



Pioneer Campus 2040

Realising the
potential of
global science
and innovation
campuses

Report Summary
April 2023





Contents

04	Introduction
05	Approach
06	The Pioneer Campuses
08	Critical success factors
12	Campus 2040: key themes
14	Questions for campus stewards
15	Conclusion

Introduction

Around the world, interdisciplinary science and innovation campuses are a crucial, yet often unsung, part of successful innovation ecosystems. They are the places where start ups begin, where series A, B and C funding is secured, where advanced manufacturers design and make astonishing products. They attract private sector investment, global talent and public sector anchor institutions. They are linked to, but distinct from, local universities and key parts of their local community. They are home to thousands of scientists, engineers and innovators. They are the 21st century's foundries for the future.

And, in my experience, they are ferociously busy places. Often with hundreds of organisations on each site and a steady drumbeat of new arrivals, buildings and breakthroughs. In a fast-paced environment it can be hard to make the time to build with a long-term vision in mind, but it's never been more essential. The Pioneer Campus 2040 report pools the collective intelligence of eight world-leading campuses to find, despite differences in local context, common themes that will influence our future success.

My Harwell colleague Dr. Barbara Ghinelli introduced me to the wonderful phrase 'Innovation is a contact sport', and I believe contact between leading innovation

campuses is crucial to their future success. My hope is the Campus 2040 report and symposium can act as a catalyst for conversation between campuses around the world. Crucially, increasing our impact is not a zero sum game – success in Eindhoven can promote new technologies that spur growth in Tsinchu or Here East and vice-versa.

To pioneer is to be proactive, to break new ground. This isn't just a role for the scientists and innovators, it's just as important that stakeholders in leading campuses approach their task in the same way. Our findings suggest campuses who actively tackle the questions raised by this report, who think of clusters at multiple levels, who develop win-win partnerships with local government and local communities, and who invest in placemaking as much as facility building will be the next generation of world-leaders. It's an exciting prospect.

Thank you to each global campus who contributed and to the SQW team who crunched the data and created such useful insights. I sincerely hope the science campus community finds this report as useful, thought provoking and inspiring as I have.

Stuart Grant
CEO, Harwell Campus





Approach

This report explores the critical success factors underpinning a selection of leading science and innovation campuses and how they are evolving to meet the challenges of tomorrow.

It aims to inform a broader debate, focusing particularly on the future evolution of policies for science and innovation and the read-across to local, regional and national economic development.

The research was conducted by the economic and development consultancy SQW. It focused on eight campuses – two from the UK and one each from France, Sweden, Germany, the Netherlands, Taiwan and Australia. These were chosen based on four criteria:

- i. internationally visible because of the quality/quantity of research and innovation conducted;
- ii. an easily identifiable single/core site;
- iii. multidisciplinary, with strengths in more than one core discipline;
- iv. a 'mixed economy' of public and private sector actors.

Across each of the case studies, the report team reviewed relevant literature and spoke to stakeholders including managers and regional policy makers.

The full report is available at harwellcampus.com/campus2040

The Pioneer Campuses

- > Adlershof Science and Technology Park Germany
- > ANSTO Innovation Precinct Australia
- > GIANT Innovation Campus France
- > Harwell Science and Innovation Campus UK
- > Here East UK
- > High Tech Campus Eindhoven Holland
- > Hsinchu Science Park Taiwan
- > Lund Science Village Sweden



Harwell Science and Innovation Campus

- Established 1946
 - 700-acre site
 - 200+ companies on site
 - 6,000+ people on site
- Space/energy/health tech/quantum

Here East

- Established 2012
 - 130 companies on site
 - 5,500 people on site
- Digital/creative

Lund Science Village

- Under development
- 44-acre site
- Eventual target of 24,000 people on site

Advanced research in material science and nanotechnology/microelectronics/quantum technology/energy/health & life sciences/environment/food & packaging

Adlershof Science and Technology Park

- Established 1991
- 193-acre site
- 530+ companies on site
- 11,600 people on site

Photonics & optics/microsystems & materials/IT & media/biotechnology & environment/renewable energies & photovoltaics

Hsinchu Science Park

- Established 1980
- 1,695-acres across six locations
- 400+ companies on site
- 140,000 people on site

Integrated circuits & semiconductors/precision machinery/computer & peripherals/telecommunications/optoelectronics/biotechnology

High Tech Campus Eindhoven

- Established 2003
- 247-acre site
- 280 companies on site
- 12,500 people on site

Semiconductors/photronics/5G & Li-Fi/digital services/AI/user experience technologies

GIANT Innovation Campus

- Established 1956
- 586-acre site
- 40 companies on site
- 15,000+ people on site

Energy/information & communications technology/health

ANSTO Innovation Precinct

- Established 2018
- 272-acre site with scope for further 740 acres)
- 37 companies on site
- 360+ people on site

Nuclear technologies/environment/human health

Critical success factors

The 2040 team analysed ten existing reports from the innovation cluster literature alongside the primary data from our eight case study campuses to look for common critical success factors (see Table 1). The campuses were diverse and their local contexts and

histories differed. Despite this heterogeneity a consistent group of success factors which featured repeatedly in our study and the broader literature were identified. Our analysis suggests six key factors underpinning successful campuses are as follows:

1. Long-term vision, actively led

Successful innovation locations frequently benefit from clear leadership and a long-term vision. Whether this originates from the public or private sector, a university and/or public research facility, it invariably relies on partnership between multiple organisations.

Developing a common ambition and long-term commitment from all stakeholders is crucial as innovation locations take time to develop.

The development of innovation locations is often linked to an individual (or small group) with the ability to drive the vision forward, due to personal commitment, charisma, and authority.

2040 Rating: 11/11

2. A sustainable supply of talent

Many successful innovation locations rely on a talent pipeline from universities and other educational institutes on site or nearby to build a long-term supply of high-skilled labour, supplemented by recruitment of mid-career and senior professionals from further afield, often internationally. It's important

to note that talent is not only about technical expertise. Enabling expertise in areas such as funding, communications, IP and real estate is crucial.

2040 Rating: 11/11

3. A culture of sharing, catalysed

Successful locations have a culture of sharing ideas between – and within – research and business communities. As the economist Alfred Marshall observed, that once the process of local specialised industrial concentration has begun, it becomes both cumulative and socialised such that “the mysteries of the trade become no mysteries; but are as it were in the air.”

Knowledge economy sharing takes different forms – it may be through formal or informal collaborations which operate within disciplines and/or between adjacent sectors where technologies are converging. Idea sharing is facilitated by physical infrastructure and ‘social engineering’ to create environments for individuals to ‘collide’ and form new ideas.

2040 Rating: 10/11





4. Places that buzz

Creating a community with a 'buzz' – rather than a 9am-5pm business park – helps to attract talented people and encourage them to interact. Common areas and shared public spaces within the innovation location are important

to this, as are wider contextual factors such as affordable housing, schooling, cost of living and campus accessibility.

2040 Rating: 10/11

5. Critical infrastructure & critical mass

The importance of critical mass on each campus shone through. One or two organisations isn't sufficient to create the flywheel effect seen in the most successful campuses. A critical mass of activity on campus is both a cause and consequence of 'success'. It's the mass and diverse range of size of organisations that reduces risk, with large organisations soaking up the talent and the small organisations developing new ideas and encouraging movement of talent between organisations.

Underpinning this is the right infrastructure to enable access – particularly sustainable transport options – alongside the technical infrastructure to support science and innovation.

Sometimes this is in the form of major 'anchor' facilities such as the European Spallation Source in Sweden. More frequently it is smaller scale wet labs, clean rooms or 5G that enable the business of science to happen quickly and efficiently.

2040 Rating: 9/11



6. Agility around a core competency

Successful innovation locations often have a competitive advantage in one or more areas to provide a USP.

This could be gained from the presence of specialist 'big science kit', the organic growth of likeminded organisations or a strategic decision to focus on emerging specialisms. Entry criteria for businesses and

research organisations can be used to build/maintain these core competencies – permission to say no to organisations that aren't aligned is important. As technology evolves however, the ability to adapt – as the Here East campus has around e-sports and build new communities is vital.

2040 Rating 8/11

Critical success factors – literature review

A range of papers on innovation districts were reviewed as part of the Campus 2040 project. Interesting similarities and differences in critical success factors were identified.

	SQW (2001)	Brookings Institution (2017)	PwC (2011)	Global Institute of Innovation Districts (2019)	HR&A Advisors, New Localism GIID (2020)
Core competency	X	X	X	X	
People: leadership, researchers, workforce	X	X	X	X	X
Culture: idea sharing and lifestyle	X	X		X	X
Business capabilities	X	X		X	X
Sophisticated demand		X			
Access to funding	X	X		X	X
Infrastructure provision	X	X		X	X
Regulatory environment		X			X
Core Inclusion-innovation link				X	X
Building critical mass				X	
Environmental sustainability / Net Zero principals					
Flexible spaces					

Royal Society (2020)	Satellite Applications Catapult (2021)	Savills (2021)	Connected Places Catapult (2021)	Arthur D. Little (2005)	2040 Report (2023)
X			X	X	X
X	X	X	X	X	X
X	X	X	X	X	X
X	X		X	X	X
X			X		X
X	X	X	X		X
X	X	X	X		X
X	X	X	X		X
			X		X
	X		X		X
			X		X
			X	X	X

Table 1: Success factors in relation to innovation locations - as identified in the literature.

Campus 2040: key themes

“Prediction is very difficult, especially if it’s about the future.”

Niels Bohr

The Campus 2040 project aims to prompt conversation about what our community hopes and wants campuses to become, not an attempt to predict what great campuses will be. Much like the innovators in our campuses, we hope to identify the pipeline of the possible and think forward to the practical and sustainable. Five key opportunities emerged from our research.



#1 From science places to innovation scientists

Several interviewees identified the potential to improve the science of places that create innovation.

Pioneer Campus 2040 will experiment with and invest in ‘facilitated serendipity’ and actively increase its effectiveness in terms of research translation and commercialisation.

It might, for example, attract (or even seed) a new generation of venture capitalists or early stage investors. It will also develop new relationships with institutional investors and/or major charitable trusts, given the risky and costly nature of commercialisation journeys.

Those responsible for Pioneer Campus 2040 might even start to precipitate a changing set of relationships around IP ownership, giving more flexibility and incentive for outstanding researchers to become entrepreneurs within wider campus ecosystems. In this context, the relationship with funders (and perhaps especially central government and its agencies) could change – becoming more enabling than controlling and unlocking the full potential of the assets on major campuses in the process.

#2 From pragmatic spaces to living laboratories

Campuses are, by definition, home to some of the world’s best scientists and engineers. They ought therefore to be responding to global agendas and developing new and different responses and Pioneer Campus 2040 will be part of the process.

There is scope to increasingly use campuses as ‘living laboratories’ responding to the challenges of the day and gaining critical insights in the process.

Campuses could increasingly host mini-modular or innovative power solutions, building on established expertise linked to the production

of energy. They could pioneer the design of new buildings and crucially, the retrofitting of existing ones. Finally, they could find zero carbon solutions for travel – both on campuses and from them to other centres of population. Active travel will be part of this, but so too will be the use of electric and autonomous vehicles and other solutions in respect of future mobility.



#3 From permission to partnership

It's clear that 'no campus is an island' – they are interconnected with regional ecosystems, and local communities. Public sector bodies more broadly will also be crucial to the success of Pioneer Campus 2040 by creating the opportunity for the researchers and businesses to build an effective campus. This applies at national, regional/state and local levels of government and encompasses the facilitation or direct delivery of transport, digital and energy infrastructure, housing and schools and leisure amenities.

The provision of these assets on, or in close proximity to, the campus will help drive its success.

Innovative governance models that ensure community engagement and community benefits from the campus will be increasingly important.

In this context, it will also continue to be underpinned by a strong and increasingly mature relationship with the state – locally and nationally.

#4 From sector focused to challenge focused

Pioneer Campus 2040 will have a greater focus on societal challenges. Much of the history of many campuses has been linked directly or indirectly to defence and national security and this may need to continue given global uncertainty. But it is also possible that wider societal challenges will come to the fore; the consequences of ageing populations could certainly be one and issues linked to Net Zero are likely to be a second.

We're seeing more connectivity across sectors, with different sectors working more closely than ever before, leading to technology

designed for one sector inspiring breakthroughs in another. For example the tech sector is playing an increasing role in the growth of the life sciences sector.

Whether it be 3D printing revolutionising the potential of medical devices or the rise in quantum computing in drug development, we're seeing some lab space scaled down in favour of another type of lab space, and the location and characteristics of assets are playing a growing role too.

#5 From relative opacity to radical accessibility

Many of the featured campuses have done incredible work to make themselves more welcoming, providing social spaces on campus, and actively connecting with their local communities. Nonetheless, taxpayer investment in science and innovation is likely to increase in many countries, the argument for significantly increasing the accessibility of leading campuses on a range of fronts becomes clear.

Increasingly, the design of campuses will make them physically more accessible and there will be fewer and fewer 'castle and moat' arrangements.

Of course, imperatives around agility sit uncomfortably with ongoing requirements surrounding site security. While security concerns will not disappear, new approaches to managing them will be important.

Pioneer Campus 2040 will be a place where talented people are stimulated to excel and can thrive – irrespective of their gender, class, nationality, ethnicity, age or any other factor that deters effective participation. Indeed the diversity of the workforce associated with Pioneer Campus 2040 should itself be a catalyst for innovation. Campus managers can do much to effect greater diversity, but this – like many other aspects of the route to Pioneer Campus 2040 – needs to be a shared endeavour. At a local level, there will be a need to work more effectively with local government and local communities. Central government will have a role to play too. Policies around visas and training will, for example, have a major bearing on the shape of Pioneer Campus 2040.

Questions for those that care about the future of campuses

The trends and opportunities in this report don't present neat answers for the leaders of science and innovation campuses, but they do raise powerful questions.

How can we experiment on our campuses with what works for innovation?

- Can we make it easier to test prototypes and ideas on our campuses?
- Can we innovate with new IP models?
- How can we more intentionally design buildings to foster interaction?
- Can we respond to societal challenges more coherently?

How can campuses proactively build stronger and more resilient partnerships locally, nationally and globally?

- How can we work with local government in a long-term way and maximise the benefits of each campus for our local communities?
- How can national government better support the campus environment, alongside their support of R&D?

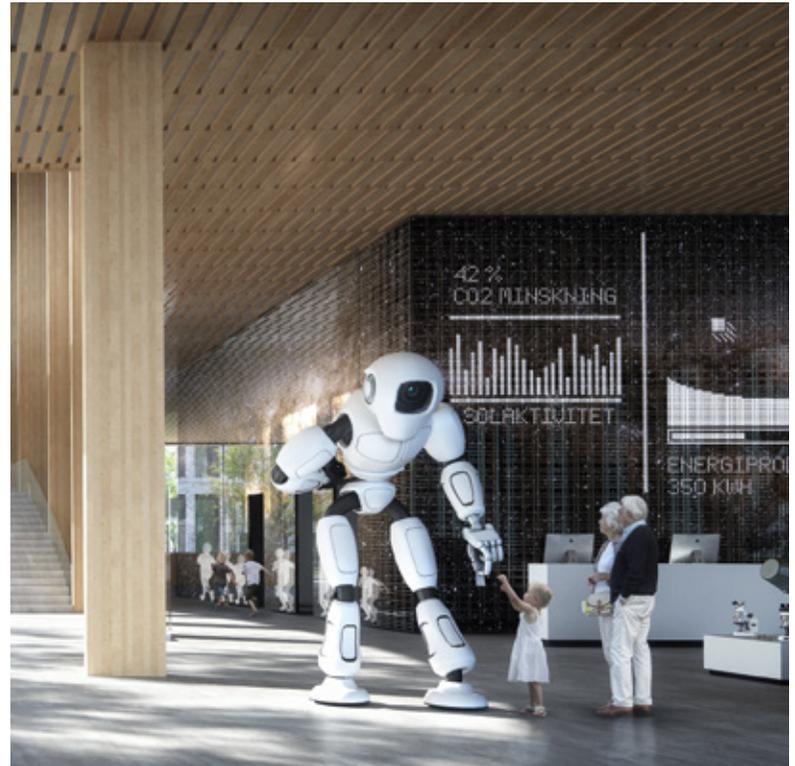
How can we make our campuses more liveable, and more active parts of their local communities?

- Are we planning for the workforce of the future and the norms and expectations that will come with the next generation rather than the previous one?
- How can a greater proportion of our local communities engage with the work happening on campus?
- Can we improve the user experience of campus life?
- How can we take down barriers and maintain operational security?

How can we build connections between our campus communities at multiple levels?

- How can we facilitate serendipity beyond business-as-usual networking?
- How can we encourage interdisciplinary connection and collaboration?
- How can we connect different career stages?

1



2





3

4



Conclusion: the campus opportunity

In many ways, the key ingredients of successful innovation clusters are well established. Alfred Marshall set out cluster theory in his 1890 book *Principles of Economics* – outlining the idea that, while individual organisations might be creative and successful on their own, collaboration with others makes them stronger in the long run. Scholars such as Michael Porter at Harvard Business School, have deepened this work.

The recipe for successful science and innovation campuses has similarities to that for regional clusters, but there are important differences. The 2040 report and this summary document, aim to catalyse conversation and further innovation in the campus community.

Consistent foundational success factors were identified that seem likely to be as central to success in 2040 as they are today: long-term vision, leadership, talent, culture, critical mass, agile expertise and energetic, ‘buzz-filled’, environments.

Campus 2040 also identifies promising opportunities for the stewards of leading campuses. Whether by more actively facilitating innovation, leaning in to societal challenges, deepening partnerships or radically increasing accessibility the potential for pioneering campuses to deepen their impact is clear.

The full report findings can be downloaded from harwellcampus.com/campus2040

- 1 Lund Science City
- 2 The Institute of Imagination
- 3 Scientist at work – ARC Oxford
- 4 Giant Campus – Grenoble

HARWELL

The UK's leading science and innovation campus

Acknowledgements:

David Crichton-Miller
Christine Doel
Lee Glassbrook
Daniel Metcalfe
Michelle Miles
Tim Moonen
Kathryn Page
Donald Ross
Bill Wicksteed