultimately for their success on ingredients drawn from the wider geography.

In addition to our historical consultations and case study work with cities and city leaders we have, for this survey, examined a further 13 international exemplars which are recognised as important centres of innovation in leading cities and which together constitute a wide spread of location type and development maturity. We've carried out site visits to many of these locations, and have consulted leaders or planners in all of them.

The locations are: (1) Berlin TXL Urban Tech Republic; (2) Boston 128 corridor; (3) Brooklyn Tech Triangle, New York; (4) Guangzhou Knowledge City; (5) Herzliya, Tel Aviv; (6) Industry City, New York; (7) King's Cross, London; (8) London-Stansted-Cambridge corridor; (9) Paris-Saclay; (10) One North, Singapore; (11) South Lake Union, Seattle; (12) Seoul Innovation Park; and (13) Suzhou Industrial Park.

ACKNOWLEDGEMENTS

Thanks to the following contributors for their insight and advice. (These individuals have no responsibility for the specific content or arguments developed for this survey.)

Dr Philipp Bouteiller, **CEO, Tegel Projekt (Berlin TXL)**; Lori Curran, **real estate investment strategy director, Vulcan Inc.**; Gary Ghozlan, **chairman of the industrial zone, Herzliya Municipality**; Prabha Rathinasabapathy, **former project director, Argent**; Andrew Kimball, **CEO, Industry City**; Tair Kowalsky, **SigmaLabs accelerator manager, Tel Aviv**; Seong Won Lee, **research director, Seoul Innovation Park**; Shani Leibowitz, **senior VP development and planning, Brooklyn Navy Yard Development Corporation**; Eun Joung Shim, **Seoul Innovation Park**; Benjamin Singer, **director, WeWork Israel**; Efrat Tolkowsky, **CEO, Gazit-Globe Real Estate Institute, IDC Herzliya**; Sonam Velani, **policy advisor, deputy mayor for housing and economic development, New York City**

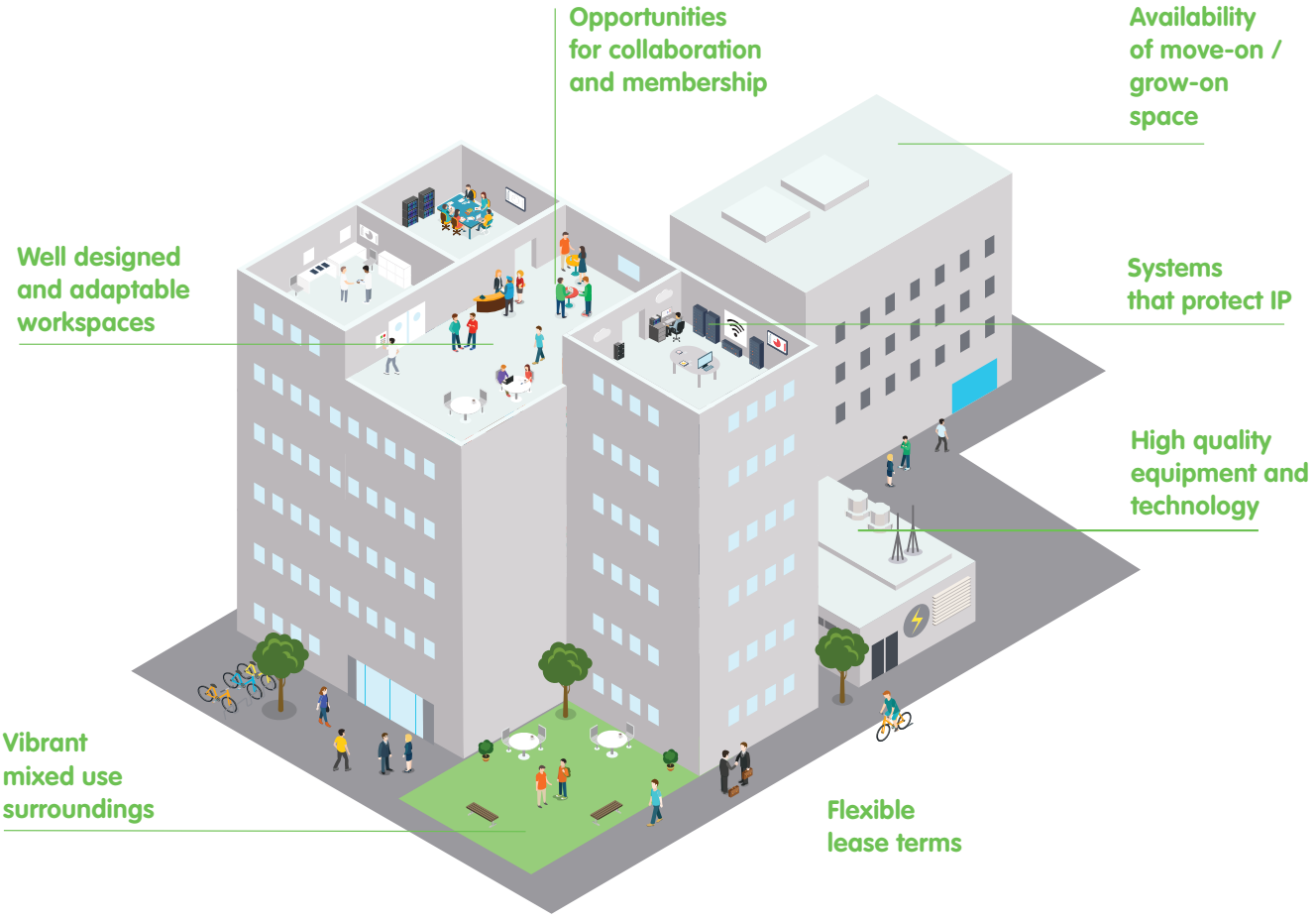
2

LOCATIONS AND ASSETS

WHAT DOES THE INNOVATION ECONOMY **NEED**?

Tenants within the new innovation economy have highly specialised locational demands because of the size and fledgling nature of their businesses, the dynamic lifecycles they enjoy, the kinds of intellectual property they own, and the particular forms of interaction they require (see Figure 2).

The precise needs of these companies depend on market segment preferences, technology demands, and the interaction preferences of different sectors, but at their core are a number of common features.



2.1 LOCATIONAL NEEDS OF INNOVATION SECTORS

Proximity to collaborating firms, institutions and individuals is crucial. Also critical is flexibility of office or lab space to allow room for teams to grow and for uses to be adapted. Shared and collaborative spaces for group work, equipment use, meetings and events are highly sought after because they provide a dynamic setting and allow companies to pool costs. Reliable digital streams, and mechanisms to protect IP in shared environments, are increasingly viewed as essential, while rental models that allow for the unpredictable cash flows of start-up companies are an advantage.

The particular needs and preferences of companies operating in the innovation economy require owners of land and buildings, as well investors, designers and developers, to adapt their offer and approach quickly if their locations are to host a critical mass of innovation activity. Urban Land Institute Europe points to a number of shifting implications for real estate, including:

- Real estate is moving from an 'asset owner' to a 'service provider' model where operators don't just rely on ownership of bricks and mortar but develop a suite of other services to support the firms they host (e.g. funding, coaching, networking and supply)
- Buildings must constantly evolve to accommodate bespoke and developing needs in respect of access, location, workplace, building layout and rental
- A culture of transparency, partnership and mutual incentives increasingly characterises relations between owners and occupiers
- Real estate is adopting a 'total place' or 'whole ecosystem' perspective, taking account of wider conditions in order to attract and sustain start-ups

Figure 2 (left): Overarching workspace preferences of innovation economy firms

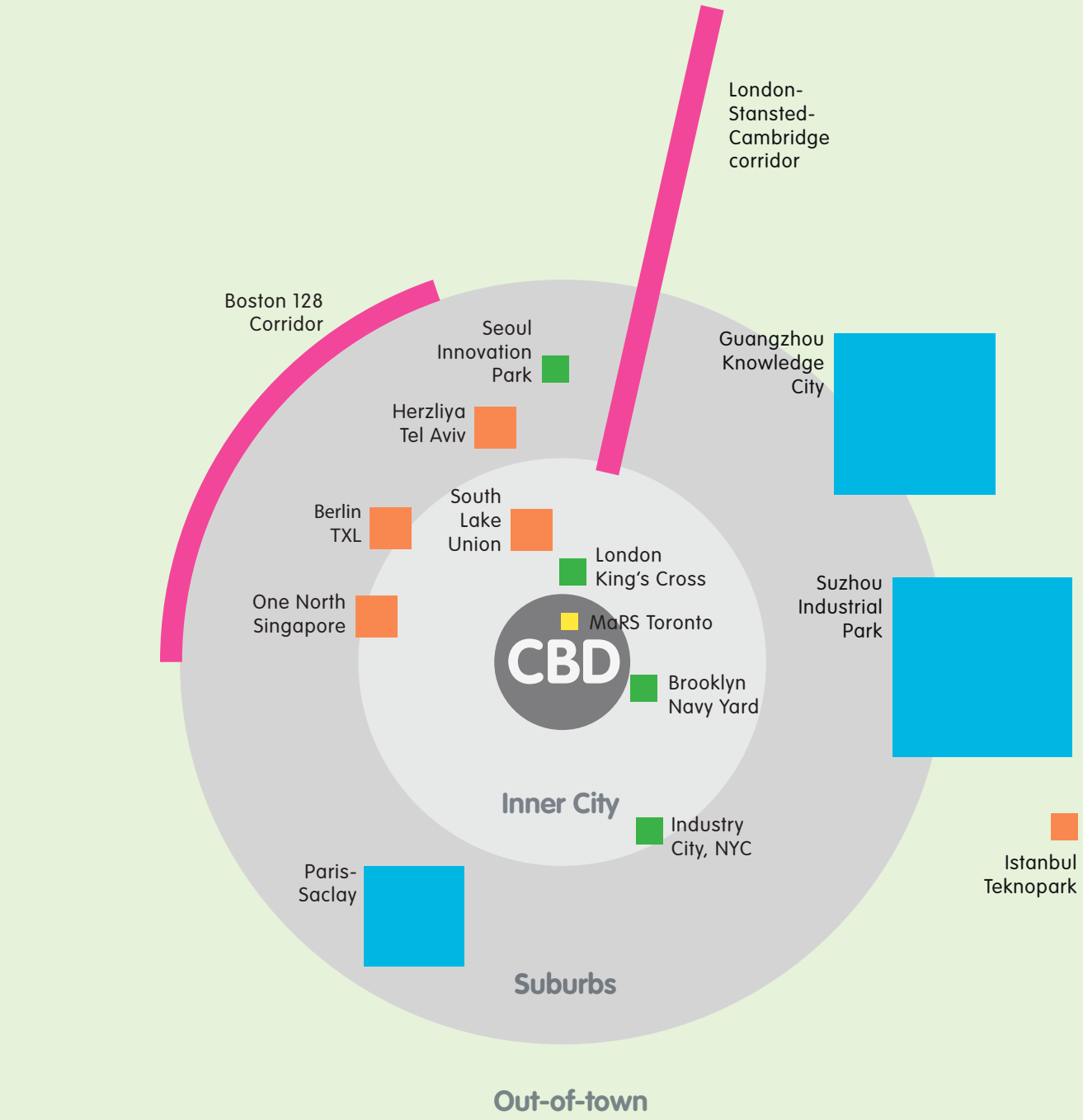
2.2 **FORMATS** FOR LOCATIONS **REQUIRED** BY THE INNOVATION ECONOMY

Recent studies highlight the growing re-urbanisation of innovation – increasing numbers of firms are quitting out-of-town science and technology parks in a quest for more accessible, denser urban environments conducive to innovation and cross-fertilisation[3]. Innovation, these studies conclude, prefers the density, connectivity and market access that only inner cities can provide[4].

However, international evidence suggests that innovation continues to cluster in a very wide mix of urban, suburban and non-urban locations, and at very different scales, from single buildings to major city sub-centres, designated zones, and intercity corridors.

More dispersed clusters are also common, with innovative companies adopting a shared regional identity as part of an informal culture of partnership and in a bid to boost international visibility. Each of these innovation location types develops its own success models in order to attract, promote and sustain innovation.

Figure 3: Sample range of innovation spaces studied for this survey



Single building (2,000 – 40,000 m²)

Campus or neighbourhood (30,000 – 300,000 m²)

Entire district (1 – 3 km²)

Sub-region (50 – 300 km²)

Corridor (20 - 100 km)

3 BEFORE THE 'WHERE' OF INNOVATION **FUNDAMENTAL DRIVERS** AND **ECOSYSTEM CONDITIONS**

Fundamental drivers

Innovation economies are most likely to emerge in cities where fundamental growth drivers already exist. These drivers take many forms. Firstly and most obviously, urban locations need to be near a sizeable customer and supplier market, not only within the city itself but also regionally, nationally and even internationally. Historically, this access has been rated the most important factor influencing business location decisions[5]. Access to, and credibility among, a local base of investors with the appetite to invest in higher risk activities is also vital – lack of traction here can be an insurmountable stumbling block for many aspiring locations.

Other drivers relate to local sector and company dynamics. Demand typically stems from existing sectors that, on the one hand, show medium-term signs of growth, and, on the other, need to improve productivity and performance due to changing market conditions. Cities are more likely to host innovation if interactions among firms, and between firms and other public or private bodies, is regular, spontaneous and horizontal, rather than infrequent, planned and asymmetric[6]. Such interaction encourages a culture of dynamic competition among related firms, which is a critical spur to innovation in terms of products, services and business models.

Further drivers exist in the twin areas of knowledge and research. Innovation locations are not exclusively dependent on the presence of knowledge or technology-intensive institutions – after all, not all 'university cities' are centres of innovation. Their success is also tied to an established culture of collaboration, a financial imperative to commercialise, and a related system of entrepreneurship within and around these institutional anchors, plus an ability to retain and build the base of skilled workers needed to populate firms and sectors oriented towards innovation. This last factor is itself shaped by the existing policy and funding environment, and whether it incentivises the right balance of enterprise, solutions-driven activity, and IP protection.

The extent to which these drivers are present is fundamental to the initial viability of innovation locations.

These fundamental drivers create the conditions and motivation for the innovation ecosystem to develop. The ecosystem fosters the basic processes of enterprise formation and business growth that in turn require specific locations.

The innovation ecosystem

The innovation ecosystem spans all the businesses, institutions and relationships engaged in the process of developing technology and innovating – that means all the customer communities, infrastructures, supply chains, labour markets and investment systems.

Checklist of fundamental drivers that underpin the innovation ecosystem

FUNDAMENTAL DRIVERS		
Market and investment drivers		
Access and proximity to markets: (1) Consumer market (2) Large institutional purchasers of innovation products (3) Public sector market prepared to adopt innovative technologies and solutions (4) Established volunteer base (e.g. clinical trials, test markets)	✓	×
Investors seeking high returns and willing to invest in company balance sheets	✓	×
Sector drivers		
Established sectors in the region that are part of an established value chain (e.g. manufacture, regulatory, marketing), and which have clear growth opportunities	✓	×
Costs pressures within supply chains for larger firms and clusters needing to increase productivity	✓	×
Inter-firm activity drivers		
Presence of start-ups, more established companies, international firms, technology transfer organisations, and other relevant commercial bodies[7]	✓	×
Competition between firms leading to urge to innovate	✓	×
Knowledge and R&D drivers		
Presence of knowledge anchors (larger R&D institutions and universities) creating IP which needs to be commercialised to continue investment in research	✓	×
Cross-pollination of academic and commercial research (promoting IP management and commercialisation)	✓	×
Research expertise in adjacent sectors fostering the growth of convergent technologies and other combined innovations	✓	×
Skills drivers		
Pool of qualified talented workers in fast-emerging sectors seeking employment opportunities	✓	×
Policy drivers		
Policy incentives to secure solutions to pressing problems (e.g. health research, climate change, security, food, energy, waste, water, disaster recovery)	✓	×
Support of national agencies and institutes for interdisciplinary research, with shared strategic goals among major bodies and a strong element of cross-agency collaboration	✓	×

The ecosystem has a much wider geography than a single quarter, district or zone, and responsibility for fostering and co-ordinating it is usually shared by multiple organisations and tiers of government.

Studies of innovation ecosystems highlight three core dimensions – enabling infrastructure, the skills and human capital base, and the framework conditions for business and investment. Strong ecosystems generate a critical mass of start-ups and high-growth companies.

Checklist of ecosystem conditions to test viability of potential centres of innovation

ENABLING INFRASTRUCTURE		
Connected to a system of cities or clusters offering comparative or complementary advantages in innovation sectors[8].	✓	×
Travel links to major roads and city centre rail hubs, plus convenient access to airports, to support labour mobility	✓	×
High quality telecommunications, IT platforms, and reliable electric power	✓	×
Attractive locations for work and leisure, and public space that has the 'stickiness' to encourage people to stay and interact	✓	×
Strong supply of affordable housing in mixed-use locations nearby	✓	×
Proactive local government land use policies	✓	×
Real estate providers that adopt an agile, service provider mindset	✓	×
SKILLS AND HUMAN CAPITAL		
Strong demographic profile, prevalence of younger (20 to 44-year-old) age groups	✓	×
Availability of high-level specialist skills – laboratory technicians, data scientists and broad mathematical competences	✓	×
Leadership and management skills to provide SMEs with professional management and leadership	✓	×
Proximity to product manufacturing expertise	✓	×
Interdisciplinary university courses and scientists to develop curricula, apprenticeships and training schemes	✓	×
Viable talent attraction and retention strategies for city/region	✓	×
FRAMEWORK CONDITIONS FOR BUSINESS AND INVESTMENT		
Access to an investment community (business angels, venture capitalists, investment banks) that shows confidence in smaller firms	✓	×
A mix of funding solutions for different stages of corporate development (incentives, tax breaks, technology funds)	✓	×
Funding regime willing to finance risky research, and a culture of risk-taking in firms' research portfolios[9]	✓	×
Policy and regulatory landscape capable of promoting innovation and intelligent procurement (consultants, patent lawyers)	✓	×
Culture and track record of inter-firm and inter-institutional collaboration and knowledge sharing	✓	×
Sector specific support networks	✓	×
Mechanisms to accelerate research and deployment of new products	✓	×
National tax and regulation framework conducive to business in relevant sectors	✓	×
Opportunities for collaboration with centres of excellence (e.g. academic and research institutes, medical schools, teaching hospitals).	✓	×
IP protection	✓	×

4 TRANSFORMATION WITHIN **DIFFERENT TYPES OF INNOVATION LOCATION**

This report examines the qualities and attributes that support the transformation of nine different types of location into successful spaces for the innovation economy. These location types are:

- Innovation **hub** buildings in CBD or 'city fringe' location
- Innovation **quarters** close to major transport termini
- Innovation **sites vacated** by major employers
- Innovation **campuses** oriented around universities
- Innovation **districts** in inner city post-industrial areas
- Innovation **triangles** that connect three concentrations of innovative activity
- Innovation **parks** in suburban areas undergoing intensification
- Innovation **zones** in large out-of-town locations
- Innovation **corridors**

4.1 INNOVATION HUB BUILDING LOCATED WITHIN **CITY CENTRE** OR AT **CBD FRINGE**

There are many examples around the world where a single building is established as a centre of innovation at the urban core. These buildings leverage their proximity to universities, venture capital sources, banks and government institutions in order to help commercialise and launch companies with high growth potential, and to catalyse a wider innovation culture across the city.

International examples of established innovation hub buildings[10]

	First formed	Distance from CBD	Size	Main spaces/tenants	Main sector specialisms
MaRS, Toronto	2000	<500m	140,000 m², 200 tenants, 6,000 workers	Office, co-working and lab space. Firms: AirBnB, Synaptive Medical, Nymi	Health, Cleantech, ICT
La Kretz Innovation Campus, Los Angeles	2011	<500m	55,000 m², 28 companies	Business incubator with workspaces, training, and prototyping centre. Firms: Amperics, Chai Energy, Rain Systems	Cleantech
SUP46, Stockholm	2013	<500m	50+ start-ups	Co-working space and start-up hub. Firms Beatly, Henry, Gro play, Lingio	Mobile, media, gaming

Although no two single innovation buildings are the same – with each having their own founding purpose, sector expertise and composition of firms – they often share these attributes:

- High proportion of start-ups and small firms
- Usually led by the private sector, or by non-profit charities overseen by a private board
- Buildings are existing structures repurposed for innovation economy
- Financial model tends not to rely on rental revenues. Rents are often supported by public operating grants, partner grants, event space rental, subscriptions, memberships and competitions
- Strong adaptation to the needs of primary industries (e.g. wet lab space, IT equipment)

The success of 'hub buildings' depends on the quality of collaborations taking place between innovators, mentors, investors and local business leaders. This is fostered by:

- *Spaces that can be adapted to multiple roles* (e.g. rooms that function as workspaces, event spaces and meeting spaces in a single day). This not only optimises square footage but also allows the building to invite firms and others into the space for a range of purposes
- *Mix of memberships* tailored to suit innovators that need a fixed location, co-working space, or hot-desking – a popular model because it maximises traffic in a single building
- *Competitions and awards* attract and reward the best researchers and entrepreneurs to these niche locations while promoting commercialisation of promising new technologies
- *Financial support mechanisms*. Hub buildings often have progressive financial systems to support equipment and working capital needs (e.g. refundable tax credits, low-interest loans, tax exemptions for gains received)[11]

Source: Raysonho, CC-by-SA 2.0

MaRS, Toronto (see overleaf)

Checklist of success factors for innovation hub buildings

Management experience in both entrepreneurship and community management	✓	×
Provision of free services (e.g. expert advice, networking opportunities, seminars, workshops, market research, legal support)	✓	×
Critical mass of surrounding night time activity and amenities	✓	×
Shared access to equipment, meeting space, lobby space, gallery and fitness space	✓	×
On-site or adjacent accommodation for short to medium term (3-12 months)	✓	×
Proximity to affordable 'grow on' space	✓	×
Wide range of financial support mechanisms to help small firms over the medium term (e.g. refundable tax credits, exemptions, loans, debt refinancing)	✓	×
Engagement of Business Improvement District or local growth partnership	✓	×
Competition among candidates for membership, to ensure high standard of early stage businesses	✓	×
Entrepreneurship education programmes to build skills base and traffic flow	✓	×

CASE STUDY

MaRS, Toronto

A launch platform for high-growth companies

KEY SUCCESS FACTORS

- **Flexible spaces able to meet the needs of science and software sectors**
- **Wide range of free services for venture clients – start-ups screening, networking, workshops, market research**
- **Diverse cross-sector collaborative environment with mix of company sizes and practices**
- **Large entrepreneurship education programmes**
- **Excellent transport connectivity with greater Toronto area by subway and GO transit system**

MaRS is a non-profit research and innovation hub building located in downtown Toronto. Envisioned in 2000 and opened in 2005, it has since become an important enterprise and networking hub, and platform for the launch of several of Canada's high-growth companies.

With an early focus on medical sciences, MaRS later expanded to take in IT and cleantech services and, more recently, financial technology. A total investment outlay of some C$600m has yielded around C$3bn in economic value. Annual expenditure at MaRS amounts to some C$40m, with real estate rents accounting for just a quarter of the total. The shortfall is made good by provincial (Ontario) operating grants, restricted provincial grants, and partner grants.

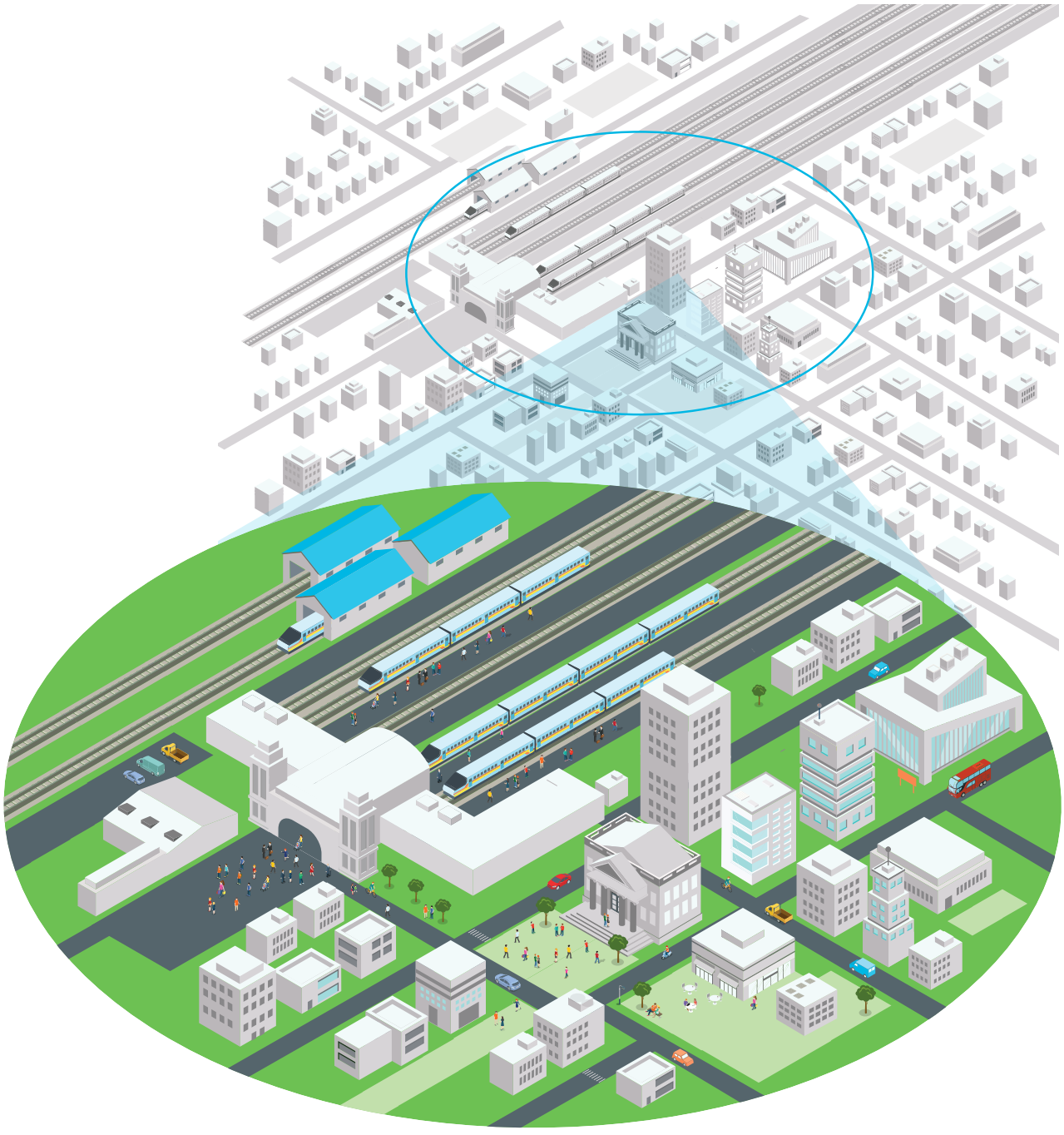
Development of MaRS has taken place in two phases. Phase 1 combined an innovation centre with a laboratory tower, incubator, furnished offices and meeting rooms. In Phase 2 a new tower was added using a C$400m provincial loan facility, doubling the centre's footprint. New anchor tenancies are part of a provincial government initiative to bring a medical cluster tackling infectious disease to Toronto's downtown core, enabling a rapid response to a future emergency along the lines of the SARS crisis. The site's mix of lab space, tech space and institutional research has proved attractive and popular.

Today, MaRS has over 100 tenants of different size and maturity, including start-ups, mid-size companies and multinationals, investors, researchers, community developers, professional service firms and retailers. Together these companies employ over 3,500 people.

In terms of recognised success criteria, the MaRS innovation hub building excels when it comes to a shared access to facilities, proximity to the nighttime economy, and education for entrepreneurship. Less well established factors include access to short-term accommodation, and experience of managing entrepreneurial communities.

4.2 INNOVATION QUARTERS CLOSE TO **MAJOR TRANSPORT TERMINI**

Characterised by high quality public space and heritage buildings, often brought back into use after a period of decline, innovation quarters face particular challenges thanks largely to their prime assets and locations.



4.2: INNOVATION QUARTERS

International examples of innovation quarters close to major rail termini[12]

	First formed	Distance from CBD	Size	Main spaces/tenants	Main sector specialisms
King's Cross, London	2007	1-2km	0.3km^2	Anchor tenant + with office, co-working and educational spaces. Includes Google, Central St Martins, Digital Catapult Centre	Mix with focus on education, culture, design, digital
Werksviertel, Munich	2012	3km	0.4km^2, up to 10,000 jobs when complete	Offices, workshops, maker-spaces, co-working spaces, events and studios. Includes Rohde & Schwarz, Werk 1	Mix with focus on media, IT, maker industries

Although each innovation quarter has unique characteristics, they often have these attributes in common:

- *High quality public space* that attracts residents and visitors back to areas that were once appealing
- *Sensitive re-use of heritage buildings* to attract cultural amenities and give a sense of authenticity to a city
- *Mix of space* to locate anchors
- *Keeping business costs low*. Costs of labour and real estate are a particular challenge in these sites because of their prime locations. Sites succeed if a suite of resources is created – real estate, accounting, human resources and legal – that help start-ups lower their costs
- *Road and pedestrian access*. Good road access for cars and freight is often a major challenge at these sites, as is bicycle and pedestrian mobility which may be constrained by existing infrastructures on or near to railway land
- *Relocation of government agencies,* publicly funded research institutes, and research labs gives other stakeholders the confidence to enter and participate

As a consequence of their prime locations, innovation quarters tend to face significant challenges in respect of construction costs, not least because local rules often demand highly creditworthy tenants. In order to justify ground-up commercial development, innovation quarters usually need to demonstrate rents per square foot that are far above affordability levels for smaller tech firms. Moreover, the economic incentive to refurbish warehouse or storage facilities is often weak, as their existing uses can be highly profitable.

Checklist of success factors for innovation quarters

	✓	✗
Mixed-use zoning	✓	✗
Capacity to host and secure a major anchor tenant alongside smaller firms	✓	✗
Sensitive and authentic re-use of heritage buildings	✓	✗
Activation of temporary public spaces through art, gastronomy and culture	✓	✗
Improvement to public safety, noise and walkability	✓	✗
Densification/development rights	✓	✗
Mechanisms to retain and recycle value	✓	✗

CASE STUDY

Werksviertel, Munich

Accommodating the 'Munich Mix' for the next generation

© Rohde and Schwarz

KEY SUCCESS FACTORS

- **Nine landowners working towards a common purpose, coordinated and connected to infrastructure by the city government**
- **Retention of real estate with heritage value, and creation of continuity with the past**
- **Developments driven by commitment to building long-term value rather than ambition for early exit**
- **Recycling of profit share into social infrastructure using public instrument**

Located on a 40ha brownfield site just east of Ostbahnhof station, Werksviertel, or 'factory quarter', is Munich's biggest new mixed-use innovation district and one of the last remaining large sites available close to the city centre. With the land co-owned by nine organisations, including family landowners, private firms and municipal stakeholders, overall responsibility for the project was taken up by the City of Munich. Owing to a lack of time and resources, however, the works remained a low priority for many years.

Since 2008, active public sector involvement in the redevelopment process has helped build consensus among all site owners around a final development plan, after years of negotiation. Current development rights allow landowners to increase the floor area ratio in return for a charge on profits (currently €50m), with the funds earmarked for surrounding social infrastructure including roads, parks, schools and kindergartens.

As the site's largest landowner, Otec GmbH played an important catalyst role at the start of the programme, securing rights to convert the land from industrial to mixed-use, and then to support ongoing cultural and artistic events and activity in the quarter. The property arm of Rohde & Schwarz – the site's anchor employer – has made a number of key investments in high-technology buildings that demonstrate the area's focus on innovation and quality.

The latest phase of Werksviertel's development sees the relocation to the site of a major city concert venue under the terms of a public-private partnership. Investors acquire the land and construct the concert hall, while the state supports the operating company via a lease contract with a 50-year maturity.

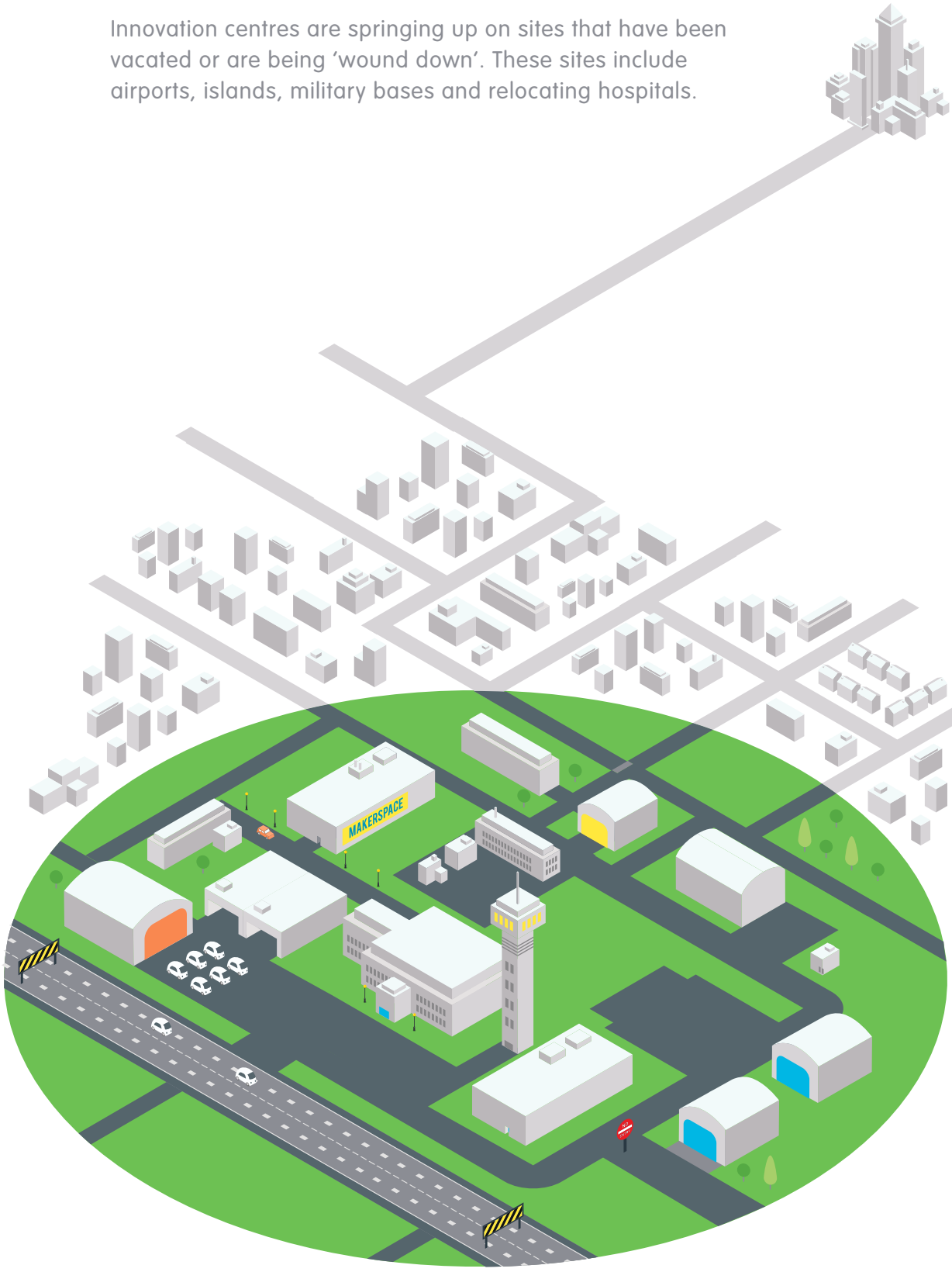
Although getting agreement among nine landowners took time, Werksviertel has successfully built a series of very dynamic mixed-use workspaces, attracted a range of larger and smaller tenants, maintained high environmental standards, and delivered good quality placemaking.

By encouraging multiple stakeholders to engage with the district in different ways, the innovation quarter has become a recognised example of how a city can convert an industrial area next to railway land into a vibrant and inclusive urban environment without destroying existing assets.

Against the success criteria for innovation quarters, Werksviertel has a clear and sustained track record of success in terms of improvements to safety and the public realm, effective use of densification rights and value capture, and re-zoning for a dynamic mix of uses. It has also had some success in heritage placemaking and leveraging anchor institutions.

4.3 INNOVATION SITES **VACATED** BY A **MAJOR EMPLOYER**

Innovation centres are springing up on sites that have been vacated or are being 'wound down'. These sites include airports, islands, military bases and relocating hospitals.



International examples of innovation sites vacated by a major employer[13]

	First formed	Former use	Distance from CBD	Size	Main spaces/tenants	Main sector specialisms
Brooklyn Navy Yard, NYC	1987	Naval yard	5km	0.4km² office space, 330 firms, 7,000 workers	Manufacturing units, studios, maker spaces. Includes December Box, Honeybee Robotics	Maker-industries (design, electronics, clothing, digital)
Berlin TXL	2012 (2018 open)	Airport	10km	5km², up to 17,500 employees, 1,000 firms	Mixed use technology and production hub with residential facilities, tenants TBC	Smart city solutions
Seoul Innovation Park	2014	Public health offices	6km	190 tenants, 1,000 jobs	Citizen-driven innovation events, co-working and workshop spaces	Social innovation

The historical use and ownership of these sites give them a number of distinguishing features that set them apart from other location types. These features include:

- Infrastructure systems – transport, power, utilities – are already in place
- Public sector has a leadership role in these locations, often via a city-owned company or development agency
- Lack of public realm and low initial appeal for younger innovators

Success factors for vacated sites include:

- *Clear pathway for transition from former use*. Examples exist of developments being delayed by challenges presented by existing tenants vacating and setting up in a new location. National and local government support for a smooth transition is important if the current cycle of needs and preferences is to be met
- *Appetite for, and deliverability of, large-scale redevelopment*. Large vacant sites depend on real scale of ambition and resources, as well as requisite skills to deliver the project
- *Independent leadership*. Because these sites very often have a measure of government ownership, it can be a challenge to build a leadership model that is sufficiently insulated from politicisation and risk-aversion to adapt quickly to the innovation economy's needs
- *Creating identity, profile and positive visibility*. Successful examples usually demonstrate a continuous focus on a specific sector or type of company, and maintain a clear set of guidelines or rules around firm membership to uphold this identity
- *Adding commercial and mixed use of space* is important within repurposed sites that are often monolithic and mono-functional when first vacated
- *Developing a patient approach* to value creation, given the potential appeal of selling the existing property for maximum short-term return (e.g. for housing)

Checklist of success factors for innovation sites vacated by a major employer

Scale of ambition for major redevelopment or reuse	✓	✗
Scale of resources required to deliver major project	✓	✗
Unified identity and purpose	✓	✗
Support of higher tiers of government	✓	✗
Independent and/or professionalised leadership model	✓	✗
Wide mix of space	✓	✗
Patient approach to return	✓	✗
Availability of skills sets and organisational formats for major project development and delivery	✓	✗

CASE STUDY

Berlin TXL, Berlin

Repurposing an airport for the innovation economy

KEY SUCCESS FACTORS

Berlin is currently refitting its main international airport for the innovation economy. Six months after the city's new international hub airport opens, Tegel (TXL) airport will shut down, and Berlin TXL will assume ownership of the site on behalf of the State of Berlin and the federal government. At some five per cent of the size of Paris, the space is large. It is also centrally located, at just 15 minutes' drive from the city's heart. The site represents a major opportunity for Berlin, an innovation rich but relatively low density city, to absorb a new cycle of growth within the city boundaries.

Although Berlin TXL's progress has been held up by delays with the substitute airport, the project has made headway in four critical areas:

- **Strategic leadership from a privately owned city corporation.** With decision-making independence and an astute and professional workforce, the private entity has helped the project be more creative and ambitious. While the focus of municipal teams has been on planning and noise emissions, the independent body took a strategic view from the start, adopting a comparative outlook based on global evidence
- **A clear focus and brand.** Since 2012, the project's leaders have chosen to brand specifically around urban technology rather than the general theme of 'innovation'. Thanks to a commitment to collaborative working, especially around joint marketing, the project's offer is communicated in a coherent way locally and internationally. Berlin TXL Urban Tech Republic's long-term vision is to be a hub and living lab for the research community focusing on future cities
- **Long-term sector-oriented business model.** Drawing on the lessons of comparable developments worldwide, the project champions the whole value chain of innovation, from science to industrial production. Berlin TXL doesn't expect to make a profit by selling land plots or renting out space, its leaders concluding a property driven vision would make it harder to maintain a proper focus on urban technology. Instead, the project is curating very carefully which companies and sectors are welcome, with applications already rejected from logistics firms and super-market retailers

The sheer scale of the site means it makes sense to locate incubation at one end and large manufacturing at the other. Some 80ha is earmarked for major corporations and 24/7 manufacturing, while at the centre of the location is a scientific core community comprising highly interactive small businesses and Berlin's Beuth University of Applied Science. Each area of the site has a distinctive profile – energy, medical and robotics. The scientific anchoring provided by Beuth University and the opportunities for spill-overs into related industries have been key components of the project from the outset

- **Strong placemaking focus.** In support of the development's urban technology theme, the project team has carefully curated areas of mixed-use, density and footfall – including cafes, kiosks, barbeque spots and entertainment areas that encourage social activity. Use of gaming graphics to build a 3D model and to create an immersive experience has allowed the site's designers to fine-tune placemaking while accommodating 5,000 residential units with a dense social infrastructure

Although it's too early to evaluate Berlin TXL fully against all the success criteria for vacated sites, it's clear the project would score highly for the skills, organisation and leadership required to deliver success at this scale. Further positive signs point to the fulfilment of a wide mix of space types and the potential multi-cycle support of upper tiers of government.

4.4 INNOVATION **CAMPUSES** ORIENTED **AROUND UNIVERSITIES**

A significant proportion of new innovation projects are springing up around existing urban universities. This is sometimes described as the 'anchor-plus' model proposed by Bruce Katz and Julie Wagner. In this wave, the focus is not so much on regenerating an industrial zone but on promoting 'densification' within a compact area around an anchor university– often a university with a healthcare or technology specialism[14].

4.4: INNOVATION CAMPUSES

International examples of innovation campuses

	First formed	Distance from CBD	Size	Main spaces/tenants	Main sector specialisms
Austin Innovation Zone	2013	<500m	Approx 5km^2	Anchor + with University of Texas, Central Health Brackenridge Campus, Dell Seton Medical Center, co-working, lab and incubator spaces	Life sciences, digital, creative arts
Paris-Saclay	2011	25km	77km^2, 10,500 R&D jobs, 60,000 students	18 higher education establishments, office, lab and co-working spaces	Higher education, smart energy, aerospace, defence, advanced manufacturing
Cardiff Innovation Campus	2013	<500m	60,000m^2, currently 28,000 students at the university	Cardiff University, workshops, lab spaces, incubator facilities, co-working spaces	Chemicals, life sciences, IT, social sciences

For these locations to adjust to the innovation economy the priority is often to create a nexus for inspirational collaboration or incubation. The approach envisages a bolder, more porous model than the traditional silo structure that often sees academia cut off from commercial networks.

Challenges, which have been tackled by the most mature examples of these locations, include:

- *Zoning of these areas* may not be conducive to a vibrant, high density, mixed-use environment. Zoning guidelines or incentives may be needed to encourage private developers to bring forward flexible innovation-friendly development
- *Optimising underused land and property*, which can be lucrative for owners in an existing non-innovation function (e.g. parking)
- *Leveraging university assets in support of the local economy* (local procurement, employment, workforce training, incubation of companies and social enterprises). A common criticism of campus-style innovation areas is that they appear to be exclusive districts detached from their surrounding communities
- *Larger room spaces* are usually necessary to allow students and local residents to enter, participate and collaborate
- *Transport deficits*. Typically located close to roads rather than railways, and with limited access points, innovation campuses rely on improvements to transport systems and choices, and a clear transportation plan to highlight opportunities for new entrants
- *Developing a total place agenda*, including an affordable housing component, which promotes vibrancy, reduces through traffic, and encourages economic integration
- *Community engagement and participation*. Some campuses have successfully institutionalised community involvement – for example, through community task forces that agree on housing, public spaces and job opportunities – and established planning principles that are incorporated into long-term goals
- *Risk of a lack of business engagement*. Innovation campuses in particular need to make it as easy as possible for businesses to relocate by, for example, creating one-stop portals for interested businesses to find the space, networking, and marketing services they need. The approach also helps tenants collaborate on improvements that matter to the private sector

Checklist of success factors for innovation campuses

University perceived as source of know-how and technology	✓	✗
Board members and management team with in-depth knowledge and experience of property development and real estate	✓	✗
Mechanism for implementation across different stakeholders (university, local authorities, landowners, developers, firms)	✓	✗
Alignment of multiple master plans	✓	✗
Reduced physical barriers with surrounding neighbourhoods	✓	✗
Leverage of university facilities, labs, technology transfer, mentorship, student entrepreneurship	✓	✗
Multi-stage vision and scenario planning	✓	✗

CASE STUDY

Paris-Saclay, Paris

A 'federal university' for science and innovation

Source: Barande, CC-by-SA 2.0

With the aim of giving Paris a global visibility to rival Silicon Valley in science and innovation, the city is looking to consolidate many of its leading research institutions under a single brand, Paris-Saclay. The huge site earmarked for the project is located 20km southwest of the centre at the edge of the city's suburban industrial belt.

The idea of bringing individual colleges together within a 'federal university' system is based on the Oxbridge model. To deliver the project, Paris-Saclay has repackaged the offers of over a dozen academic institutions within 49 Masters degrees and various doctoral programmes.

The Paris-Saclay campus was designated a project of national interest (opération d'Intérêt national, or OIN) and implemented as a government joint venture. It will receive €2bn of public investment up to 2020.

Large firms from leading sectors such as energy, IT, automotive and health are moving to the new site – tenants include EDF, GE, Nokia, HP, Sun Microsystem, Sanofi, and Thalés. Also locating are publicly and privately run incubators and accelerators.

The development of Paris-Saclay has been catalysed by the construction of Line 18 of the Grand Paris Express Métro, which will connect it to the rest of the Paris region.

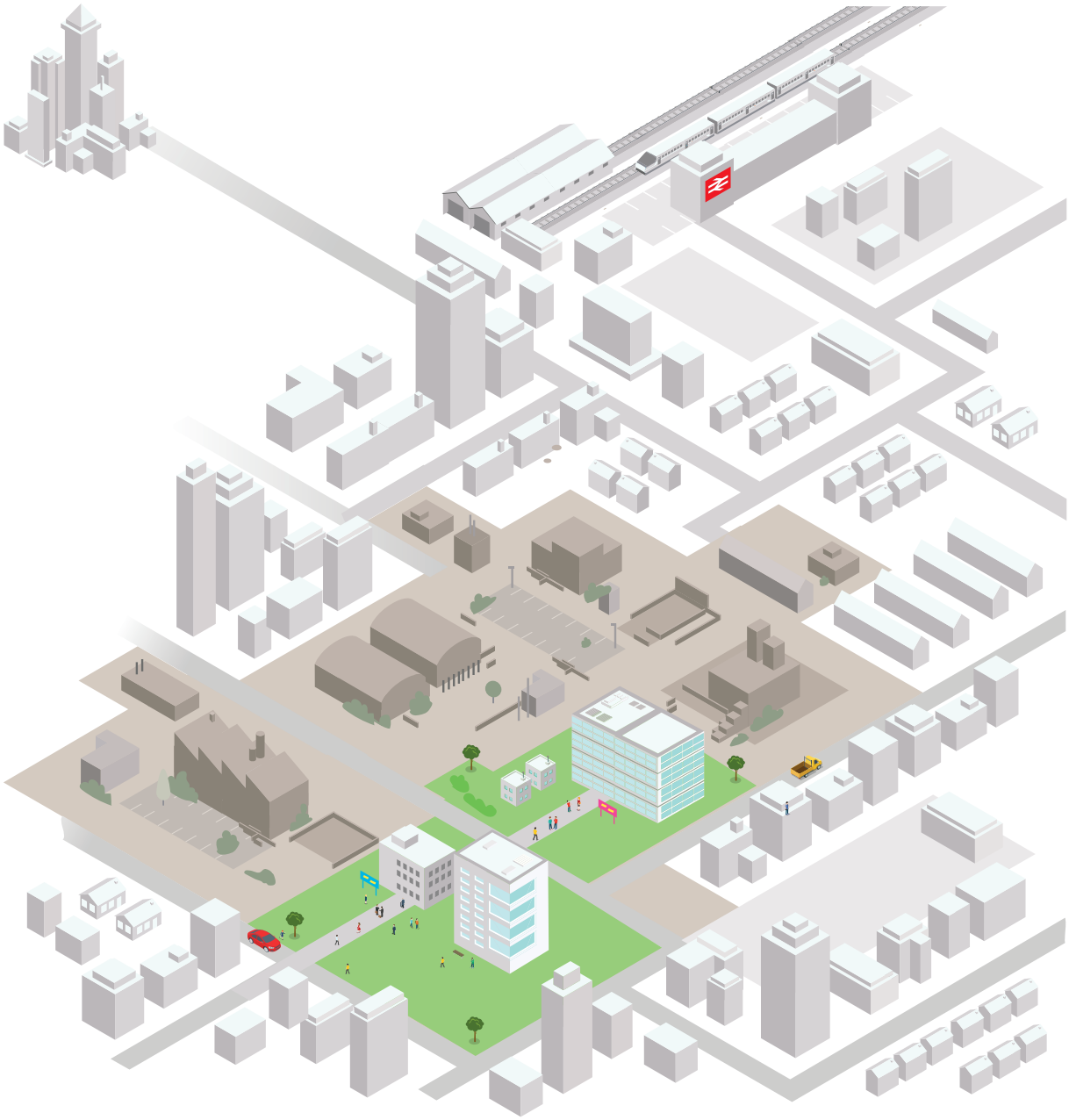
The two main challenges so far are:

- Established elite universities – the grandes écoles – are reluctant to integrate with less high profile universities and lose their own identity. There are concerns that each university is looking to retain its own autonomy, undermining the commitment to shared governance many see as vital for raising international profile and prestige
- The site retains an out-of-town suburban feel that lacks the vibrancy to appeal to the full spectrum of younger talent. While the architectural and design developments now coming on stream aim to cut this deficit, it's unclear if these will prove an adequate substitute for the more organic interactions of an established urban setting

It's clear that Paris-Saclay would score highly against the success criteria for leveraging university capabilities and facilities. Its capacity for adhering to a multi-stage development process, for aligning master plans, and for developing implementation mechanisms that embrace multiple stakeholders is less certain at this stage.

4.5 INNOVATION DISTRICTS IN **INNER CITY POST-INDUSTRIAL AREAS**

The revitalisation of brownfield former industrial land in inner city areas to support innovation activity is one of the new landscape's most popular models. It's a model within which markedly different ownership and management scenarios thrive, with some led chiefly by city governments (e.g. Barcelona 22@), others by a large private landowner or developer in partnership with a supportive local or city government (e.g. South Lake Union, Seattle).



International examples of innovation districts in inner city post-industrial sites[15]

	First formed	Distance from CBD	Size	Main spaces/tenants	Main sector specialisms
Barcelona 22@	2000	3km	8km^2	Co-working, office, maker and workshop spaces. Tenants include Yahoo RD, universities, Telefonica, Indra, Sanofi Aventis	ICT, medical technologies, energy, design and media
South Lake Union, Seattle	2000	2.5km	0.5km^2, 36,000 jobs	Biomedical anchors and major tech office spaces, plus commercial/retail + housing. Includes Facebook, Google.	IT, life sciences
Industry City, NYC	2014	9km	140,000m^2, 400 companies,	Re-imagined urban area with workshops, co-working and maker-spaces, labs. Tenants include Shyp, AbelCine, West Elm	Mixed sectors, including design, culture, bio and cleantech, film

Ingredients for innovation success at these inner city former industrial zones include:

- *Improved rail transport links*. Inferior rail connectivity represents a major challenge for former industrial areas that are often poorly linked to the city's transport network
- *High quality broadband*. These districts typically lack core power and broadband provision when first identified, and new sub-station plants are often needed
- *A centre of excellence*. These sites lend themselves to interdisciplinary activities driven by multiple teams from different sectors conducting systematic explorations side by side
- *Financing programmes to refurbish light industrial space*. These programmes are often in short supply compared to incentives around housing
- *Long-term human capital development*. Because of their location within cities, innovation districts are typically called on to prioritise improvements in educational infrastructure while confronting challenges associated with unemployment, housing, health, crime and anti-social behaviour. Skills academies, volunteering, careers advice programmes and business partnerships are all part of the picture here
- *A development agency* often plays a major role as champion and catalyst for an innovation district, supporting incoming companies while addressing issues of capital, skills, space provision, branding, and land development
- *Housing provision, both affordable and high end*. Significant opportunities for 'densification' and housing development often present themselves in de-industrialised districts, and these may be given special planning status

Checklist of ingredients and success factors for innovation districts

Leveraged history of innovation	✓	✗
Consolidated land ownership	✓	✗
Housing component at multiple price points	✓	✗
Transport upgrades to improve links to CBD and surrounding communities	✓	✗
Sector-specific development agency or management team with relevant experience	✓	✗
Plans and mechanisms for inclusion and engagement with disadvantaged local communities	✓	✗
High quality broadband and power systems	✓	✗
Spaces that offer flexibility for large firms to expand and start-ups to 'grow on'	✓	✗
Aspiration and achievement of high sustainability standards	✓	✗
Municipal economic development strategy focused on business expansion and creation rather than incentives	✓	✗

CASE STUDY

South Lake Union, Seattle

Multi-cycle stewardship of a high technology district

KEY SUCCESS FACTORS

- **Vulcan Real Estate took significant risks in buying a large land portfolio before riding out economic turbulence**
- **Consistent public sector co-investment and working collaboration over 10+ years**
- **Long-term plan around housing and sustainability with appeal to local residents**
- **Distinctive architecture that doesn't resemble Seattle CBD's**
- **Provision of independent and distinctive amenities, with a focus on basic services**
- **Flexibility of land parcels and space provision**

In the mid-1990s, the land north of Seattle's CBD was a declining light industrial zone that had suffered decades of disinvestment. The area used to be home to Boeing and Ford and still hosted small businesses, but mostly consisted of parking lots, derelict warehouses, and properties past their prime. Against this backdrop, the idea emerged for a 61-acre public park – the Seattle Commons – bordered by laboratories, apartments and office buildings.

Paul Allen, co-founder of Microsoft, loaned Seattle Commons $20m to purchase land at the park's proposed location. After voters twice rejected the park proposals, the land reverted to Allen's ownership and he decided to rethink its purpose under the management of Vulcan Real Estate. With the presence of the Fred Hutchinson Cancer Research Centre providing an anchor for a possible biotech cluster within the site, Vulcan continued to purchase land at the location. By 2001 it owned a critical mass of 45 acres.

In the early development phase, Vulcan's three main goals were to generate a market return, to have a positive community impact, and to be a leader in environmental safety. Because it didn't own all the land in the quarter, Vulcan wasn't in a position to develop a master plan – its challenge was to develop a vision that could be agreed by other landowners. That vision – to become a new economic centre for Seattle using a 'walkable' mixed-use development model with high sustainability standards – went on to capture the imagination of local residents.

In its first development cycle the project benefited from a strong relationship between Vulcan and Mayor Greg Nickels, his staff, and leaders on the city council, allowing close collaboration on zoning the area and building an infrastructure plan. What followed was $740m of infrastructure investment, 85 per cent of it in public money with the rest coming from Vulcan and other private sources. Public infrastructure investment in the Seattle streetcar network was

Source: Jelson25, CC-by-SA 2.0

particularly telling, providing as it did a connection to the CBD. Meanwhile joint city-federal investment in the Mercer Corridor road carriageway, as well as re-investment in parks, open space, and a new power sub-station all played their part. Infrastructure upgrades were used to attract a wide range of high-profile tenants – including Zymogenetics, Seattle Biomedical Research Institute, and Merck Pharma.

Development proceeded on an iterative basis, adapting to the challenges of adjusting a research campus setting to an urban infill context, and with Vulcan making every effort to ensure the architectural offer differed from the style and feel of downtown Seattle. While there was a conscious attempt to avoid shopping malls and to support independent retail and restaurants, the developers were careful to meet the high demand for basic services and entertainment.

South Lake Union has constantly responded to the market in terms of its space provision, and there has been relatively little speculative development. In its first development cycle the aim was to foster the development of life sciences research with a little complementary housing. In the second cycle the district diversified into IT and e-commerce, with the arrival of Microsoft and Amazon in particular giving rise to unprecedented floor space demand, and significant commercial and hotel development.

Today, South Lake Union is a rapidly maturing and diversified technology innovation district that exerts a magnetic pull on highly skilled creative workers and complements Seattle CBD's concentration of government and financial services. As South Lake Union has matured, start-up space has become more expensive.

Against the success criteria for innovation districts, South Lake Union has a distinctive and impressive track record overall in terms of consolidated land ownership, transport upgrades, provision of flexible spaces for firms of different sizes, and high quality digital infrastructure. Some progress has also been made in improving the project's inclusiveness in terms of jobs and housing, and in aligning with the wider city economic strategy.

4.6 INNOVATION **TRIANGLES** CONNECTING **THREE SEPARATE LOCATIONS**

Innovation triangles are distinctive because they bring together diverse locations, connecting either separate urban areas or three zones within the same city. What these sites share are linkages across industry, residential neighbourhoods, and established office locations.

International examples of Innovation triangles[16]

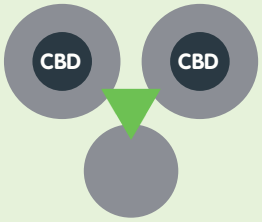
	First formed	Distance from CBD	Size	Main spaces/tenants	Main sector specialisms
Brooklyn Tech Triangle	2012	<2km	1,350 companies, 2km² of office space, 17,000 jobs	A mix of offices, maker-spaces and co-working and incubators spaces, as well as educational establishments. Tenants include Etsy, Amplify, MakerBot	Mixed, although mainly digital media and maker-industry
Twente Innovation Triangle	2012	4-7km	1,200 companies and 21,500 workers	Science park, office space, incubators, University of Twente	Advanced manufacturing and materials, nanotechnology
North San Jose Innovation Triangle	1990s	8-16km	1,400 companies, 55,000 people	Office space for large and SME tech companies, incubators, co-working space. Tenants include Cisco Systems, Cypress Semiconductor	ICT

Challenges associated with nurturing this type of three-sided innovation relationship include:

- *Ensuring the right kind of space is available* for innovation firms. Many triangles in urban areas are already 'built out' – they may need a rapid upgrading of workspace supply. Lack of suitable workspace inhibits growth and dulls the appetite of firms for relocation. Demonstrating the potential to adapt existing facilities for innovation uses often calls for superior marketing campaigns, leasing competitions, or interior design contests
- *Job preparation and upskilling*. The size of innovation triangles means they usually span areas of deprivation and unemployment. To sustain popular enthusiasm and political will for the triangle project, robust programmes for career development and the inclusion of younger, mid-skilled populations within local neighbourhoods are often paramount
- *Governance*. These triangles typically rely on a governance coalition comprising local governments, business improvement districts, development agencies and other partners. A blueprint for triangle development may be needed
- *Common identity*. Because the triangle usually spans multiple local authorities and different historical economic identities, challenges arise in agreeing and building a shared identity that reaches beyond the profile of individual nodes.
- *Incentives*. A further priority is the development of incentives attuned to the needs of innovation firms (short-term horizons, non-institutional grade credit, rapid lease termination, sub-market rates)
- *Physical infrastructure connecting parts of the triangle* that are poorly linked. Many innovation triangles have weak connections along at least one axis due to historical shortcomings. They rely for future success on investment in dedicated connectivity projects as well as wider improvements to local cycling infrastructure and in walkability

Checklist of success ingredients for innovation triangles

Multi-agency governance collaboration and strategic planning	✓	✗
Clear profile of the triangle above and beyond the respective 'points'	✓	✗
Opportunities for interaction among competing and complementary firms (e.g. meet-ups in neighbourhood bars, increased spending in local stores, resource sharing between institutions)	✓	✗
A tech community that actively participates in local community events	✓	✗
Maintenance of affordable rents	✓	✗
Alignment of public relocation incentives with the business model of innovation sectors (e.g. short-term leases, small spaces, not on tax liabilities)	✓	✗



CASE STUDY

The Brooklyn Tech Triangle, New York

Combining three complementary locations to expand innovation outside Manhattan

KEY SUCCESS FACTORS

- **Successful engagement of technology leaders, local entrepreneurs, government, the real estate community and community representatives around a central proposition**
- **Strong strategic plan that identifies precise scale of innovation economy activity and potential, and key steps for next cycle of development**
- **Promising model for integrating local talent into innovation sectors**

Photo by: Albert Vecerka, Esto Photographics, CC-by-SA 2.0

Since 2008, New York City has experienced a much more diversified demand for workspace, especially outside Manhattan, including within sectors such as digital media, publishing, advertising and health technology. Although, until recently, it lacked the non-Class A former industrial space to meet a growing demand from entrepreneurs, the city benefits from a series of large underused ex-industrial sites in or near prime locations.

Brooklyn has tried many times over the past few decades to absorb high value economic functions that spill over from Manhattan, with mixed success. After creating an over-supply of Class A buildings for which there was limited demand, Brooklyn CBD has, over time and with the support of city planners, witnessed a refitting of corporate buildings to meet the aesthetic preferences of creative companies. With many firms opting to populate reclaimed factories, shared workspaces, incubators, and creative office buildings, critical mass has been achieved, driving strategic priorities for an innovation 'triangle' – the Brooklyn Tech Triangle.

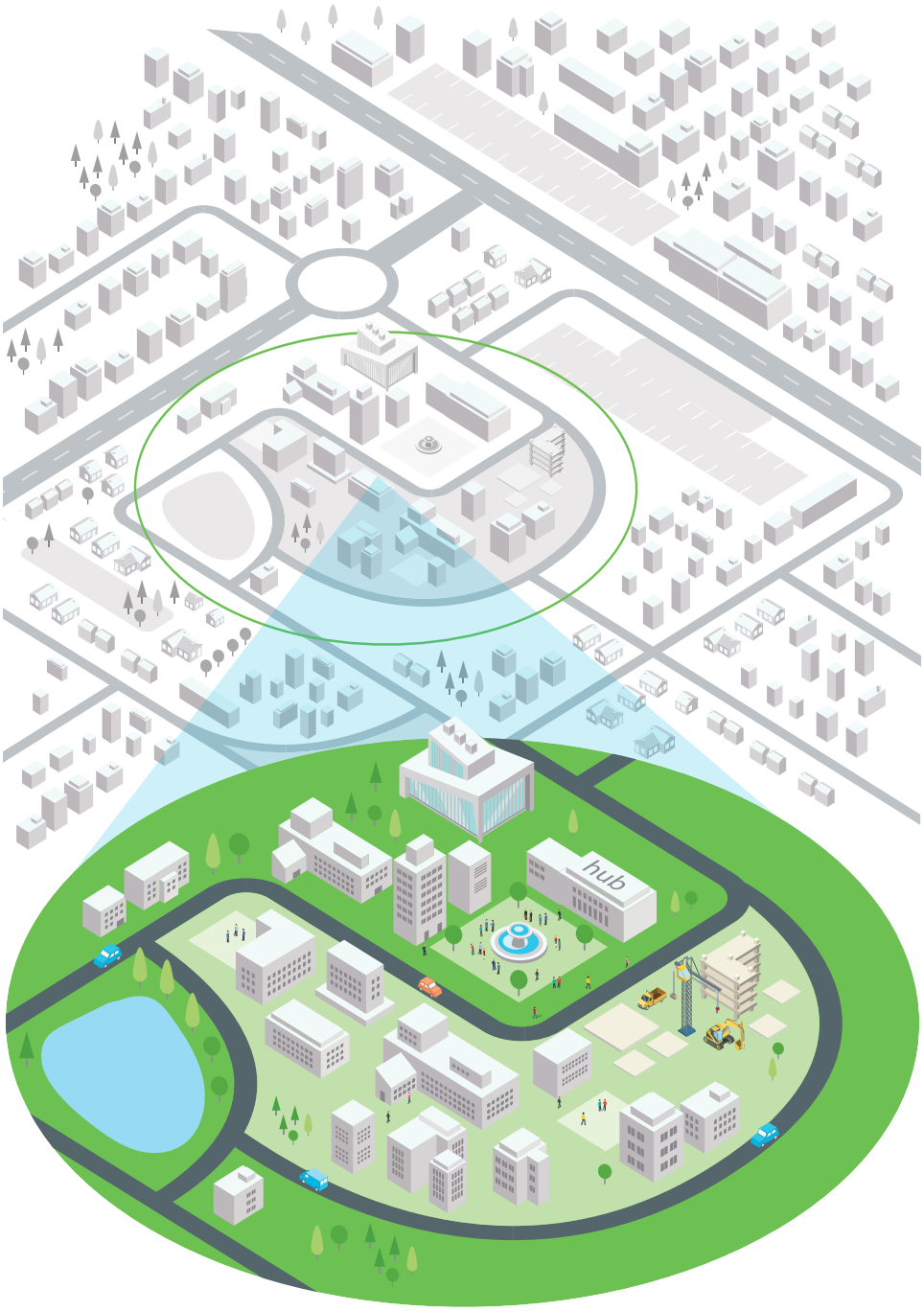
The Brooklyn Tech Triangle comprises three diverse locations – an old industrial park (Brooklyn Navy Yard), a technology-focused cluster (DUMBO), and an evolving commercial and office destination (Downtown Brooklyn). It also hosts a very wide mix of firms, from self-funded start-ups to rapidly growing companies with international reach. Together the triangle hosts over 1,300 innovation companies with 17,000 employees, and has been growing at over 10 per cent each year.

The clustering of firms within the Tech Triangle has created huge demand for amenities – including a 21-acre park, new and improved bus services, and public infrastructure to test and demonstrate new innovations. It's all part of the next cycle of development as described in the Triangle's strategic plan. The plan is, however, provisional – it requires ongoing support and investment from New York City government.

The Brooklyn Tech Triangle would certainly score well against success criteria such as opportunities for company interaction, multi-agency collaboration, and the engagement of the tech community. What is less established at this stage is the profile of the triangle relative to its key nodes, its alignment with public relocation incentives, and its ability to keep rents affordable.

4.7 SUBURBAN INNOVATION PARK

Despite the buzz surrounding the urbanisation of innovation, many innovation parks have been, and continue to be, established in low-density suburban locations. Here, they often meet the needs of companies or activities not ideally suited to the inner city (e.g. logistics, laboratory or engineering), or the municipal ambitions of suburban district leaders looking to compete for tax base with the city centre.



International examples of suburban innovation parks[17]

	First formed	Distance from CBD	Size	Main spaces/tenants	Main sector specialisms
Herzliya, Tel Aviv	1990s	10km	0.5km², 60+ start-ups, 1500 companies	Office, co-working and incubator spaces, presence of IDC Herzliya, Amazon, Apple	IT, software, cybersecurity, urban innovation
Technology Park, Malaysia	1996	16km	2.8km², 10,000 jobs, 150 companies	Office, incubator, lab and workshop spaces	IT, engineering and biotech
One North, Singapore	2001	9km	2km², 130,000 workers and residents	Co-working spaces, labs, studios, workshops, separated into three zones: Biopolis for life sciences, Mediapolis for media, Fusionopolis for materials research	A mix of life sciences, media and materials research

Suburban centres of innovation confront distinctive challenges and imperatives in developing an innovation economy or transforming an existing 'science park' model. Necessary adjustments often include a consideration of how to accommodate more of the value chain in their specialised industries, and how to forge productive multiplier links with the surrounding area. Other influential considerations or constraints include 'silo' thinking, quality of life, retail and commercial offer, and affordability.

Success factors for suburban innovation parks include:

- *High quality anchor institutions* are often key to forming cohesive communities and networks in lower-profile suburban districts, and to lending credibility and expertise to spin-off enterprises. Many rely on a robust scientific research base that hosts leading institutions committed to long-term growth and development within the park
- *Centre of gravity*. Successful suburban parks often establish a building, sculpture or special feature that acts as a pull for tenants and stakeholders in the park and the surrounding neighbourhoods. Such a focus item provides a source of identity, visibility, community and 'stickiness' to the district, so helping to develop a credible brand
- *Supporting technology transfer and cross-fertilisation* is a major challenge in suburban locations. Successful locations have set out to 'cluster' new buildings managed by intermediaries (e.g. large firms, educational institutions), to generate new relationships, and to intensify existing networks. Thriving suburban innovation parks become closely-knit communities within which interaction between tenants is regular and spontaneous[18]
- *Active industry associations* that provide strong advocacy leadership are important to the success of single sector suburban innovation parks
- *Access to new sources of capital*. Because of their suburban location, these sites often depend for success on a proximity to, or regular interaction with, experienced venture capital, experienced management, and an embedded entrepreneurial culture
- *Proximity to downstream manufacturing processes* for key products is also important in certain sectors

One North, Singapore

Photo by: Erwin Soo, CC-by-SA 2.0

Checklist of ingredients for successful suburban innovation parks

Secured tenancy of anchor institution(s) – e.g. attracted by recruiting, M&A, or talent acquisition opportunities	✓	×
Centre of gravity and design features to build identity and community	✓	×
Dense, 'under-one-roof' development that challenges silo mentality within and between departments and companies	✓	×
Technology-transfer mechanisms – e.g. clustering of building 'hubs' that are managed by intermediaries to promote cross-fertilisation	✓	×
Industry associations that provide clear advocacy	✓	×
Access to, and visibility in respect of, multiple sources of private capital	✓	×
Zoning, taxing, and CPO powers	✓	×
Land parcels developed on a 'just-in-time' basis	✓	×
Links to local schools to build curricula with related provision, and channels for career development	✓	×
Compelling brand concept that captures spirit of the park	✓	×

CASE STUDY

One North, Singapore

Master planning to accommodate the whole innovation value chain

KEY SUCCESS FACTORS

- **High quality architecture and design builds international interest and visibility**
- **University and polytechnic departments willing to act as horizontal agents and catalysts within the ecosystem**
- **Meeting space for whole city's cluster leaders to congregate**
- **Infrastructure is accessible and inviting, with enhanced interaction, pedestrianisation, face-to-face contact, place identity and social capital**

Singapore's effort to host the innovation economy in vibrant, multi-sector, mixed-use locations is embodied in One North, a re-built park located 9km from Singapore's CBD. Master planned by the experienced state development agency, JTC, One North accommodates three distinct clusters – life sciences, creative industries, and art/business/technology, each located on neighbouring sites. All three clusters host incubation and accelerator facilities integrated with a residential, retail and leisure offer, housing over 100,000 people in total.

The park's location was influenced by available proximity to major public institutions, including the National University of Singapore, National University Hospital, Singapore Science Park I, II, and III, and Singapore Polytechnic[19].

The life sciences component of the project was the first to be launched nearly 15 years ago. Today, it offers 300,000m^2 square feet of co-working, networking and laboratory spaces, and hosts over 40 private firms[20]. A state media company anchors the media cluster, which is home to numerous start-ups receiving state-sponsored support[21]. By carefully staging development, the third cluster's build-out has been tailored to latest industry preferences, including cleanrooms, anti-vibration buildings, and facilities for nanofabrication and data storage[22].

In its second development cycle, One North has evolved into an explicitly entrepreneurial ecosystem. Block 71, for example, hosts 1,000 people in start-ups and incubators, with plans for expansion into six blocks in total by 2017.

Success criteria for innovation parks indicate that One North would score full or nearly full marks for anchor tenants, identity building, land development, and effective use of zoning and tax powers. Access to diversified sources of private capital, industry advocacy and leadership, and links to wider education are less fully developed priorities.

4.8 OUT-OF-TOWN **INNOVATION ZONE**

Around the world, cities and regions are creating large-scale zones dedicated to innovation, many of them configured as ‘special economic zones’ or ‘enterprise zones’. These zones often offer enhanced terms for business location and investment, and simplified planning. While some spring up on green field land as a separate ‘city’ or sub-centre of the established city, others draw in multiple nearby locations because of their perceived opportunities for growth, investment and job creation. Although the scale of these zones means their instigators are often top tiers of government, local authorities working in collaboration may also take the lead in creating a zone management team.

International examples of out-of-town innovation zones

	First formed	Distance from CBD	Size	Main spaces/tenants	Main sector specialisms
Suzhou Industrial Park	1994	18km*	288km^2, 25,000 firms	Manufacturing facilities, incubator spaces, labs, offices, higher education. Includes Siemens, Microsoft, IBM, Samsung, Hejian, AMD, local start-ups	Advanced manufacturing and engineering, bio and nanotech, digital, design
Guangzhou Knowledge City	2010	35km	123km^2, 500,000 residents, 270,000 job opportunities	Office, lab, incubation, co-working and manufacturing spaces	Cleantech, biotech and pharma, ICT, advanced manufacturing, creative industries
Manchester Airport City Enterprise Zone	2011	14.5km	1.7km^2, potential 16,000 new jobs	Offices, workshops, labs, factories	Life sciences, advanced manufacturing, logistics

*Distance from city centre, as the Industrial Park is the main activity centre of Suzhou

Challenges and constraints associated with large-scale out-of-town innovation zones include:

- *Transport links*. Failure to agree main transport links can hold up development because transport is often a key catalyst for unlocking housing and commercial activity
- *Project coherence*. The risk of fragmented projects that fail to achieve a coherent vision and a positive agglomeration is high in large innovation zones. Where zones rely on multiple funding streams and lines of reporting, wasteful duplication of effort leads to weak outcomes
- *Leadership*. Strong higher tier engagement and leadership of the project is needed
- *Logistics capacity*. A large innovation zone's competitive advantage lies in its ability to connect to national and regional markets, customers and suppliers. Smooth business operations, and reliable entry and exit of goods, are vital components of success
- *Attracting more highly skilled workers*. The visibility and appeal of zones in ex-urban or fringe locations is often poor, and attracting the right skills is critical to long-term viability
- *Business climate and investment friendliness*. An attractive business, IP and regulatory framework helps these zones develop more flexible approaches to land use, patents and hazardous materials, which are often key considerations in these kinds of locations[23]

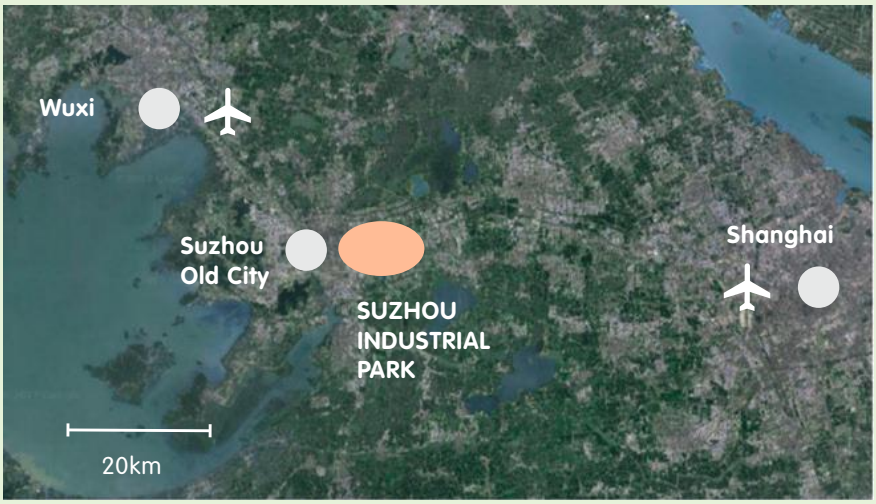
Checklist of ingredients and success factors for out-of-town innovation zones

Strategic location relative to other markets and centres in regional innovation system	✓	✗
Clarity of vision	✓	✗
Agreement and assurances about major transport links	✓	✗
Flexible master planning and development parcels	✓	✗
Long-term political support and prioritisation from higher tiers of government	✓	✗
Simplified and easy-access 'one-stop' systems for businesses to navigate	✓	✗
Some delivery autonomy from higher tiers of government	✓	✗
Phased delivery to avoid oversupply	✓	✗

CASE STUDY

Suzhou Industrial Park, Suzhou (nr. Shanghai)

Local-national co-operation for innovation at scale



KEY SUCCESS FACTORS

- **Consistent and stable support from political leadership**, a sound legal and regulatory regime and clearly defined incentives, creating a positive macro environment. Specific legislation was created at national and provincial level to outline the roles and responsibilities of different stakeholders – Suzhou government, developers, and investors – and to establish clear rules on tax, finance, land, customs and immigration
- **High degree of leadership autonomy** enabling policy and institutional reform, take-up of best global experience, and co-ordinated project authorisation and land allocation
- **Flexible, phased master plan** overseen by a planning commission sequences mixed urban development with large residential areas planned for the centre. High quality recreational amenities and a strong local social protection system make SIP a beacon of liveability
- **Nationally pre-eminent infrastructure provision**, especially for telecoms and digital
- **Highly efficient 'one-stop-service centre'** to improve the business and investor experience
- **Co-ordination across the region to supply specialised skills** in tandem with colleges and universities, plus an on-site technical and vocational college with more than 10,000 students. High skills relevance of courses means ultra high employability of graduates
- **Bespoke funds** to invest in innovation bases and public technology service platforms in biotech, nanotech, software, animation and business services
- **Specialised teams** targeting different segments of value chains – production, distribution, R&D, services, investment, promotion
- **Leadership in terms of the 'circular economy'** and recycling among zone systems

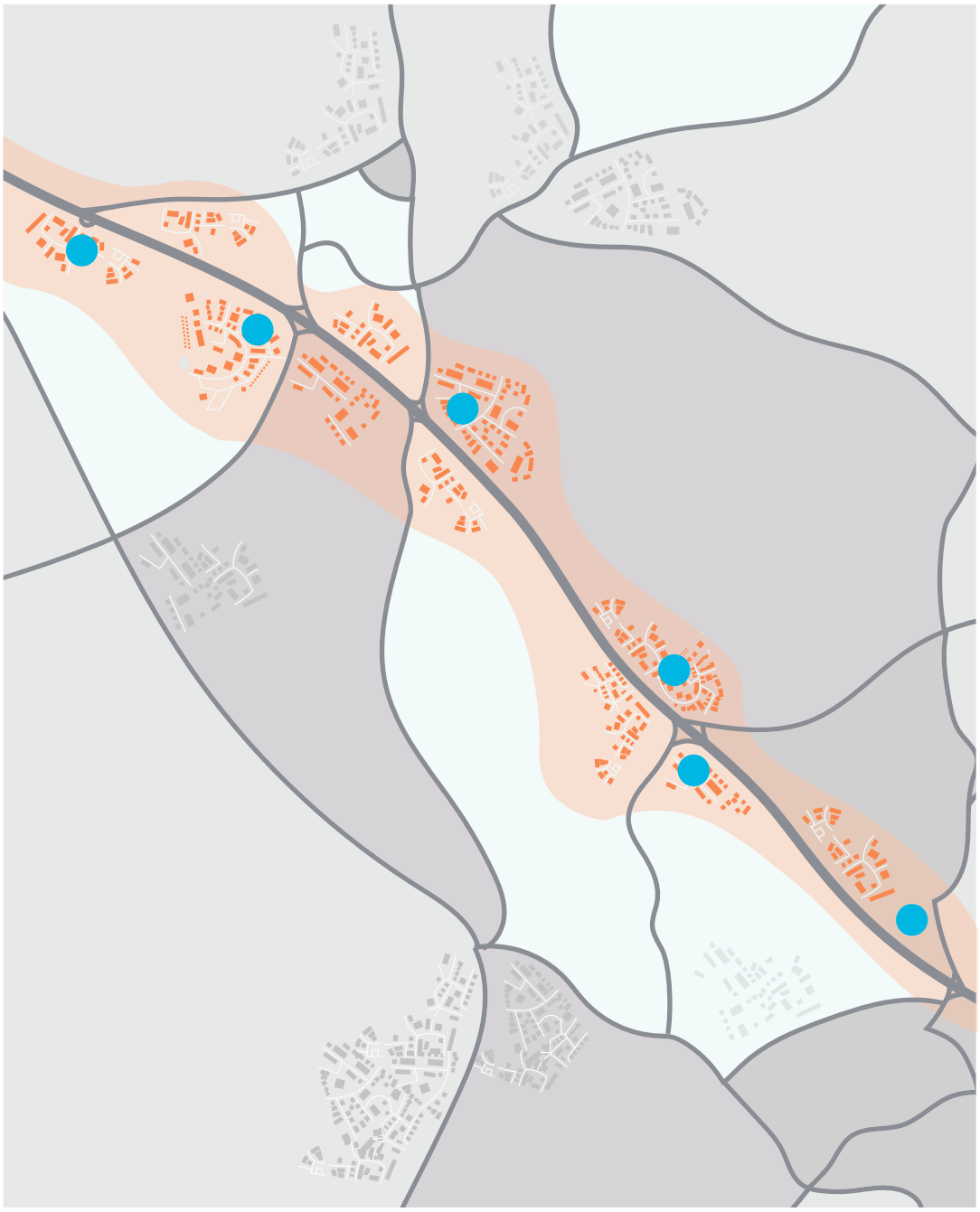
Suzhou Industrial Park (SIP) is a major urban sub-centre located in the east of the city of Suzhou, which itself has a satellite relationship with Shanghai. Launched in 1994, the park is very large, at 320km^2. It hosts a 'CBD' as well as an 'innovation district', 'high tech area', 'free trade zone', and other areas dedicated to tourism and sustainability. A quarter of the zone is managed by a long-term joint venture between China and Singapore. A major destination for foreign capital, SIP is today highly competitive in sectors including integrated circuits, liquid crystal display screens, software and pharmaceuticals.

SIP faced early challenges due to competing business models and the channelling of resources by Suzhou city government to a competitor technology district – Suzhou New District. But the park was restructured and, in 2001, a Chinese consortium of state-owned enterprises took a 65 per cent stake in the reconfigured project, triggering an upturn in profitability[24]. In 2015, SIP was nominated by the national government as China's first 'open innovation' pilot zone pioneering a transition to the innovation economy. Despite becoming a major focus for advanced innovation, the zone retains its 'industrial brand' associations – which are now being reconsidered.[25]

Clearly, SIP has fully met the success criteria for long-term political support, business friendly systems, phased transport upgrades, and flexibility of development parcels. It would probably score less well in terms of delivery autonomy from higher tiers of government.

4.9 INNOVATION **CORRIDOR**

Innovation corridors are often established or configured so as to acknowledge an economic area that is demonstrably interconnected, with strong commuter patterns, and complementary industry clusters and supply chains. The corridor approach optimises key assets, transforming an older development paradigm into a more innovation-friendly model using specialisation, concentration and skills development.



4.9: INNOVATION CORRIDORS

International examples of innovation corridors[26]

	First formed	Distance from CBD	Size	Main spaces/tenants	Main sector specialisms
London-Stansted-Cambridge corridor	2012	100km	515,000 innovation oriented jobs	Universities, labs, offices, co-working spaces, incubators, workshops	Primarily biomedical, ICT, cleantech, agritech
N2 innovation corridor, Boston	2013	7km	1.7km^2, 150 companies	Mainly high grade office and workshop space. Includes TripAdvisor, PTC, Turbine	ICT, digital media, biotech
Cascadia innovation corridor, Seattle-Vancouver	2016	193km	650 start-ups a year, $10bn in VC investment	Mix of offices, start-ups and incubators spread along the two cities. Includes Microsoft, Amazon	ICT, digital media, life sciences

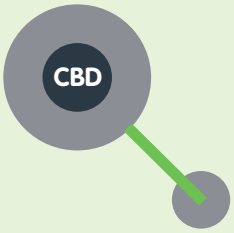
Responsibility for corridors generally spans several government jurisdictions that have little in common other than a shared use of infrastructure (e.g. roads, railway lines). Because corridors are essentially composed of infrastructure and industry, a deficit of high quality locations often arises, as do issues of inclusion and equality between or among the various nodes. At the same time, landowners and local authorities may have little or no history or track record of co-creating a complex structure that balances risk and reward and incentivises bold decision-making fit for the innovation economy.

Because the principal challenges for innovation corridors arise from governance, strategy, placemaking and labour market needs, organisational imperatives include:

- *Strong and structured collaboration* across the governments, local authorities, and institutions spanned by the corridor. Research shows the importance of formal and informal structures that facilitate the exchange of technology and insight while enhancing co-ordination according to an agreed agenda[27]. A shared vision is needed if the corridor is to develop a strong brand identity and meaningful governance
- *A skilled and diversified leadership network* for the corridor enhances the buy-in, across a diffuse area, of stakeholders who might otherwise lack aligned interests. Collaborations and consortia play a key role in marketing the district and promoting further growth by organising events and supplying business support tailored to needs. Collaborations also leverage expertise dispersed across local academic centres.
- *Investment*. Improving the rate and weight of investment across the innovation corridor is key. Corridor actors typically need to enter into public-private funding models to deliver investment and to leverage local government assets as effectively as possible
- *Training and re-training* is often essential if the corridor's labour pool is to capitalise on the innovation opportunity, often requiring a step change in the way higher and further education institutions engage with other actors. Incentives often play an important role in ensuring workers along the corridor are equipped with the right skills (e.g. business owners contracted to pay for a proportion of training costs)

Checklist of ingredients and success factors for innovation corridors

Checklist of ingredients and success factors for innovation corridors	✓	✗
Governance co-ordination mechanism to develop shared vision and leadership	✓	✗
Collaborative economic development institutions to support corridor	✓	✗
Clear case for investment, and pipeline of projects	✓	✗
Key sector strategies	✓	✗
Co-ordination networks in higher education and employer training	✓	✗
Placemaking and liveability	✓	✗
Focus on the social value created	✓	✗



CASE STUDY

London-Stansted-Cambridge corridor

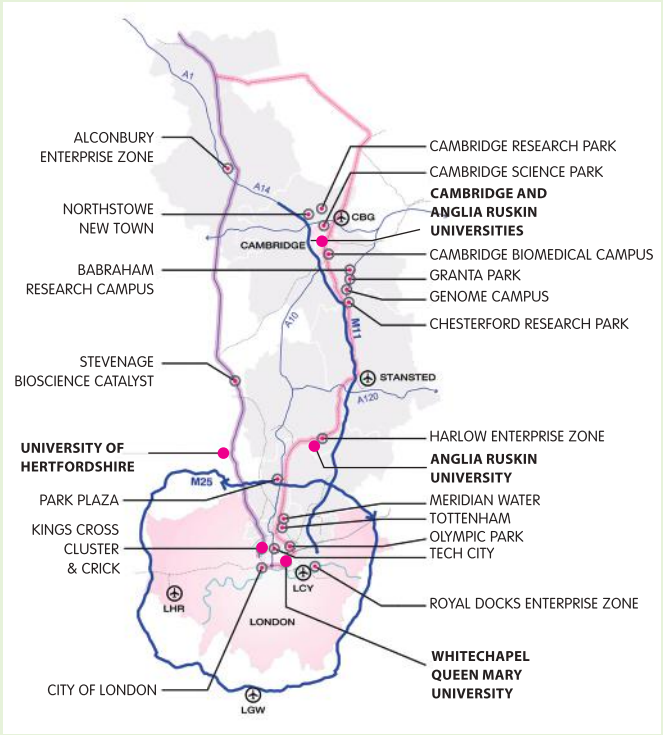
Organising for growth in high tech and life sciences

The London-Stansted-Cambridge corridor is an increasingly important innovation economy zone, home to numerous biomedical, IT and cleantech firms, as well as research institutes and science parks. The corridor links locations along the M11, A1(M) and A10 road routes, and the north-south rail axes that connect London with Cambridge. The corridor spans 16 local authorities, three counties, and the capital itself in a region of 2.7m people.

Although the corridor has never officially been publicly planned or designated, in recent years its organisation and promotion have been taken up by the London Stansted Cambridge Consortium (LSCC) with a mission to reflect the strong interconnections between labour markets, residents, supply chains and a shared airport, and to advocate collectively in order to deliver investment.

The 100km-plus corridor connects London's growing science and technology cluster, centred on King's Cross and stretching to the Olympic Park, with research institutes, modernising science parks, successful technology locations and affordable logistics or supply chain management sites further north, in towns and cities like Cambridge, Harlow, Stevenage and Stansted. The diversity of industry specialisms, brownfield land availability and enterprise zone opportunities promises rapid growth – and the ability to accommodate this growth[28].

The size and length of the corridor means it combines areas where there is significant available employment, housing land and workforce supply with areas that are fully occupied in terms of commercial space, have low unemployment and experience housing supply challenges. This offers scope to address growth needs for the science and technology economies of both London and Cambridge using corridor capacity in the areas between the two, as well as the potential to develop new locations around the airport and the boroughs of north London.



The corridor has made significant progress against the success criteria in the creation of a multi-jurisdiction co-ordination mechanism, engagement of higher education institutions, and a clear case for investment. Progress in areas like placemaking and liveability, and in demonstrating the project's overarching social value, is less visible to date.

CONCLUSION
TURNING **ASPIRATION** INTO **REALITY**

Although our report's principal focus is on innovation locations that have shown clear signs of success, this doesn't conceal the fact that more aspiring innovation locations fail than succeed.

International evidence and experience suggest very strongly that if a putative location lacks the necessary fundamental drivers and ecosystem ingredients, or the development capacity to make a site work, its case for receiving public funds in a bid to develop a specialised innovation function is weak.

While there are no hard and fast rules governing a city's capacity to host an innovation location, aspiring cities do require a critical mass of the fundamental ingredients outlined in this report. In the UK, a city like Cambridge clearly has the knowledge, R&D, and skills drivers (world-class university, talent pool, academia-business porosity) in abundance, as well as sector and inter-firm drivers to support an innovation corridor. Manchester has the market and investment drivers (consumer base, institutional presence, airport) supported by expanding knowledge anchors to develop an out-of-town zone. And London exhibits multiple drivers associated with market size, investor appetite, agglomeration dynamics, sector maturity, universities, and human capital , and so can support multiple formats of innovation location.. As these examples show, cities build an innovation economy in different ways and with different assets – but a minimum threshold of drivers is needed.

For cities that lack these prerequisites, a better strategy might be to focus on economic fundamentals rather than a specific locational opportunity. This perspective prioritises:

- Growing the existing business base
- Increasing skills levels in technology rich sectors
- Fostering innovation in existing companies, entrepreneurs and institutions
- Supporting the visitor and experience economies
- Watching the market carefully and waiting for the right conditions

Such an approach promotes growth and modernisation across the city as whole, adopting a flexible rather than a prescriptive approach to the way particular locations are developed. It also recognises the innovation credentials of the wider region.

The risk of promoting an innovation quarter, hub, corridor or other location type when the right conditions are not met is significant. Not only does it waste money that could be better spent elsewhere, it also erodes confidence – among citizens, media, civil servants and leaders – and damages external perceptions of a city's longer term potential.

Making an innovation location work

However, when the ecosystem conditions and fundamental drivers do indeed exist, international examples and experience demonstrate that new innovation locations can be developed with great success using the right set of well-timed interventions. The opportunities are clearly there for many more cities to grow their roles within the innovation economy, provided they base their ambitions and vision on clear market logic and proven demand.

KEY CONDITIONS FOR SUCCESSFUL INNOVATION ACROSS LOCATION TYPES

- Quality and depth of collaboration between innovators, mentors, investors, established business, and local leaders is assured
- The right management systems and skills are in place for ensuring the innovation community can be hosted effectively, that necessary upgrades can be delivered, and that a positive identity and visibility can be fostered
- Conditions for anticipating how a location will ride the cycles of growth, especially in terms of ensuring proximity to 'grow on' space and encouraging productive synergies with other locations, are met
- A whole place perspective that understands the widest possible set of incentives for, and deterrents to, innovation-oriented firms and talent is present
- Proactive engagement with local skills supply and future skills demands takes place
- Matching the scale of ambition and resources to the size of the location is a priority

This survey of nine different types of innovation location highlights the importance of sound public and private sector decision-making and leadership in identifying and adopting the right success models for prospective locations.

Many of the locations showcased in this review have achieved success (in terms of jobs growth and investor appetite), often in the face of multiple challenges, and appear to have developed a mature and sustainable model for future development. Others, successful in their first development cycle, are now encountering a fresh set of challenges as demand and costs rise, and space and resources shrink. Although many locations are currently pursuing a coherent strategy, it's too early to know whether they will achieve the critical mass of sustained success.

This report highlights the very different requirements of innovation locations at different scales in relation to both fundamental drivers and ecosystem requirements. It also focuses on locational specifics such as different land costs, ownership models, anchors, company types, infrastructure assets, leadership vehicles, co-ordination issues, and geospatial advantages. Although each innovation location develops its own success model, key conditions for success are shared across different locations. These conditions are summarised in the panel above.

Across these nine types of innovation location the scope and scale of public sector engagement varies widely. In some cases, the public sector may be involved principally in granting planning permission for use changes, managing the nearby public realm, and fine-tuning the regulatory framework to host new kinds of education offer, temporary uses, and funding provision. In others, more sustained public interventions may be needed to enable and support development of the right quality and at the right scale, speed and density. Decisions about whether and how the public sector should get involved, and through which vehicle, are often crucial. As innovation locations mature, the public sector role changes, often to facilitate synergistic growth across locations when new space is required.

A momentous opportunity exists for cities to take advantage of the innovation economy of the future. Around the world many different types of location will find a route to sustained market demand, provided they uphold or observe success factors that match their specific endowment. Over time, more and more cities will participate in the expanding innovation economy, but not necessarily or specifically because a 'location' has been established within them. Instead, for these aspirational cities, targeted interventions at city and regional level will support a wider set of innovation drivers, including entrepreneur base, potential growth companies, and supply of skills.

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