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Hubs of Innovation

The role of Districts, Corridors and Quarters as hubs of the Covid-adjusted innovation economy

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Foreword –

Helping more places foster innovation

The ambition to create productive, technologically advanced places has been around for decades, but with the global challenges of Covid-19, decarbonisation and regional disparities facing us today, that ambition is stronger than ever.

We know that some places become hubs of innovation while others don't – and that what works in one place doesn't necessarily translate to another. Which particular place characteristics and assets can come together to deliver long term, sustained success? How do places balance the need for a steady investment course while allowing for the disruption that so often accompanies successful innovation?

We published a study which addressed some of these questions in 2017 and this year asked the team of leading place-based innovation specialists at The Business of Cities to revisit and update their analysis. They invited a wide range of stakeholders – from asset owners to policy makers – to explore what factors have helped and hindered the emergence of hubs of innovation in their locations. This report is the result. It showcases successful examples of places around the world which have nurtured and grown sites of high value, high growth businesses. It considers which type of format works best for different industry types, and also signposts UK locations which are at different stages of maturity in cultivating Hubs of Innovation in their locale.

This analysis is complementary to other work which Connected Places Catapult have led, considering the latent potential of parts of the UK to grow Hubs of Innovation in particular industries, and looking in more detail at the journeys which hubs of innovation go on from inception to maturity. We hope places will benefit from the lessons shared by the contributors to this report and use it to develop an appreciation of the different models of success which have emerged in the last 50 years – and as stimulus to innovate further and create new models for the future.

Nicola Yates OBE – CEO, Connected Places Catapult

Executive Summary

The Innovation Economy after Covid-19

The innovation economy has been one of the defining features of the last economic cycle. How places become places of discovery and job creation has rapidly become a worldwide preoccupation for cities, local governments, regions and nations.

Around the world there are now more than 500 places - be they districts, neighbourhoods, corridors, or clusters of buildings - that have been recognised or designated as hubs of innovation within their region. More than 80% of these are in cities and metropolitan areas - these places accommodate a growing portion of an innovation economy that has been re-urbanising in recent decades! What nearly all of them share is an objective to optimise how they are physically configured and orchestrated in order to achieve economic and social

outcomes for their community, their city or their region.

Until recently the vast majority of recognised hubs were in North America and Europe. Today more than a third are in Asia-Pacific, Africa and Latin America, and this share is rising all the time. Everywhere, they are driving a mindset shift among incumbent businesses, public and private landowners, institutions, capital and governments, about how value will be created and captured in future.



The place logic of innovation and the Covid adjustment

Covid-19 is dramatically reconfiguring the landscape of the innovation economy for the 2020s. How places can draw on their assets, ecosystem or expertise to make a new location for innovation work is an urgent priority as governments and business alike look to rebound from Covid-19.

Hubs of Innovation now have to consider how well they are 'Covid-adjusted' - resilient to the uptick in remote working, ready to repurpose space to match new demands and business models, and responsive to new policy frameworks to 'level up' and make growth inclusive, locally and nationally.

The effective distribution of innovation capacity is an urgent agenda that ultimately relies on defined places and concentrations to emerge, yet success is rarely guaranteed. Worldwide, more hubs of innovation fail than succeed, as do efforts to redraw the innovation map. It is important that future choices are grounded in evidence and appropriate international practice.

This report captures the recent experience of a wide variety of places around the

world in order to understand what it takes to host the innovation economy across different formats and scales. It explores what pre-existing demand drives place-based innovation, given the very varied spatial and industry patterns of today's innovation economy. And it examines the requirements of infrastructure, leadership and investment that fit the geography of an aspiring place of innovation.

In one sense the report's focus is on the 'ingredients' necessary for each type of place. It is a companion piece to a Connected Places Catapult handbook which supports places to understand the 'recipe' - the set of interventions and processes that serve success and maturity over time.

Factors underpinning innovation



Hubs of innovation are an outcome of wider market drivers – this is the first principle that emerges from international experience. Specific high-performing locations may emerge, at many scales and sizes, when the required conditions have been fostered. These conditions emerge as part of a wider ecosystem where businesses have access to markets, sectors have clear impetus to innovate, investors are willing to invest in enterprise more than real estate, policy is incentivising bold solutions, public buyers are pro-innovation, and knowledge anchors are producing commercialisable IP. Not all places or regions possess many of these preconditions.

Places also rely on enabling infrastructure, skills, and business environment. If all of these attributes are not continually developed or enhanced, many locations will fail to succeed as innovation hotspots, regardless of the physical quality of the place itself.

Ten types of innovation location



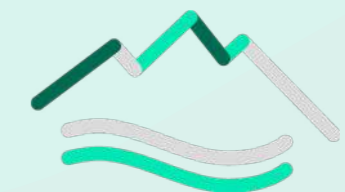
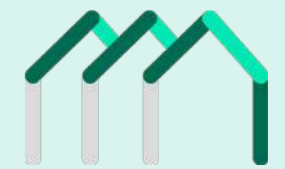
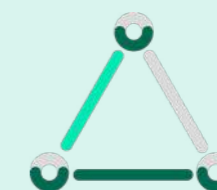
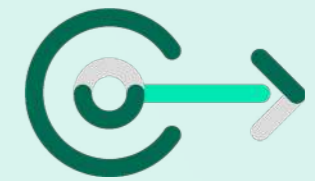
The report identifies the typologies for ten innovation place formats to have emerged in the last decade, each of which is capable of delivering a range of specialised functions within the wider ecosystem. The ten place formats are: (1) hub building; (2) quarter; (3) vacated site; (4) campus; (5) district; (6) triangle; (7) park; (8) zone; (9) corridor and (10) landscape.

Each of these ten configurations manifests its own success model in order to cultivate innovation and then continue to respond to changing demands. The report presents a checklist of key success factors for each type of location, based on a wide sample spanning most of the world's leading innovation economies. Among the common success factors that all ten types of location share are:

- Quality and depth of collaboration between innovators, institutions, mentors, investors, established business and local leaders, reinforced by incentives and frameworks for joint ventures and risk-taking
- The physical and digital connectivity to meet the specific innovation demands of business and talent
- Matching the ambition, resources and management skills to the size of the location and the scale of transformation and behaviour change required
- Anticipating how the community will grow, including 'grow on' space, housing and amenity needs, and synergies with other locations
- A whole place perspective that understands what attracts innovation-oriented firms and talent, and ensures the innovation community is inclusive
- Proactive engagement with local skills supply, future skills demands and pathways to enterprise

About this report

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



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Introduction

After Covid-19: rooting the innovation imperative in insight and experience



1

Introduction

After Covid-19: rooting the innovation imperative in insight and experience

For some time innovation and entrepreneurship have been acknowledged as critical ingredients in the long-term success of national and metropolitan economies. The innovation economy is a driver of local jobs – attracting global talent, business and capital – and a source of fresh ideas or smart solutions to help places become more efficient, productive, resilient and liveable. Meanwhile innovative firms and sectors have become highly proficient at repurposing underused land. It's no surprise, then, that more and more places are looking to host a bigger slice of the innovation economy where they can.

Municipal governments, as well as private landowners and developers, have been responding to the opportunities of the innovation economy by releasing space for development or conversion. This response has been given a new tenor by Covid-19's disruption

to travel-to-work patterns and the possibility of a more agile and distributed ecosystem. Across the UK, and around the world, underused buildings, sites and locations continue to be pro-actively or pre-emptively designated as innovation centres using an inventive array of descriptive labels.



What is the Innovation Economy?

Innovation is more than a single ‘tech sector’ or ‘startup 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 established and emerging industries. Rapid technology disruption and adoption is having a cross-sector impact on business models, capital systems, products, services, real estate, and productivity throughout the economy, redefining established sector boundaries along the way.

The innovation economy has always been with us. Today, however, it exists at a bigger scale and spans more industries.

The number of patents filed worldwide has increased from under a million a year in 1990 to well over three million today, while the number of innovations produced through global collaboration has increased from 1,600 to much more than 10,000 in the same period. Annual venture capital over the last 30 years has soared from less than \$20bn to more than \$250bn. 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’.

The innovation economy affects all sectors but is especially visible in areas such as advanced materials, biopharmaceuticals, business services, advanced manufacturing, financial services, healthcare, scientific instruments, software and communications. These 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.

Cities in particular take the innovation economy seriously because the innovation models of the above industries depend substantially on proximity between firms and institutions, and the innovation economy talent pool benefits from larger urban markets, urban environments and lifestyles. As it is widely viewed as a critical source of future growth in trade and productivity, and a driver of jobs resilience and spillovers, more countries and cities are looking to harness it, and more places large and small are looking to understand their role in it after Covid-19. ²

But not all places have what it takes to host a new location for innovation. Hundreds of examples exist 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’.³ Only a minority of lessons have been learnt since. The failure of many such projects to create a concentration of high-value activity meant their lofty labels came to be viewed as a triumph of marketing over market, of style over substance.

Nevertheless the buzz around the transformation potential of innovation persists, as does a corresponding appetite to create a new centre of innovation on a wide range of potential sites. In this context it is essential that place leaders, higher tier governments, businesses and landowners understand what is possible, desirable and realistic.

The risk inherent in pre-emptively nominating a location as a hub for innovation is that it may not fulfil expectations. The danger is that too many places try to copy the trend without a proper rationale or a genuine market demand. Effort and resources are wasted along the way.

This report aims to draw attention firstly to the drivers and requirements that are prerequisites for an innovation economy to exist in a city or region. Then it examines 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, this report 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 50 places worldwide on their innovation location projects.

This report is an expanded 2nd edition of a report that pioneered a typology of success factors for the many different kinds of innovation location formats to have emerged in the last ten years. It is driven by an overarching set of questions many places, decision-makers and capital-holders grapple with:

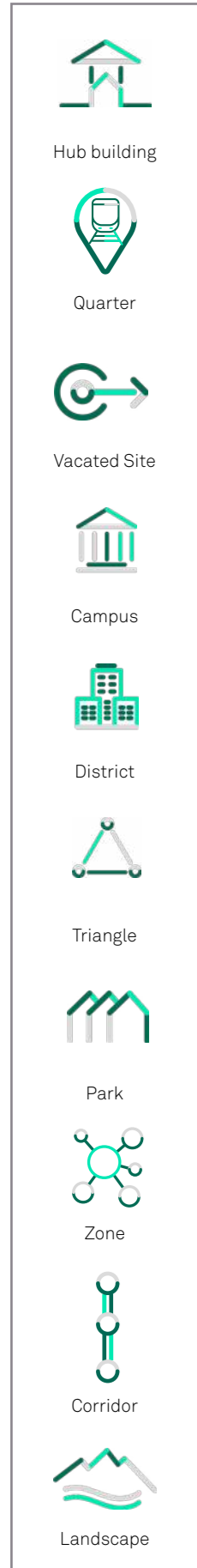
- What does the innovation economy need in terms of places and property?
- Can all places host an innovation hub? Can some cities and regions host more locations? If so, why?
- What are the key elements that enable different types of innovation location to succeed?
- What is ‘market driven’ and what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

The report is 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



2017 - MaRS



No innovation location is an island. These formats are typically located within a common ecosystem of innovation that has a city, regional or national geography. These local concentrations host certain specialised functions of the broader ecosystem, and in so doing lend the ecosystem identity, visibility and accessibility. Nevertheless any innovative place relies ultimately

on ingredients drawn from the wider geography. This paper is inspired by international exemplars - locations that stand out for particular ingredients they demonstrate. These locations - in Canada, China, France, South Korea, Norway, Switzerland, United States and many more - provide a number of lessons for those just starting out or reviewing their own success model.

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Figure 1: Simplified typology of innovation locations | Note: CBD indicates Central Business District

Locations and assets

What does the Innovation Economy need?



2 Locations and assets

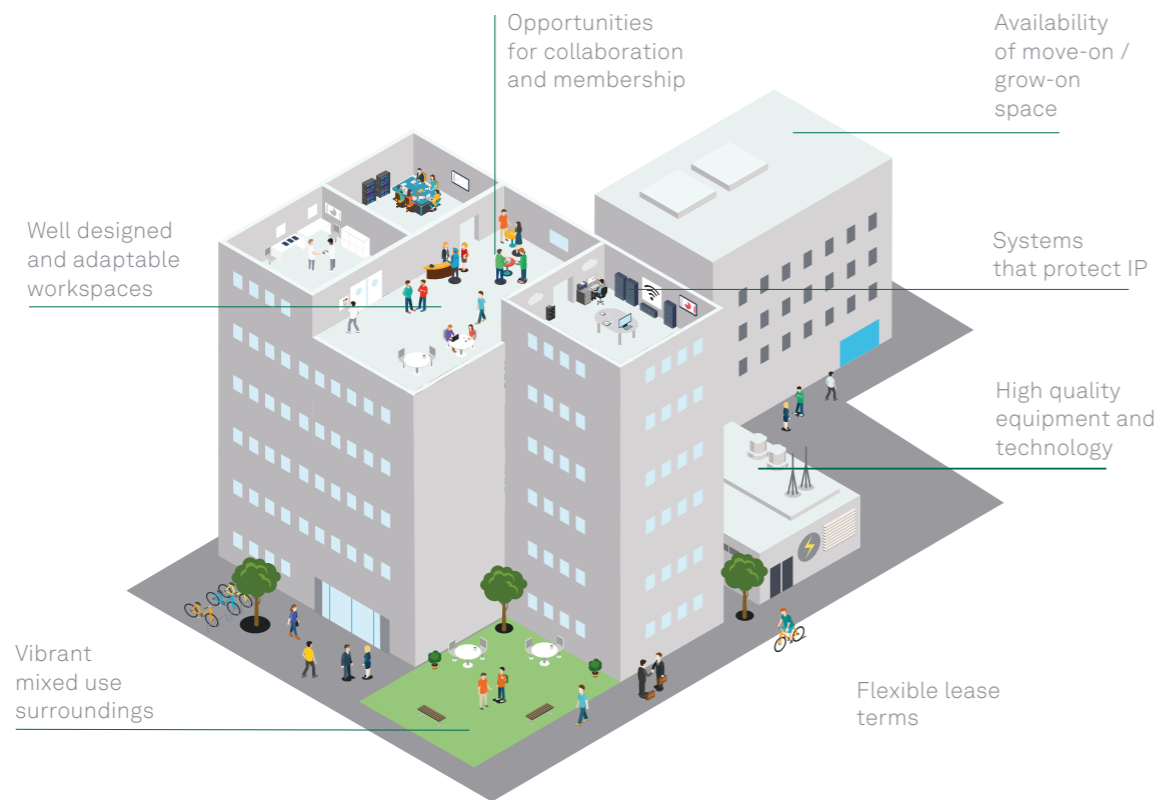
What does the Innovation Economy need?

Tenants within the innovation economy have grown to have highly specialised locational demands.

The size and fledgling nature of its businesses, the dynamic lifecycles they enjoy, the kinds of intellectual property they own, and the particular forms of interaction they require, mean they cannot afford to be agnostic about what their immediate location possesses (see **Figure 2**).

The precise needs of these companies depend on market segment preferences, technology demands, and the interaction preferences of different sectors. Covid-19 has also altered the habits and preferences of companies of different sizes but at their core are a number of common features.

Figure 2: Overarching workspace preferences of innovation economy firms



2.1

Locational needs of innovation sectors

Proximity to collaborating firms, institutions and individuals is part of the modus operandi for nearly all contemporary innovation locations. Although Covid-19 has disrupted and digitised patterns of collaboration in many parts of the world, and may expand the digital 'catchment' of certain locations, it has not replaced the fundamental advantage of face-to-face interaction and regular proximity.⁴ At the same time Covid-19 has re-affirmed the importance of flexibility of office or lab space to allow room for teams to grow, scale back during crises and for uses to be rapidly 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.

Figure 3: Common location preferences of innovation economy firms in different sectors

	Proximity and porosity	Shared work spaces	Mix of floorplates	Access to grow-on space	Access to Capital	Incubation, mentorship, community	Co-located sectors	Mix of uses	Proximity to customers and clients	Access and appeal to talent	Rapid digital connectivity	High calibre, specialised shared equipment	Access to major knowledge & decision-making institutions	Privacy, security, and IP protection	Nearby housing affordability	Agile rental models	Walkability and micro-mobility	Excellent logistics, airport access, and long-distance transport links	Heritage environments and dense amenities	Large test spaces
Broad-based 'Tech'	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Creative	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Life Sciences	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Advanced Manufacturing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Financial Services/Fintech	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Digital	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Urban Tech	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Advanced Materials	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Energy and Sustainability	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Social Enterprise	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Scientific Devices & Instruments	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Food & Drink	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Defence & Aerospace	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Depending on the industry mix being cultivated, other factors are increasingly viewed as essential. These include reliable rapid digital connectivity, mechanisms to protect IP in shared environments, rental

models that allow for the unpredictable cash flows of startup companies, and access to land or facilities to hold tests and pilots. This mix of needs is observed in generalised form in **Figure 3**.

In almost every case the location needs are not the same as they were ten or more years ago. 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.

These adaptations have altered the mindset within the real estate and built environment industries. Because value is bound up with the performance and competitiveness of the companies they host, there is now wide recognition that real estate has to shift from an

agnostic 'asset owner' mentality relying solely on bricks and mortar, to a 'service provider' mindset that proactively supports the firms they host (e.g. funding, coaching, networking and supply). This also means that buildings risk becoming stranded assets and so have to constantly evolve to accommodate bespoke and developing needs of their occupiers in respect of access, location, workplace, building layout and leasing models. The wider result is that more of the real estate industry is adopting a 'total place' perspective, that pursues vision about what is required in the whole innovation location, and is mindful of the wider conditions that make it possible to attract and sustain startups.⁵



2.2

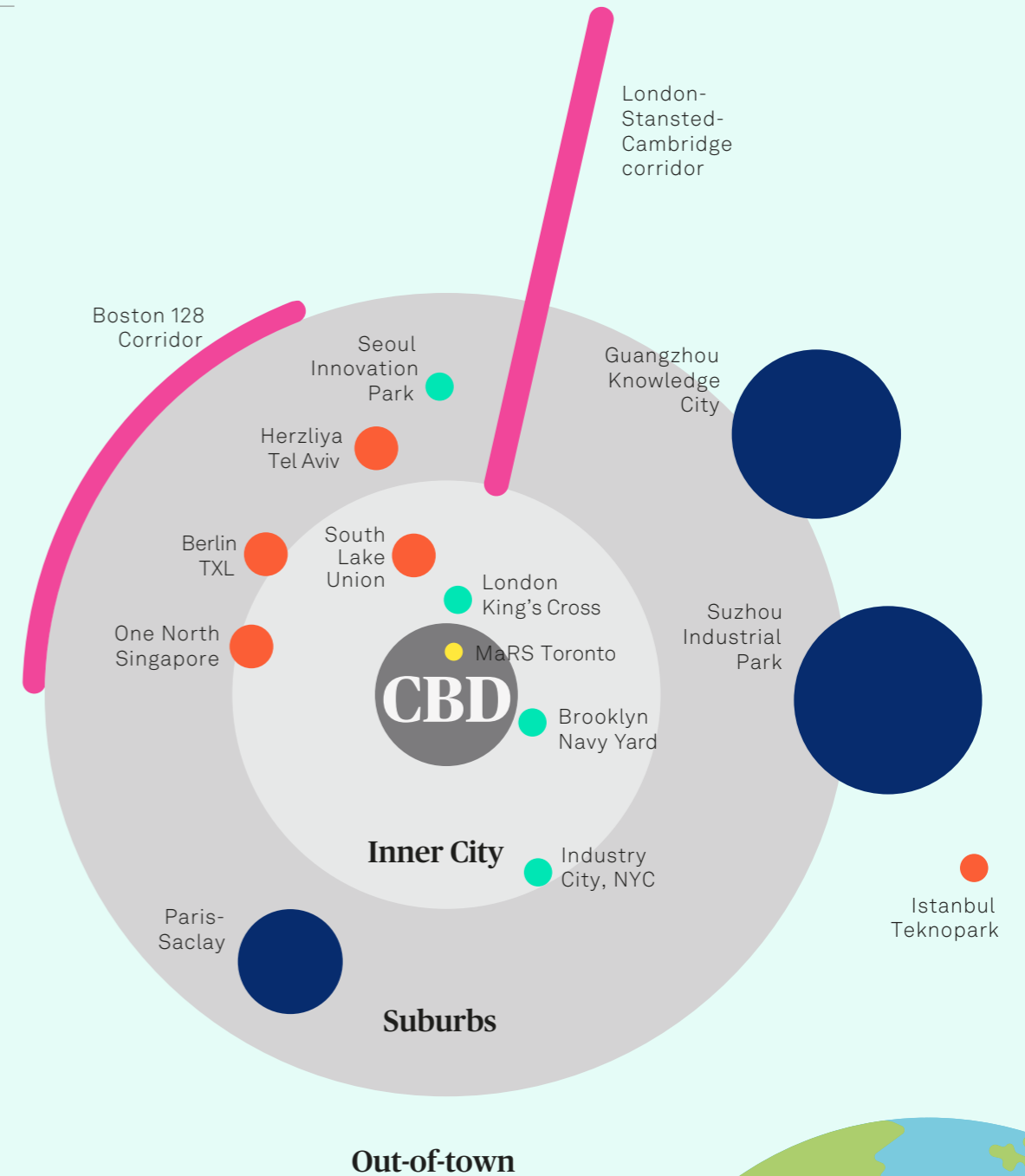
Formats for locations required by the innovation economy

For many years innovation has been re-urbanising. More firms had been quitting out-of-town science and technology parks in a quest for more accessible, denser urban environments conducive to innovation and cross-fertilisation.⁹ Companies seeking to innovate have, by and large, preferred the density, connectivity and market access that cities provide.⁷

However, international evidence suggests that innovation continues to cluster in a very wide mix of urban, suburban and non-urban locations, and that Covid-19 has injected momentum into a more distributed set of centres. These places also operate at very different scales, from single buildings to large walkable districts, 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. Place leaders across each of these innovation location types develop distinct success models in order to grow demand and foster growth companies.

Figure 4: Range of innovation spaces studied in this survey



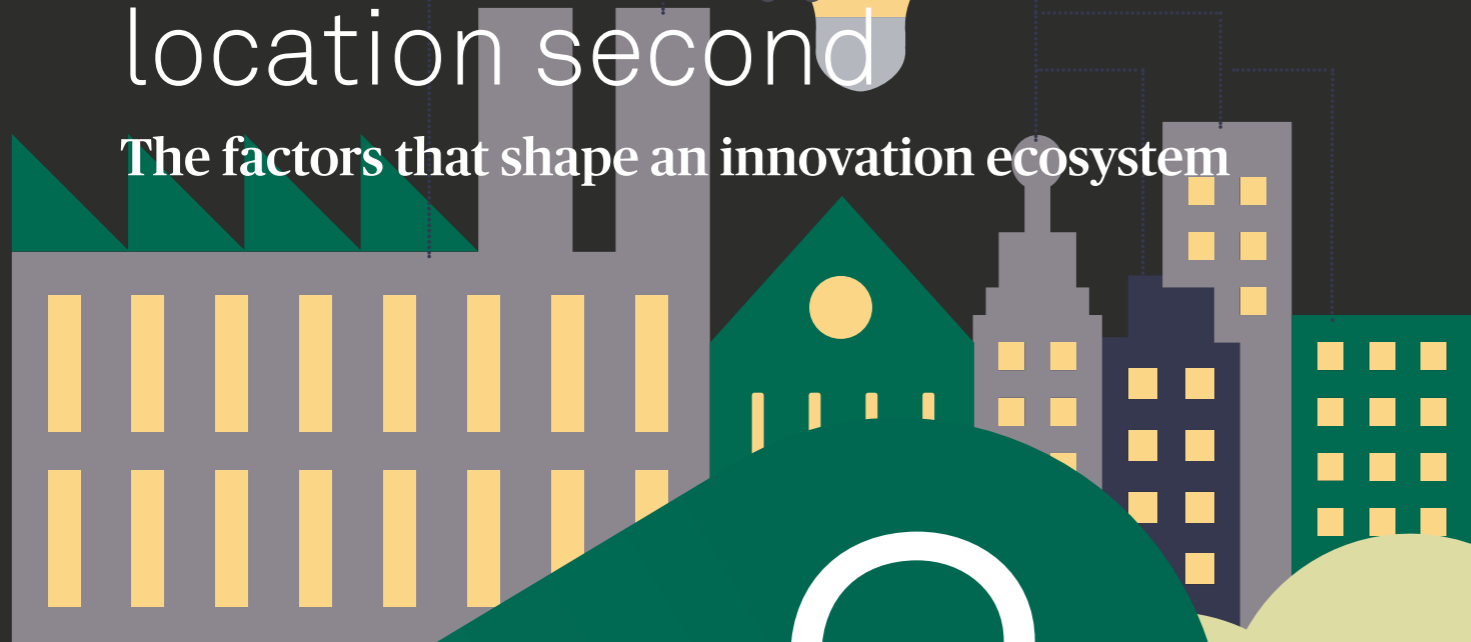
- Single building (2,000-40,000m²)
- Campus or neighbourhood (30,000-300,000m²)
- Entire district (1-3km²)
- Sub region (50-300km²)
- Corridor (20-100km)





Ecosystem first, location second

The factors that shape an innovation ecosystem



3

2019 - Werksviertel



3

Ecosystem first, location second

The factors that shape an innovation ecosystem

Innovation locations do not arise in a vacuum. They are produced within an ecosystem, which spans all of the actors and relationships whose goal is to enable technology development, enterprise and innovation. Such ecosystems have a much wider geography than a single location – they usually operate at a whole region level or even larger. Responsibility for co-ordinating these ecosystems may be shared by many organisations, firms and tiers of government.

The ecosystem fosters the basic processes of enterprise formation and business growth that in turn require specific locations. A location concentrates some of an ecosystem's activities so that they share an identity, and become visible and accessible to those not located within it.

Innovation ecosystems themselves are most likely to emerge in places where there are drivers of growth that already exist. These drivers take many forms. Firstly and most obviously, locations need to be near a sizeable customer and supplier market, regionally, nationally and even internationally. In the past this access has been rated the most important factor influencing business location decisions.⁸ Access to, and credibility among, a local base of investors with the appetite to invest in higher risk activities is also vital⁹ - 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. Places 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.¹⁰ 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. Much depends on the policy and funding environment, and whether it incentivises a suitable balance of enterprise, solutions-driven activity, and IP protection.



Innovation locations also arise in knowledge-rich ecosystems. This is not only to do with 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, incentives to commercialise, and a related system of entrepreneurship within and around these

institutional anchors. Locations also rely on their wider geography's ability to retain and build the base of skilled workers needed to populate firms and sectors oriented towards innovation.

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

Studies and experience of innovation ecosystems also highlight four core dimensions – the economic demand drivers, the enabling infrastructure, the skills base, and the framework conditions for business and investment. It is ecosystems that are strong across these four domains that tend to generate a critical mass of startups and high-growth companies.

These four dimensions are observed in the checklist below. Place leaders can assess whether the majority of preconditions are in place. Importantly, only some of these factors are in the direct or indirect

control of local leaders and governments. Many of the preconditions rely on frameworks, policies and infrastructure investment decisions taken by higher levels of government.

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

ECONOMIC DEMAND DRIVERS		
Existing presence of industries that are growing and feel competitive pressures to innovate	✓	✗
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 risk capital	✓	✗
Presence of larger, more established and internationally-oriented companies ¹¹	✓	✗
Presence of knowledge anchors (larger R&D institutions and universities) creating IP which needs to be commercialised to continue investment in research	✓	✗
Culture of 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	✓	✗
Pool of (and/or place attributes to attract) qualified talented workers in fast-emerging sectors seeking employment opportunities	✓	✗
Policy incentives to secure solutions to pressing problems (e.g. public health, climate change, security, food, energy, waste, water, disaster recovery)	✓	✗

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 ¹²	✓	✗
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	✓	✗
Regulatory adjustments 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 to provide confidence on return on investment ¹³	✓	✗



ENABLING INFRASTRUCTURE		
Connected to a large city or system of cities which offers advantages in innovation-oriented sectors that are complementary ¹⁴	✓	✗
Travel links to major roads and city centre rail hubs, plus convenient access to airports, to support labour mobility	✓	✗
High quality telecommunications, digital connectivity, 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 that prepare and respond rapidly to changing needs and circumstances	✓	✗
Real estate providers that align with their occupiers and adopt a service provider mindset	✓	✗

SKILLS AND HUMAN CAPITAL		
Strong demographic profile and resilient long-term skills supply	✓	✗
Availability of high-level specialist skills – for example 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 (for certain sectors)	✓	✗
Courses and scientists to develop curricula, apprenticeships and training schemes	✓	✗
Viable talent attraction and retention strategies in the wider region	✓	✗

The success model of different types of Innovation Location



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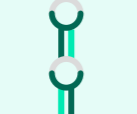
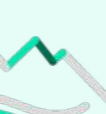


4

The success model of different types of Innovation Location

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

These location types are:

- 1. Innovation **hub buildings** in CBD or 'city fringe' location 
- 2. Innovation **quarters** close to major transport termini 
- 3. Innovation **sites vacated** by major employers 
- 4. Innovation **campuses** oriented around universities 
- 5. Innovation **districts** in inner city heritage-rich and post-industrial areas 
- 6. Innovation **triangles** that connect three concentrations of innovative activity 
- 7. Innovation **parks** in suburban areas undergoing intensification 
- 8. Innovation **zones** in large out-of-town locations 
- 9. Innovation **corridors** spanning road or rail transport links 
- 10. Innovation **landscapes** based around natural assets 

Each of these location types are explored in turn. We draw on international practice to observe the common ingredients in each and explain these through an example case study. We also identify three UK locations within each 'type' that are at different stages of their own journey.



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 pioneering centre of innovation in their place. Often in an 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 and region.

UK examples of innovation hub buildings

	First formed	Distance from CBD	Size & Scale	Main spaces/tenants	Main sector specialisms
BioCity, Nottingham	2003	1.5km	4 buildings (180,000 sqft), 62 companies	Office, co-working and lab space. Firms: Sygnature Discovery, XenoGesis, Haemostratix	Biotech and and biopharmaceuticals, drug discovery
Engine Shed, Bristol	2013	1km	30,000 sq ft (40,000 sq ft expansion planned)	Business incubators with office and co-working space. Tenants: SETSquared Bristol, Tech Spark, UKRIC, Lettus Grow, Actuation Lab	Sector agnostic (engineering, healthtech, robotics...)
Titanic Quarter, Belfast	2013	2km	40,000 sq ft site, 7 buildings, 60 startups	Co-working space and startup hub. Firms: IBM, AnyVision, Novosco, Arralis	Sector agnostic (software, financial services, pharma & biotech)

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 startups 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 exclusively 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)¹⁵

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 – startups 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. MaRS-supported ventures have raised around C\$4.83bn between 2008 and 2017, contributing more than C\$11.7bn to Canada's GDP in that period. Annual expenditure at MaRS amounts to some C\$47m, 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 150 tenants of different size and maturity, including startups, mid-size companies and multinationals, investors, researchers, community developers, professional service firms and retailers. Together these companies employ over 6,000 people.

With more than 15 years of experience, MaRS is now undergoing a cycle of expansion through partnerships. Launched in 2020, its 5-year Momentum programme is funded as part of the federal government Scale-up Platform, in collaboration with Communitech and Invest Ottawa. It has also partnered with Export Development Canada to help Canadian tech companies export their products globally. It is also planning to open a second hub in partnership with the University of Calgary.

In terms of recognised success criteria, the MaRS innovation hub building excels when it comes to a shared access to facilities, proximity to the night time 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.



UK examples of innovation quarters close to major rail termini

	First formed	Distance from CBD	Size & Scale	Main spaces/tenants	Main sector specialisms
Newcastle Helix	2014	1km	10ha, 500,000 sqft, up to 4,000 jobs	Offices, co-working spaces, labs, events, and educational spaces. Includes National Innovation Centres for Ageing and Data, Siemens MindSphere Lab	Mix with focus on life sciences, urban sciences, data science
Digbeth, Birmingham	2017	<1km	300+ businesses	Office, co-working, studio spaces, light industrial space, and retail Tenants: Gensler, MUBU music, Blue Thorn Technology, Brewbroker	Digital technologies (3D design printing, BIM), creative industries (music and events, design, marketing)
Leeds Innovation District	2017	<1km	Up to 6ha available for development, up to 1000 new jobs	Office and flexible working spaces, workshops, demonstration area Tenants: University of Leeds, Leeds Teaching Hospital NHS Trust, Leeds Beckett University	Creative industries (music and film production, broadcasting, animation)



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 startups 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. Continuing to foster an affordable and inclusive tenant mix can therefore often be a key leadership priority. 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	✓	✗
Anticipate affordability and community engagement imperatives	✓	✗
Densification/development rights	✓	✗
Mechanisms to retain and recycle value	✓	✗

Case study

Werksviertel, Munich – Accommodating the ‘Munich Mix’ for the next generation



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
- Leadership in terms of mobility-as-a-service

Located on a 40 hectare brownfield site just east of Ostbahnhof station, Werksviertel, or ‘factory quarter’, is Munich’s biggest mixed-use innovation district in the last 10 years, unlocking 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.

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 site density 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 investments in high-technology buildings that demonstrate the area’s focus on innovation and quality. This has also manifested in a decentralised energy system, which uses a groundwater geothermal plant to link up electricity, heating, cooling and

e-mobility. This drives energy efficiency, district resilience, and up to 40% reduction in CO₂.

Subsequently Werksviertel successfully brought a major city concert venue into the district under the terms of a public-private partnership. Investors acquired the land and paid for construction, while the state supported 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.

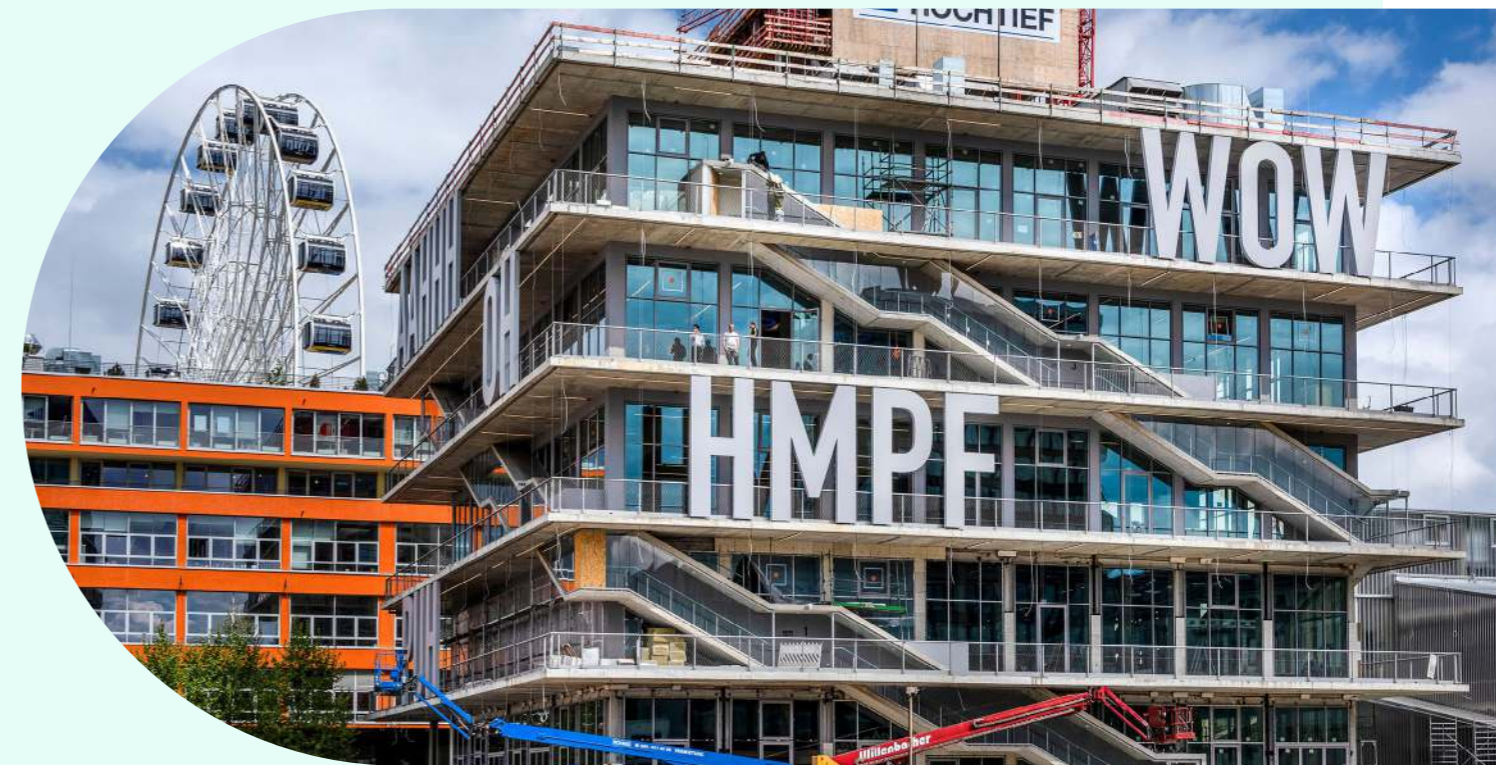
Gradually the quarter has used its urban character to become a testbed for ‘mobility as a service’. In 2019, it invited Audi to open an innovation hub and test out new sustainable mobility solutions. The company relies on the district’s urban lifestyle to understand the needs of a variety of customers, from commuters to visitors to residents. Co-location with other digital mobility firms has been fostered.

By encouraging multiple stakeholders to engage with the district in different ways, the innovation quarter has become a recognised example of

how Munich can convert an industrial area next to railway land into a vibrant and inclusive urban environment without destroying existing assets. One effect is that a municipal company has begun to buy property adjacent to the district to develop additional innovation space and to co-locate the regional Sparkasse bank nearby.

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 the calibre of anchor tenants.

2019 - Werksviertel



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.

UK examples of innovation sites vacated by a major employer¹⁶

	First formed	Former use	Distance from CBD	Size & scale	Main spaces/ tenants	Main sector specialisms
MediaCityUK, Manchester	2006 2011 (1st phase of development completed)	Dockyards	4km	81ha, 250 SME	Mixed use technology and production hub, incubator. Tenants: BBC, ITV, Ericsson, Kellogg's, Vodafone Digital Innovation Hub	Media & creative industries
Blackpool Airport Zone	2017	Commercial Airport	5km	58 ha, 52 companies	Warehouses and centres for manufacturing, energy and aviation	Mobility, cybersecurity, sport & entertainment
MEA Park, Liverpool	2017	Dockyards	6km	1m sq ft, 20,000 new jobs	Large-scale and flexible spaces, advanced module testing centre, warehouses, education facilities	Logistics & manufacturing, energy



2020 - MediaCity UK

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:

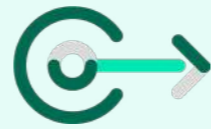
- **Clear pathway for transition from former use.** Examples exist of developments being delayed by challenges presented by existing tenants vacating and setting up in a new location. Federal and local government support for a smooth transition is important if the current cycle of needs and preferences 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



Marineholmen, Bergen – Co-Location to Accelerate Marine Innovation

Key success factors

- Long-term approach to return on investment, resulting in investment in key innovation infrastructure and creating open public spaces
- Facilitating a rich programme of events and generous sharing of successes with partners to create network effects and sustain a shared long-term focus
- Careful curation of the community and alignment between interests of real estate with its tenants and other stakeholders
- Up-front infrastructure investment costs shared by larger organisations, enabling SMEs to develop and test scalable solutions affordably
- A critical mass of anchors, agencies and institutions serving one primary niche but fostering healthy competition to encourage faster development



Norway's 2nd city of Bergen has a long maritime history. Over the last 30 years its shipyards have become a key site of advanced innovation, since Norway's first ever multi-stakeholder collaborative research centre was established with a focus on marine biology and informatics.

When a new forward thinking real estate partner acquired ownership of the site in 2001, this spurred a new cycle of expansion into surrounding shipyards to foster more opportunities for interaction and investment in startup infrastructure. GC Rieber, which owns the land along with the University of Bergen, has been very hands on about the tenant mix, the building variety, and on-site amenities. Around £35m (400m NOK) has since been invested in the development.

The location's aim was to decisively position itself as a marine research hub and create a community that spans the value chain from research to commercialisation and regulators. Attracting major marine institutions to relocate was critical. These institutions contributed to the ecosystem by building various types of laboratories for both large-scale marine biology testing and for corrosion and material testing. The opening of ILAB in 1989 marked the first development of shared marine infrastructure, operating under a "laboratory as a service" model for the university of Bergen and vaccine producers. The Norwegian Ocean Observation Laboratory opened in 2016, a deepwater research lab with state-of-the-art equipment to explore and analyse deep sea areas. Marine infrastructure being extremely costly, the provision of shared facilities on the site has enabled SMEs to develop and test solutions affordably. The presence of national cluster organisations nearby and regulatory agencies has also been important.

The whole value chain approach is visible in the ocean food sector. This approach enables a joint effort by research, industry and regulatory bodies to solve problems that arise in the aquaculture industry. Cargill Aqua Nutrition, a specialist in fish feed, shares its head offices with the world's second largest salmon producer and they are supported by fish health companies, vaccine developers and other startups in the accelerator. State-of-the-art facilities at the site owned by a knowledge consortium, opened with the aim to develop Recirculating Aquaculture Systems, and its first customer is Cargill.

Access to large industry players has proved essential for SMEs. Marineholmen has opened a Makerspace and hosts several incubator and accelerator spaces that mediate between startups, major businesses and investors.¹⁷ Creative industries have also taken advantage of the refurbished buildings such as the Corner Theatre, a building equipped with blackbox halls, studios and office facilities, as the district managers encourage crossovers between clusters. Marineholmen is now home to over 150 businesses and 3,500 jobs.

To anticipate the needs of the maturing talent mix in the marine cluster, the landowners are proactive on placemaking, sustainable design and urban vibrancy that is appealing to highly skilled talent. An attractive beach has been created that acts as a major gathering point in the city, and a host for festivals and entertainment.¹⁸

Marineholmen would score highly for its clarity of purpose, patient approach to return, variety of spaces, support of higher level agencies, and professional leadership. It is now working on building its profile and achieving the buy-in and public planning ambition to accelerate into the next cycle.

4.4

Innovation campuses oriented around universities



A significant proportion of new innovation projects are springing up around existing urban and suburban universities where opportunities to commercialise knowledge have been identified. Here the focus is not so much on regenerating an industrial zone but on urbanising, densifying and animating within a compact area around an anchor university— often a university with a healthcare or technology specialism.¹⁹

UK examples of innovation campuses

	First formed	Distance from CBD	Size & scale	Main spaces/tenants	Main sector specialisms
Heriot Watt University Research Park	1971	9.5km	67ha, 40 companies	University facilities, Edinburgh Conference Centre, incubator, test-bed space Tenants: Scottish National Blood Transfusion Centre, Scotch Whisky Research Institute, Renishaw, National Robotarium	Robotics and autonomous systems, energy transition, quantum and photonics
Birmingham Research Park	1986	5km	50+ companies and institutions	Offices, laboratory space, conference facilities, business and bio incubators Tenants: Abingdon Health, West Midlands Regional Genetics Service, UK-China Enterprise	Biotechnology, materials, computer systems, medical diagnostics
Cardiff Innovation Campus	2013	2.3km	1.7ha, currently 33,000 students at the university	Workshops, lab spaces, incubator facilities, co-working spaces, visualisation and fab labs Tenants: Cardiff University, European Cancer Stem Cell institute, Institute for Compound Semiconductors	Chemicals, life sciences, IT, biosciences, social sciences

For these locations to adjust to the innovation economy the priority is often to create a nexus for more sustained collaboration and 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

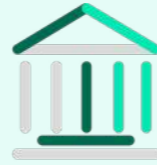
- **Optimising underused land and property**, which can be lucrative for owners in an existing non-innovation function (e.g. parking)
- **Leveraging university assets in support of the local economy** (local procurement, employment, workforce training, incubation of companies and social enterprises). A common criticism of campus-style innovation areas is that they appear to be exclusive districts detached from their surrounding communities
- **Visible and open public spaces** are usually necessary to create a sense of invitation and welcome to 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 make it easy to access for new entrants
- **Developing a total place agenda**, including consideration of an affordable housing component, increased vibrancy, more linkages to surrounding communities, and much greater mobility choice
- **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’ to maintain France’s science and innovation edge



Key success factors

- Large-scale financial support from national government for infrastructure and research
- Legal tools to fast-track planning permissions and co-ordinate land use planning across local authorities
- Clear attempts to prioritise effort in key locations to make maximum impact
- Digital tools developed to foster a dispersed community

In the R&D-rich green outer suburbs of metropolitan Paris, national government has been pursuing a vision to establish Europe’s answer to Silicon Valley. At the heart of this multi-billion euro initiative is to consolidate many of France’s top research institutions under a single brand, Paris-Saclay. Two of the area’s three nodes are next to each other and form the priority ‘Urban Campus’, divided by the N118 motorway. The aim is to deepen connections between this research cluster and major nearby corporates who have an established presence south west of Paris.

Paris-Saclay was designated a project of national interest, and this requires the delivery agency to work carefully with local partners and mayors. A 20-member multi-sector board agrees key decisions on the project, and the agency has to constantly coordinate with a complex web of local authorities, as well as host and attract investors in collaboration with national and regionwide investment agencies.

Since the outset a priority has been to encourage a culture of open innovation among instinctively secretive institutions (many in defence and aerospace) as well as universities that lack a strong track record of tech transfer. Collaborative infrastructure is key as ‘deeptech’ requires advanced labs. Large firms in energy,

IT, automotive and health are joining existing clusters on the site – tenants include EDF, GE, Nokia, HP, Sanofi, and Thalès. With national financial support, the companies have launched joint research programmes with universities and research institutes. A “business club” provides a forum for leaders to network, and collaborate on innovative projects.²⁰ This is starting to produce conscious specialisation in future mobility, health and software.

Building a single ‘whole place’ narrative around the sprawling mix of universities and institutions has also been a priority for the project leaders. In 2014, the Paris-Saclay University was created, repackaging the offers of over a dozen academic institutions within 49 Masters degrees and various doctoral programmes. However established elite universities – the *grandes écoles* – were reluctant to integrate with less high-profile universities and concede some of their own autonomy. The project leaders decided to continue without some of the *grandes écoles* and created the Paris-Saclay brand as an umbrella identity instead of merging the 20+ partners’ identities. Major communication and marketing efforts have seen Paris-Saclay University now ranked 14th in the world and IBM has now launched an AI research centre nearby.²¹



The underpinning catalyst of Paris-Saclay is the construction of Line 18 of the Grand Paris Express Métro, which will connect it to the rest of the Paris region over the next 5-10 years. While the site still is car-oriented and

metro line postponements slow the pace of growth, it has scope to be a testbed for mobility solutions, such as autonomous night shuttles for students or ebike sharing, to fill the connectivity gap.

The longer-term task is to foster the vibrancy in a fairly isolated semi-agricultural setting to appeal to a wider spectrum of younger talent. Architectural and design developments are arriving, and project leaders are prioritising walkability, spontaneity, and creating centres of gravity. Several large residential projects are planned to add footfall in the area during off peak hours, but the scale of the project is a challenge. Digital tools also act as substitutes for the more organic interactions of an established urban setting. An interactive Startup tool has been developed for startups to find peers, labs or investors. An ongoing priority is to provide affordable office and lab space, hampered by inflexible leasing contracts.

It’s clear that Paris-Saclay would score highly against the success criteria for leveraging university capabilities and facilities. Its capacity for delivering on a clear multi-stage development process is less established at this stage.

4.5

Innovation districts in inner city heritage-rich areas

The revitalisation of heritage environments and brownfield former industrial land in inner city areas to support innovation activity is one of the most popular formats for the innovation economy. It's a model within which very different ownership and management models 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).



UK examples of innovation districts in inner city sites

	First formed	Distance from CBD	Size & scale	Main spaces/tenants	Main sector specialisms
Knowledge Quarter, Liverpool	2000	<1km	182ha, 54,000 students, £2bn of investment, 2,000 jobs to be created	3 universities, 2 university hospitals, offices, co-working, labs, incubators, events space, hotels and retail Tenants: Royal College of Physicians, Sensor City, TTS Pharma	Materials, sensor technologies, medical technologies, infectious diseases, sports science
Oxford Road Corridor, Manchester	2007	9km	260ha, 80,000 workers, 74,000 students, £2.6bn planned investment to 2025	Offices, co-working and maker-spaces, labs, 2 universities, cultural institutions Tenants: National Graphene Institution, Henry Royce Institute, Qiagen	Life sciences (biomedical, genomics), advanced materials, broadcasting and creative industries
King's Cross Knowledge Quarter, London	2014	1-2km	814ha, 100+ companies and institutions, 70,000+ people	Office, co-working and educational spaces. Includes Google, Universal Music, Central St Martins, Francis Crick Institute, Digital Catapult Centre, the Alan Turing Institute	Mix with focus on education, culture, design, digital technologies



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

- **Improved high capacity transport links.** Inferior rail connectivity in particular 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' location and floorplate potential 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
- **High sustainability standards** that provide visibility and resilience to the district, and appeal to ESG-conscious tenants and staff

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 startups to 'grow on'	✓	✗
Aspiration and achievement of high sustainability standards	✓	✗
Municipal economic development strategy focused on business expansion and creation rather than incentives	✓	✗



Source: Source: Jelson25,
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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
- Collaborative planning process with city's early adopters
- 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 sustainability. 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, collaborating with neighbourhood and advocacy groups to ensure integration of the new district. 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 particularly telling, providing as it did a connection to the CBD, and creating reasons for workers, residents and visitors to mingle and cross pollinate ideas within this new space. 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, Center for Infectious Disease Research, the University of Washington School of Medicine and Merck Pharma. Many have grown their footprint in the district dramatically.

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 through an inclusive development framework. 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 Amazon, followed by the installation of Google, Facebook, and Apple 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. With increased competition leading to increased costs for smaller companies, Vulcan continues to collaborate with diverse organisations and individuals to continue the success of the innovation district.²²

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, while continuing to work with the surrounding communities. 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.

UK examples of Innovation triangles

	First formed	Distance from CBD	Size & scale	Main spaces/tenants	Main sector specialisms
Salford Innovation Triangle	2019	3km	7,000 employees at NHS Foundation Trust, 250+ companies in MediaCityUK, 60,000 students	Office, labs, smart city living lab, housing and student accommodation, Tenants: MediaCityUK (BBC, ITV), University of Salford, Salford Royal Hospital	Creative, digital and media industries (broadcasting, production), healthcare (neurosciences), materials, robotics, acoustics
Edinburgh Science Triangle	2004	10km	7 Science Parks, 4 universities, 3,000 researchers, 100 companies	Research facilities, incubators, fully fitted labs and offices Tenants: University of Edinburgh, Roslin Institute, Informatics Centre	Biosciences (animal welfare), informatics, microelectronics, energy
Silicon Gorge, Bristol-Gloucester-Swindon	2002	60km	10,000+ companies	Incubators, lab and flexible work spaces Tenants: Bristol Robotics Lab, SETsquared	Aerospace engineering, electronics, creative media, artificial intelligence, robotics



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 Research Triangle Park, North Carolina – Combining three complementary locations to expand innovation within a university cluster

Key success factors

- Charismatic and dedicated publicly-led effort to recruit high-tech companies from out of state.
- Patient effort to attract the right anchors to grow a specific industry niche
- Iterative agencies fostering specialisation through funding, training and infrastructure development
- Multi-cycle perspective that responds to changing space and amenity needs of talent and industries

Back in the 1950s, as struggling North Carolina was looking to diversify its economy and pivot to new industries, an idea emerged for a location that would connect up the research within a triangle formed by three world class universities in the three neighbouring cities of Durham, Chapel Hill and Raleigh.²³

The Triangle's success was far from a foregone conclusion. The region was small, it lacked an advanced technology base, the population was relatively low skilled and the culture of enterprise was modest. The key initial advantage was the establishment of two national labs, and the behaviour of the universities which acted as a unified research community, cooperating for the common good. A careful review of the universities' research strengths and faculty activities pointed to competitive advantages in pharmaceuticals, electronics and chemistry. Two state government leaders worked hard as the convener of common interests, encouraging institutions to inventory their in-house resources and recruit big firms.²⁴ IBM's decision to open a manufacturing facility in the Park in 1965 validated the district's mission and other major companies followed.

The Research Triangle Foundation, a non-profit agency with strong senior university presence was established not only to manage development and promote investment, but also to facilitate high quality local partnerships.²⁵ The land and floorplate

needs meant that most of the companies recruited in the Park could not be accommodated in the three cities themselves. Universities at the three 'points' have not been heavily invested in the core facilities of the Park itself, partly because of the distance from core faculty infrastructure.

State government involvement has been critical by supporting smaller companies, skills development and more recently digital infrastructure. In 1984, it established a non-profit economic development agency dedicated to grow biotech, which over 20 years was fundamental to creating a VC fund and recruiting biotech companies. Similarly, the non-profit Microelectronics Centre for North Carolina, contributed to the development of state-wide digital infrastructure and launched a microwave system linking the three universities and the Research Triangle Institute. In 2018, it partnered with Duke University to build a fibre optic cable ring throughout the triangle.

Over time the triangle has matured: Raleigh became the dominant commercial hub, and a revived Downtown Durham became a popular location for hi tech labs. The region has evolved into a diversified location and education pathways across the income spectrum have become more specialised. In effect the Triangle has evolved into a Square, and there is no discernible start and finish to the original Park today. At its core

are over 300 companies and 55,000 workers, benefiting from an established culture of enterprise and IP-sharing.

As with other triangle locations established to connect business and knowledge assets, a key task over time is to build liveable, high amenity environments conducive to workforce preferences.²⁶ An urban centre of gravity had long been neglected. It has now been pursued initially by repurposing

the ground floor of older buildings for free co-working space, supplemented by cheap rents for startups and growth stage companies. Investment in food, exercise, shopping, restaurants, public spaces and entertainment has cultivated a self-confident entrepreneurial community. This high amenity model is expanding and the park at the heart of the triangle is now introducing housing for the first time.²⁷



The Triangle would score very well against success criteria such multi-agency collaboration, independent profile, and the engagement of the tech community. Ongoing challenges are to encourage full collaboration among the university institutions and secondly to encourage regional approaches to address equity and infrastructure issues. Unlike other regions in the US, the triangle lacks a deep corporate HQ base to provide business leadership and influence on public policies.

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.



UK examples of suburban innovation parks

	First formed	Distance from CBD	Size & scale	Main spaces/tenants	Main sector specialisms
West of Scotland Science Park, Glasgow	1983	5km	25ha, 40+ businesses	Office, co-working spaces, meeting rooms, sports complex Tenants: Merck Life Science, Scottish Environment Protection Agency, M Squared Lasers, Coherent Scotland, Sartorius Stedim	Ultrasonics, photonics, pharmaceuticals, biotech
Oxford Science Park	1989	6km	30 ha, 3,500 workers, 100+ companies	Offices, startup incubator space, lab facilities Tenants: Sharp, Exscientia, Immunocore, CellCentric, Oxehealth	Health treatment and diagnostics, medtech, drug discovery & development, cloud communications
Edinburgh BioQuarter	1997	6.5km	65ha, 8,000 workers, plans for 9,000 new jobs and 20,000 people	Office, incubator, purpose-built labs facilities, co-working and workshop spaces, clinical research facilities Tenants: Edinburgh Medical School, Royal Infirmary of Edinburgh, Centre for Dementia Prevention, 2Eye Diagnostics	Biotechnology, diagnostics, genomics, bioinformatics

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 how to overcome 'silo' thinking within and between the larger firms and institutions, and how to provide an appropriate social infrastructure and amenities to serve a more selective workforce.

Success factors for suburban innovation parks include:

- **Forward thinking anchor institutions** are often key to forming cohesive communities and networks in lower-profile suburban parks, 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

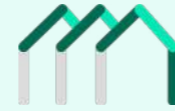
buildings managed by intermediaries (e.g. large firms, educational institutions), to generate new relationships, and to intensify existing networks. Thriving suburban innovation parks become closely-knit communities within which interaction between tenants is regular and spontaneous²⁸

- **Active industry associations** that provide strong advocacy leadership can be 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. Improved formal and informal linkages with the city centre are often a priority
- **Proximity to downstream manufacturing processes** for key products is also important in certain sectors

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 a pervasive 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 land assembly powers	✓	✗
Land parcels developed on a 'just-in-time' basis to avoid stranded assets	✓	✗
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 – Masterplanning to accommodate multiple value chains

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
- Ability to assist tenants with their expansion plans

Singapore's effort to host the innovation economy in vibrant, multi-sector, mixed-use locations is embodied in One-North, a purposely 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.

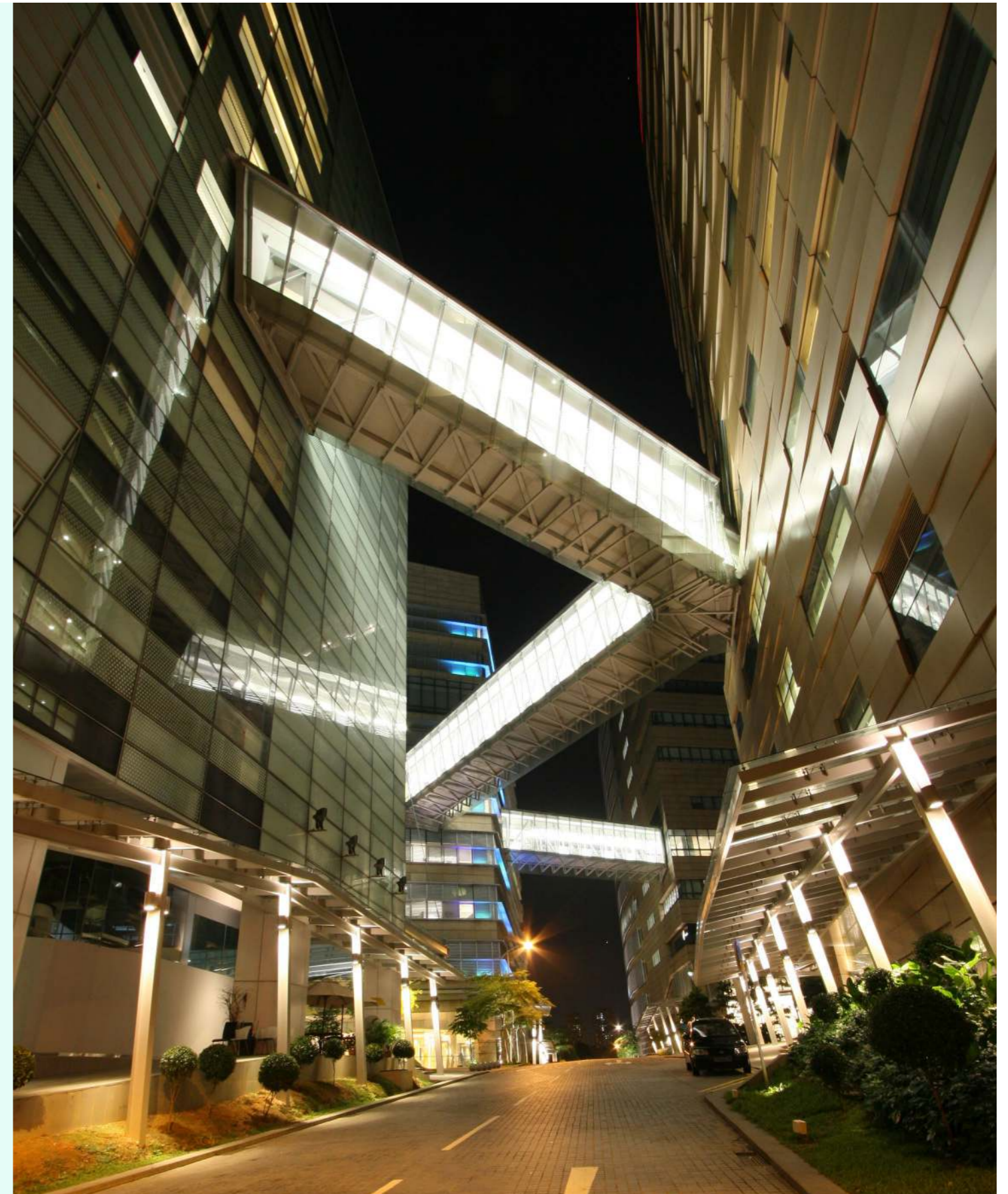
The park's location was influenced by available proximity to major public institutions, including the National University of Singapore, National University Hospital, Singapore Science Park I, II, and III, and Singapore Polytechnic.²⁹

The life sciences component of the project was the first to be launched nearly 15 years ago. Today, it offers 3.5m square feet of co-working, networking and laboratory spaces, and hosts over 40 private

firms.³⁰ A state media company anchors the media cluster, which is home to numerous startups receiving state-sponsored support.³¹ 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.³²

In its second development cycle, One-North has evolved into an explicitly entrepreneurial ecosystem. Block 71, for example, hosts 1,000 people in startups and incubators, with plans for expansion into six blocks in total by 2017. In 2019, JustCo, Asia-Pacific's leading coworking company announced the opening of a coworking centre next to consumer electronics company Razer's headquarters, thus providing a strategic location for gaming hardware and other consumer electronics companies. One-north has also expanded beyond its boundaries, now encompassing the 6.5-ha Launchpad, a hub for startups.

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', 'free zones', or 'enterprise zones'. These zones often offer enhanced terms for business location and investment, and simplified planning. While some spring up on greenfield land as a separate 'city' or sub-centre of the established city, others consist of 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.

UK examples of out-of-town innovation zones

	First formed	Distance from CBD	Size & scale	Main spaces/tenants	Main sector specialisms
Cambridge Cluster / Silicon Fen	1960	N/A	61,000 workers, 5,000 companies, £15.5bn in total turnover	Office and lab spaces, accelerators Tenants: University of Cambridge, AstraZeneca, Microsoft, Google	Pharma, medical technologies, computing, artificial intelligence, electronics
North Kent Enterprise Zone	2015	N/A	5 business parks in 3 locations	Industrial units, flexible office space, residential space, training facilities Tenants: Berkeley Modular, KIMS Hospital, Cygnet Healthcare, Air Ambulance Kent Surrey Sussex	Medical and life sciences, advanced manufacturing and engineering, digital technologies
Lancashire Advanced Manufacturing & Energy Cluster	2017	N/A	4 sites, 407 ha, potential 10,000 new jobs	Offices, R&D and light industrial space Tenants: University of Sheffield's Advanced Manufacturing Research Centre, BAE Systems, Blackpool Airport, Safran, Magellan Aerospace	Aerospace and aviation, advanced manufacturing, automated assembly, robotics, energy

Lancashire Advanced Manufacturing & Energy Cluster



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 and patenting, which are often key considerations in these kinds of locations³³

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
- High degree of leadership autonomy enabling policy and institutional reform, take-up of best global experience, and co-ordinated project authorisation and land allocation
- Careful urban planning providing a good balance between industrial development and social development
- Highly efficient 'one-top-service centre' to improve the business and investor experience
- Co-ordination across the region to supply specialised skills
- 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 320km². 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.

Specific legislation was created at national and provincial level to outline the roles and responsibilities of different stakeholders – Suzhou government, developers, and investors. To create a conducive business environment, a "one-stop shop" service centre was implemented to provide a streamlined and more transparent approach on registration, permits, tax, customs and immigration. Preferential policies were implemented to attract companies in new and high-tech sectors. Bespoke funds were also established to invest in innovation bases and public technology service platforms in biotech, nanotech, software, animation and business services.

The park also benefitted from careful urban planning, based on Singaporean expertise. Overseen by a planning commission, the flexible masterplan sequenced mixed urban development with large residential areas planned for the centre. The development of SIP was conceived as part of a broader urban development agenda and ensured integration between SIP and Suzhou City, in terms of infrastructure and social services. High quality recreational amenities and a strong local social protection system make SIP a beacon of liveability.

Attention was also brought to skills training in order to align the labour pool with the requirement of high-tech sectors. Technical and vocational colleges as well as secondary schools opened in SIP, with a more market-driven curriculum and management. Colleges and universities in the wider region also collaborated to adjust their curriculum and provide the necessary labour skills.

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.³⁴ In 2015, SIP was nominated by the national government as China's first 'open innovation' pilot zone pioneering a transition to the innovation economy.³⁵

Over the past 25 years, the park has contributed more than 800 billion yuan (£90bn) in tax revenue, and completed more than £100bn in investment in fixed assets.³⁶ The company managing and developing the park has shared its experience to other industrial parks in China such as the Suzhou-Suqian Industrial Park, and is now exporting its experience in Northwest China and Indonesia under the Belt and Road initiative.

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 clarity of vision in more recent phases.

4.9



Innovation corridors

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

UK examples of innovation corridors

	First formed	Length of corridor	Size & scale	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
Cheshire Science Corridor	2016	90km	100ha, Potential for 20,000 new jobs and 500 companies	Scientific labs, offices, leisure facilities, events space, venture funds Tenants: Translational centre for antimicrobial resistance, Medicines Discovery Catapult, Electricity North West, Rolls Royce Nuclear, AECOM	Environmental technologies, automotive, energy & nuclear engineering, chemical engineering, life sciences
Global Innovation Corridor, Sheffield	2019	40km	70,000 new jobs in Sheffield City Region	Tenants: Sheffield University, Doncaster Sheffield Airport, Digital Media Centre, National College of High Speed rail	Advanced manufacturing, digital media

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 suitable environments for innovation 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.³⁵ 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 corridor 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

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

Case study

Cascadia Innovation Corridor, Vancouver-Seattle-Victoria – A cross-border collaborative network for a well-distributed innovation region

Key success factors

- Business leadership proactive in dedicated committees to innovate and solve challenges around assets and infrastructure
- Logical complementarity between cities' industry and knowledge strengths
- Soft collaboration bringing multiple institutions in public and private sectors to work on social imperatives as well as frontier innovation issues
- Focus on long-term and impact opportunity in fast-growing Pacific markets

The Cascadia Innovation Corridor consists of the region spanning the technology-rich medium-sized cities of Portland, Seattle, Victoria and Vancouver B.C. Traversing the US-Canada border the Corridor historically has not been well coordinated and has lacked government leadership. But since 2016, a Corridor initiative led by the Business Council of British Columbia and Challenge Seattle has begun to initiate the collaboration to drive overdue long-term thinking about the region's competitiveness and place on the global stage.

The corridor benefits from cities with different strengths in terms of openness, appeal, affordability and specialisation. Seattle-based companies for example often choose to open their Canadian headquarters in Vancouver. Many people work in one city and live in another. Seattle is globally known for software, AI and aerospace, Vancouver is more known for biotech and clean technologies, and Victoria is an emerging marine and digital hub.



A Steering Committee and seven sub-committees with specific agendas are now championing the future of Cascadia. Three of the sub-committees focus on key industries: life sciences, transformative technologies (quantum computing and blockchain) and sustainable agriculture. The others work on the infrastructure, housing, mobility and talent gaps. After identifying key actions, all sub-committees then work on creating partnerships, engaging with business leaders, developing pilot projects, and convening workshops and discussions in order to find new solutions.

The corridor is also benefiting from soft collaboration that fosters the ecosystem. This includes a venture network to match tech startups with funding and collaboration opportunities across borders, and a data alliance to establish health research data sharing along the corridor. It launched the Cascadia Data Discovery Initiative, responsible for producing a standard data use agreement and creating research funding dedicated to regional data collaboration.

Players in the corridor are committing capital and key capabilities to the Corridor's future. Cascadia Urban Analytics Cooperative, a joint initiative between Microsoft, the University of Washington and the University of British Columbia, is applying data science to urban challenges such as transportation, air pollution, and housing. In its first two years,

CUAC has attracted over \$5m in funding from government, corporate, philanthropic and internal university sources.

Corridor advocacy has also produced progress on mobility between the cities, which is critical given high demand and congestion. The Province of British Columbia and the State of Oregon have committed funds to continue evaluating the feasibility of the high-speed rail in the region, in addition to improved plane and seaplane services.

Although it is too early to evaluate the CIC fully against all the success criteria for innovation corridors, it is clear the project is improving for key sector strategies, governance co-ordination, co-ordination networks in higher education, and focus on social value.



4.10

Innovation landscapes



Innovation landscapes take advantage of their proximity to natural assets to create a space in which focused ecosystems can achieve some levels of interdependence and intimacy. The type of natural asset, be it rivers, valleys, mountains or coasts, define the type of industries that will choose to locate in these sites, and provide a strong sense of identity and place.

UK examples of innovation landscapes

	First formed	Distance from CBD	Size & scale	Main spaces/tenants	Main sector specialisms
Stoneleigh Park Rural Innovation Centre, Warwickshire	1963	10km	120ha, 70 businesses, plans for up to 1,500 jobs	Offices, hotel, farm shop, visitors' centre and indoor exhibition space Tenants: National Farmer's Union, Agricultural Horticultural Development Board, GEA Farm Technologies	Food production, renewable energy, equine and livestock husbandry
Anglesey Energy Island	2008	N/A	£5.6m of investment	Demonstration zone for marine energy, lab and office space, Tenants: Minesto, M-SParc	Low-carbon energy (tidal stream energy, nuclear, wind)
Green Port Hull	2010	3km	500ha, £1bn investment underway	Extensive manufacturing, assembly and servicing facilities, logistics facilities, offices Tenants: University of Hull, Siemens, Offshore renewable Energy Catapult	Renewable energy, environmental technologies, ports and logistics, petrochemicals



Anglesey Energy Island

Challenges associated with nurturing this type of innovation location include:

- **Bridge the distance between the tenants through networks and collaborative projects.** Locations oriented to natural resources and energy generation have large size requirements and can create physical distance between players. Many innovation landscapes have to work hard to create the alliances and networks that align stakeholders behind a vision and work together towards it
- **Meeting companies' highly customised needs.** Companies require a mix of large-scale testing/prototyping, manufacturing and distribution space, and office space for support businesses. Companies may rely on available land or greater access to the natural assets for expansion and scaling up. And they may also have very specific skills requirements that require local training capabilities and facilities for short-stay staff
- **Physical and digital infrastructure development.** Often located in remote locations, innovation landscapes do not

usually benefit from the same digital infrastructure as more urban locations and expansion might require more physical links between sites or dock facilities

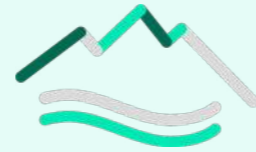
- **Preservation of natural assets.** Contrary to other innovation locations in more urban environments, innovation landscapes come under higher scrutiny when it comes to the preservation of the environment: strict environmental impact assessments are conducted and expansion might rely on permits allocations
- **Funding.** Large-scale development of infrastructure and research facilities requires significant funding that cannot be provided by local governments. Many innovation landscapes have benefitted from national or supra-national funding, as part of a wider industry development agenda such as low carbon. Major global companies' decisions to locate in these sites can also bring much needed capital injection. In both cases the role of dedicated local leadership and advocacy can be critical

Checklist of success ingredients for innovation landscapes

Multi-stakeholder governance mechanisms for shared infrastructure and services	✓	✗
Mix of land uses to accommodate major companies and business support services and optimise supply chain	✓	✗
High-quality physical and digital infrastructure	✓	✗
Capacity to harness energy and resources from natural environment for innovation and business purposes	✓	✗
Funding for large-scale infrastructure development	✓	✗
Availability of developable land	✓	✗

Case study

Park Innovaare, Villigen (Switzerland) – Strong partner network dedicated to market applications



Key success factors

- High-tech large-scale research facilities and equipment sharing
- Strong network of partners made up of research institutes and universities, cantonal and federal organisations, technology parks, and high-tech companies
- Diversification of funding sources from national and local governments to leading corporations, financial institutes and SMEs
- Efforts to bridge gap between research and innovation through applied research and cooperation with companies' R&D departments

Located in a rural river-based setting, the Park Innovaare combined the merger of two federal institutes with a home for startups in the fields of accelerator technologies, advanced materials, pharmaceuticals and medical technology, and energy.

The proximity to the river enabled the former Federal institute for Reactor Research (EIR) to operate a heavy water reactor and water was also used to dissipate the heat through cooling circuits into the Aare river. The sheer land requirements, 35ha with 20 additional ha for potential expansion, and the relative flatness of the Aargau canton, enabled PSI to easily and quickly assemble various large-scale facilities. Today, the location also enables the centre to conduct specific research such as on the impact of energy production on the atmosphere.

The natural and remote location offers opportunities for small and medium-sized startups, large corporates, universities and researchers to use the PSI's research facilities and equipment. Every year, more than 2,400 external users from science and industry benefit from access to the PSI infrastructure.³⁸ In addition to PSI's state-of-the-art research facilities, companies also benefit from the expertise and competence of PSI's specialists and graduates.

An important priority is safe and secure technology transfer. Highly specialised SMEs are encouraged to co-locate to supply products required for research and development of innovative solutions and processes. The close proximity to the University of Applied Sciences and Arts also contributes to accelerating innovation by identifying opportunities to turn application-oriented research into marketable products. A case pyramid has been developed to assess the potential of products to be commercially viable, based on the concept, industry needs and alignment with the location's focus areas. There are now 17 high-tech startups spanning biotech, medtech, quantum immunology and sensor technologies.³⁹

The location also benefits from wide support both from the public sector and from business leaders. Innovaare AG is a legal entity created in 2015 to manage the park and its shares are mostly held in private ownership. Involvement of major global companies and startups contribute to sustaining the park's market-driven development.



The new innovation campus, currently under construction, will include leasable areas such as high-precision workshops, special laboratories and clean rooms. It will be almost entirely powered by renewable energy, sourcing water from the nearby Aare river to cool the campus and solar panels. 95% of the building's heating requirements will be met through waste heat recovery.⁴⁰ The park has even more space to grow, with over 20ha available for development.

In terms of recognised success criteria, the Park Innovaare achieves high marks for multi-stakeholder governance, mix of land uses accommodating for the whole supply chain, high-quality physical and digital infrastructure and leveraging natural environment. It has also had success in diversifying its funding sources to finance its expansion.

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 possible location lacks the necessary fundamentals 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. Funding and policy attention in these cases may be better served patiently fostering the ecosystem.

While there are no hard and fast rules governing a place's capacity to host an innovation location, aspiring cities or regions do require a critical mass of the fundamental ingredients outlined in this report. In the UK, many places clearly have 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. Others have the market and investment drivers (consumer base, institutional presence, airport) supported by expanding knowledge anchors. Places build an innovation economy in different ways and with different assets – but a minimum threshold of drivers is needed. The journey towards how different places in the UK develop such drivers and then assemble the specific place-based ingredients for innovation success are explored in an accompanying handbook by the Connected Places Catapult.

For places that lack these prerequisites, a better strategy might be to focus on economic fundamentals before pursuing 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
- Targeted place-based innovation pilots
- Supporting the visitor and experience economies
- Watching the market carefully and waiting for the right conditions

Such an approach promotes growth and resilience in general, 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 place'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 places to grow their roles within the innovation economy, provided they base their ambitions and vision on clear market logic and proven demand.

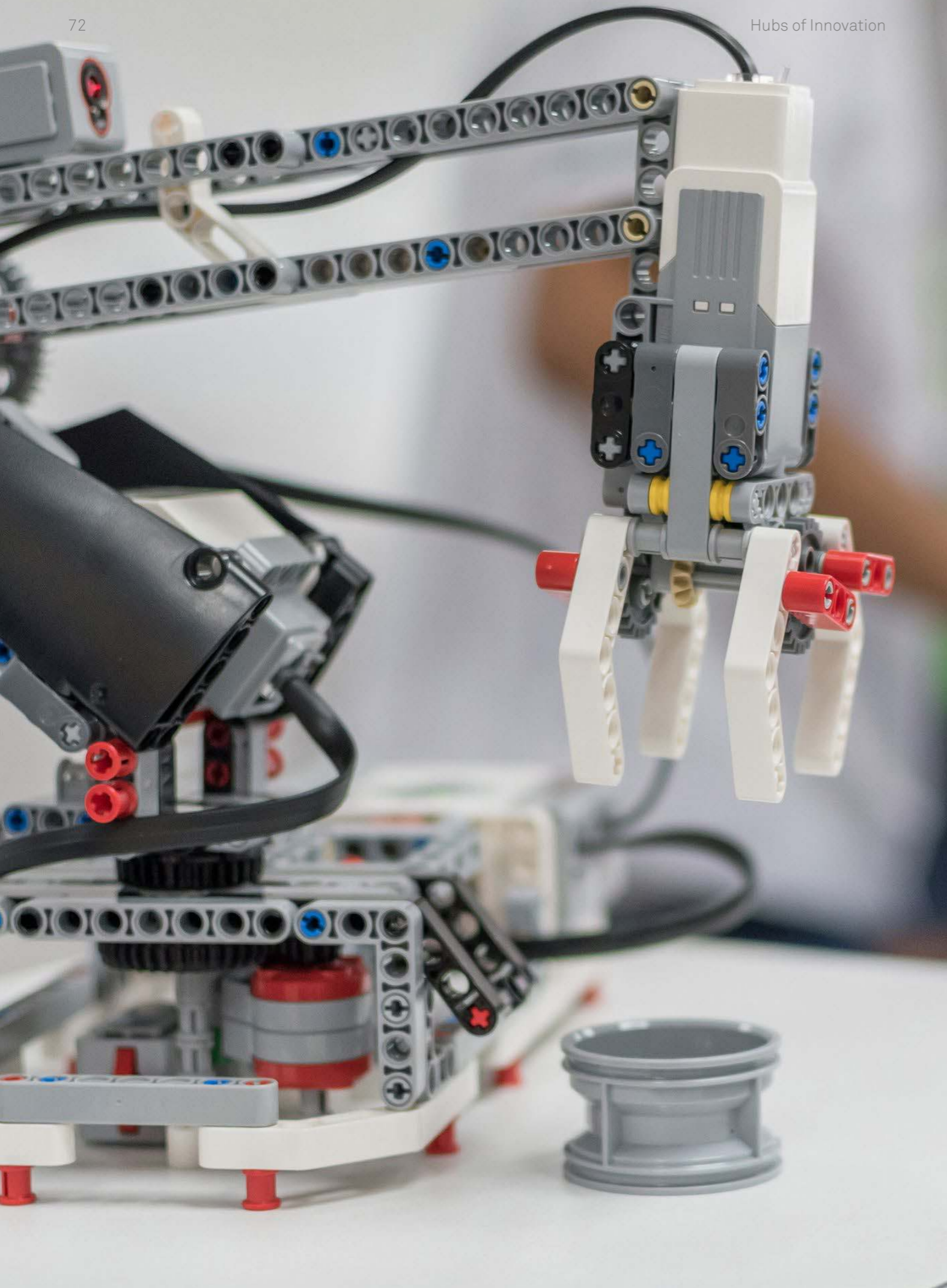
This survey of ten different types of innovation location highlights the importance of sound public and private sector decision-making and leadership in identifying and adopting the right success models for prospective locations.

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 resilient model for future development after Covid-19. 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, and as the pandemic shock plays out on SMEs and large institutions alike. 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. Agility in the face of short term shocks and medium term disruption is essential.

Each location type has specific attributes 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 typically shared across different locations are:

- Quality and depth of collaboration between innovators, institutions, mentors, investors, established business, and local leaders, reinforced by incentives and frameworks for joint ventures and risk-taking
- The physical and digital connectivity and sustainability criteria to meet the specific innovation demands of business and talent
- Matching the ambition, resources and management skills to the size of the location and the scale of transformation and behaviour change required
- Anticipating how the community will grow, including 'grow on' space, housing and amenity needs, and synergies with other locations
- A whole place perspective that understands what attracts innovation-oriented firms and talent, and ensures the innovation community is inclusive
- Proactive engagement with local skills supply, future skills demands and pathways to enterprise

Across these ten types of innovation location the scope and scale of public sector engagement varies widely, at both local, regional and national levels. 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 role of government evolves. This evolution will be explored in a forthcoming Connected Places Catapult paper.



A momentous opportunity exists for more places to take advantage of the innovation economy to accommodate jobs and build inclusion after Covid-19. Agglomeration effects on business productivity will not likely diminish, and demand for on-hand amenities and connectivity will persist, but changes in working and commuting patterns and business behaviour may result in a more agile distribution of talent and business space. Innovative firms may become more distributed across space, and some may build interactive and shared virtual communities. At the same time, Covid-19 also has created more of an imperative for places themselves to become, cleaner, less carbon intensive, healthier and more resilient to future climate and health threats. All these post-pandemic adjustments require places of all kinds to adapt.

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. Targeted place-based interventions are required, alongside a focus on ecosystem fundamentals, to support many more locations to flourish over the course of the 2020s.

6

References

- ¹ Joe Cortright (2015) 'Surging City Centre Job Growth', City Observatory. <https://cityobservatory.org/wp-content/uploads/2015/02/Surging-City-Center-Jobs.pdf>; Florida (2014) 'Startup City: The Urban Shift in Venture Capital and High Technology', Martin Prosperity Institute. http://martinprosperity.org/media/Startup%20City_14-03-14.pdf; JLL (2014) The New Geography of Office Demand: 1. The Urban Tendency; Paul Swinney, and Dmitry Sivaev. (2013) 'Beyond The High Street' Centre for Cities <https://www.centreforcities.org/wp-content/uploads/2014/08/13-09-10-Beyond-the-High-Street-Why-our-city-centres-really-matter.pdf>
- ² Scott Andes (2016). 'How Firms Learn: Industry specific strategies for urban economies'. Brookings Institution. www.brookings.edu/research/how-firms-learn-industry-specific-strategies-for-urban-economies/; John Wu, Adams Nager, and Joseph Chuzhin (2016). 'High-Tech Nation: How Technological Innovation Shapes America's 435 Congressional Districts'. ITIF. <https://itif.org/publications/2016/11/28/technation>; Jessie Adcock and Cory Dobson (2016). 'Vancouver's Innovation Economy'. City of Vancouver. <http://council.vancouver.ca/20160628/documents/rrlapresentation.pdf>; Eileen Chadnick (2016). 'Are You Ready for the Innovation Economy?' Toronto Globe and Mail. www.theglobeandmail.com/report-on-business/careers/leadership-lab/are-you-ready-for-the-innovation-economy/article31147117.
- ³ Charles Minshall (1983). 'An Overview of Trends in Science and High Technology Parks', Economics and Policy Analysis Occasional Paper 37, Columbus, OH.
- ⁴ Pamela Puchalski and Julie Wagner (2020) 'Coming Up for Air: how Innovation Districts are Pivoting during the Pandemic'. The Global Institute on Innovation Districts. <https://www.giid.org/coming-up-for-air-how-innovation-districts-are-pivoting-during-the-pandemic/>
- ⁵ Oxford Future of Real Estate initiative (2020) 'The future of real estate occupations: Issues'. Saïd Business School, University of Oxford. <https://www.sbs.ox.ac.uk/sites/default/files/2020-05/Future%20of%20Real%20Estate%20Occupation%20-%20Issues.pdf>; Ed Walter (2020) 'The new business model of commercial real estate: service provider'. Global Infrastructure Initiative. <https://www.globalinfrastructureinitiative.com/article/new-business-model-commercial-real-estate-service-provider>; Jörg von Ditzfurth and Hendrik Aholt (2018) 'Data is the new gold'. Deloitte. <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Public-Sector/gx-real-estate-data-new-gold.pdf>
- ⁶ Michael Storper and Anthony Venables (2004). 'Buzz: face-to-face contact and the urban economy'. *Journal of Economic Geography*. 4(4). 351-70; Cristina Chaminade and Jan Vang (2008). 'Globalisation of knowledge production and regional innovation policy: supporting specialized hubs in the Bangalore software industry'. *Research Policy*. 37(10). 1684-1696
- ⁷ GLA (2014) 'Supporting places of work: incubators, accelerators and co-working spaces'. GLA. www.london.gov.uk/sites/default/files/180%20IAC%20Report.Artwork_web.pdf.
- ⁸ Cushman & Wakefield (2011). *European Cities Monitor*. London: Cushman & Wakefield.
- ⁹ Colin Mason and Ross Brown (2014). 'Entrepreneurial Ecosystems and growth oriented entrepreneurship'. OECD. <https://www.oecd.org/cfe/leed/entrepreneurial-ecosystems.pdf>
- ¹⁰ Michael Storper, Naji Makarem, and Thomas Kemeny (2015). *The Rise and Fall of Urban Economies*. Stanford University Press.
- ¹¹ Hyun-Soo Woo (2016). 'Intra-Firm and Inter-Firm Agglomeration: The Location Decisions of Multi-Unit Firms'. Arizona State University.
- ¹² MIT (2011). 'The Third Revolution: The Convergence of the Life Sciences, Physical Sciences, and Engineering'. http://research.uc.edu/Libraries/Advanced_Seminar_Documents/MIT_White_Paper_on_Convergence_pd.sflb.ashx
- ¹³ Intellectual Property Office (2017) 'Promoting Innovation and Growth: The Intellectual Property Office at Work'. Intellectual Property Office. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/653493/Innovation-and-growth-report-2016-17.pdf
- ¹⁴ Gilles Duranton and Diego Puga (2013). 'The growth of cities'. https://www.oecd.org/eco/growth/Growth_of_cities_Duranton.pdf
- ¹⁵ Deloitte (2015). '2015 Global Survey of R&D Incentives'. www2.deloitte.com/content/dam/Deloitte/nl/Documents/tax/deloitte-nl-tax-global-survey-r-and-d-incentives-2015.pdf.
- ¹⁶ Berlin TXL (2017). 'Über Berlin TXL'. www.berlintxl.de/ueber-berlin-txl.html; Brooklyn Navy Yard Industrial Park (2017). 'About BNYDC'. brooklynnavyard.org/about-bnydc/; Cornell Tech (2017). 'Campus: A Place for Discovery'. www.tech.cornell.edu/future-campus/; Seoul Innovation Park (2017). 'Introduction'. www.innovationpark.kr/english/
- ¹⁷ HATCH (2018) - 'Bergen - An Ecosystem of Aquaculture Companies', <https://www.hatch.blue/blog/bergen-ecosystem-aquaculture>
- ¹⁸ Marineholmen (2020), 'Innovasjonsbydel', <https://www.marineholmen.com/english/about-us/innovation-district/a-brand-new-neighbourhood/>
- ¹⁹ City of Austin (2014). 'Austin Innovation Zone'. www.downtownaustin.com/sites/default/files/DAA%20Innovation%20Zone%20Presentation%5B1%5D.pdf
- ²⁰ Le Grand Paris by JLL (2013), 'The Saclay Plateau Research and Innovation Cluster', <http://www.grand-paris.jll.fr/en/grand-paris-project/clusters/cluster-saclay/>
- ²¹ ShanghaiRanking Consultancy (2020) 'Academic Ranking Of World Universities 2020' <http://www.shanghairanking.com/ARWU2020.html>; Lebouc, S., 2020. (2020) 'Automatisation Intelligente Et Innovation R&D' - IBM-France. <https://www.ibm.com/blogs/ibm-france/2020/09/03/automatisation-intelligente-et-innovation-rd/>
- ²² Vulcan Real Estate (2019), 'How South Lake Union Became a World-Class Innovation Hub', <https://vulcanrealestate.com/Stories/How-SLU-Became-a-World-Class-Innovation-Hub.aspx>
- ²³ Morgan P. Abbot (2018) 'North Carolina's Research Triangle Park: A Success Story of Private Industry Fostering Public Investment to Create a Homegrown Commercial Park'. *Campbell Law Review* Vol. 40 (2) <https://scholarship.law.campbell.edu/cgi/viewcontent.cgi?article=1659&context=clr>
- ²⁴ John W. Hardin, (2008) 'North Carolina's Research Triangle Park'. In: W. Hulsink and H. Dons, ed., *Pathways to High-tech Valleys and Research Triangles: Innovative Entrepreneurship, Knowledge Transfer and Cluster Formation in Europe and the United States*. Springer, pp.27-51. Available at: https://library.wur.nl/frontis/research_triangles/02_hardin.pdf
- ²⁵ RTP (2020) 'See how RTP moves North Carolina Forward' <https://www.rtp.org/history/>
- ²⁶ Charles W Wessner; (2013) *Best Practices in State and Regional Innovation Initiatives: Competing in the 21st Century*. "VI. ANNEX B - North Carolina's Research Triangle Park". National Academy of Sciences. <https://www.ncbi.nlm.nih.gov/books/NBK158811/>
- ²⁷ HUB RTP (2020) <https://hub.rtp.org/>
- ²⁸ Netherlands Foreign Investment Agency (2016). www.nfia-singapore.com/nethnews.html?id=72
- ²⁹ Hawksford (2016). 'Government Funding and Assistance Schemes'. www.guidemesingapore.com/doing-business/finances/singapore-government-schemes-for-startups; Patrick John Lim (2015). 'Singapore's future lies in being an innovative economy: Tharman'. Channel News Asia. www.channelnewsasia.com/news/singapore/singapore-s-future-lies/2224252.html
- ³⁰ Singapore National Library Board (2015). 'One North'. http://eresources.nlb.gov.sg/infopedia/articles/SIP_2015-02-18_100010.html; www.pharmaceutical-technology.com/projects/biopolis/; JTC (2016). 'One North'. www.jtc.gov.sg/industrial-land-and-space/pages/one-north.aspx;
- ³¹ Singapore National Research Foundation (2016). 'Innovation Cluster Programme'. www.nrf.gov.sg/innovation-enterprise
- ³² Alice Chia (2015). 'Fusionopolis Two to boost collaboration between private, public sectors'. Channel News Asia. www.channelnewsasia.com/news/singapore/fusionopolis-two-to-boost/2203210.html
- ³³ Lee Meixian (2016). 'Guangzhou Knowledge City "Making Progress"'. *The Business Times*. www.businesstimes.com.sg/government-economy/guangzhou-knowledge-city-making-progress
- ³⁴ Douglas Zhihua Zeng (2016). 'Building a Competitive City through Innovation and Global Knowledge. The Case of Sino-Singapore Suzhou Industrial Park'. World Bank Trade and Competitiveness Global Practice Group. <http://documents.worldbank.org/curated/en/234971468196142758/pdf/WPS7570-REVISED-Building-competitive-cities-through-innovation-and-global-knowledge.pdf>
- ³⁵ *ibid.*
- ³⁶ Li You (2019) 'Suzhou Industrial Park Celebrates 25 Years'. *China Daily*. http://www.chinadaily.com.cn/cndy/2019-04/12/content_37457505.htm
- ³⁷ David Wolfe (2016). 'Governing Ontario's Innovation Triangle: Economic Coordination in the Bay Area'. Presentation to the Bay Area Economic Summit. www.bayareasummit.ca/wp-content/uploads/2016/09/david-wolfe.pdf
- ³⁸ Daniel Kündig, Dr Andri Vital, Niels Gebhardt and Dr Giorgio Travaglini (2014). 'Park innovAARE - the innovation park at Paul Scherrer Institute'. Canton of Aargau. https://www.ag.ch/media/kanton_aargau/dvi/dokumente_5/ges_1/ueber_uns_10/dossiers_und_projekte_2/14-11-11_Broschuere_PARKinnovAARE_englisch.pdf
- ³⁹ Baublat (2020) 'Bauarbeiten Für Neubau Bei Park Innovaare Auf Kurs' <https://www.baublat.ch/bauprojekte/bauarbeiten-fuer-neubau-bei-park-innovaare-auf-kurs-30327>
- ⁴⁰ Switzerland Innovation (2020) 'Sustainable Energy To Power Park Innovaare's Innovation Campus'. <http://www.parkinnovaare.ch/sustainable-innovation-campus>

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