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科技及創新政策研究中心

粵港澳大灣區
院士聯盟
The Greater Bay Area
Association of Academicians

研究報告

在北部都會區建設大學城 推動香港創科新經濟發展

Building a University Town in the Northern Metropolis to Promote the Development of Hong Kong's New Innovation and Technology Economy

The Hong Kong Polytechnic University
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The Greater Bay Area Association of Academicians – Innovation and Technology Policy Research Collaboration Scheme

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《在北部都會區建設大學城，推動香港創科新經濟發展》

Research Report

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I. Executive Summary

This report evaluates the potential for developing a university town in Hong Kong's Northern Metropolis to advance Hong Kong's emerging innovation and technology (I&T) economy. The rationale includes meeting Hong Kong's local needs and integrating with China's national development strategies. Along with reviewing Hong Kong's I&T policy background and development blueprint, analysing case studies of successful global university towns, and gathering stakeholder perspectives from eight Hong Kong universities, the research indicates a thoughtfully developed university town will substantially boost Hong Kong's I&T economy, despite expected challenges. Whilst issues remain regarding the university town's construction and operation, this project can significantly promote Hong Kong's development into an international I&T hub. Key findings and recommendations are made regarding fostering talent, addressing land constraints, promoting industry partnerships, leveraging strategic locations, learning from global best practices, and gathering stakeholders' perspectives to inform balanced policymaking in order to ensure success. To support government planning, this report distils its key findings and makes six sets of policy recommendations.

Key findings:

1. **Reasons Why Hong Kong Needs a University Town**

   Hong Kong faces a shortage of science, technology, engineering, and mathematics (STEM) talent, with a gap of over 200,000 skilled workers estimated by 2030. Local universities have limited space to expand teaching and research due to acute land constraints. The "Northern Metropolis Development Plan" provides a prime chance to solve these difficulties, with proximity to Shenzhen uniquely positioning Hong Kong to integrate with the innovation, infrastructure, industries, and living spheres of the Greater Bay Area (GBA).

2. **Policy Advantages and Strategic Development Opportunities**

   National policies aim to develop Hong Kong into an international I&T hub, providing strong support for major investments in a university town. The Northern Metropolis development presents a strategic opportunity to concentrate intellectual capital and infrastructure in a thoughtfully planned university town that can advance collaboration.

3. **Worldwide experience**

   In-depth global case studies reveal how comprehensive planning, facilities, and integration with local innovation ecosystems enable leading university towns worldwide to become thriving talent and technology hubs. The lessons learned can help Hong Kong to better build a university town in the Northern Metropolis.

4. **Stakeholder Unity**

   Despite nuanced perspectives, diverse local stakeholders are united on the Northern Metropolis University Town's immense potential as an intellectual and economic fulcrum, if insights are synergised through tailored policymaking.

A strategic approach to building a university town in the Northern Metropolis

Synthesising extensive literature, illuminating global case studies, and insightful local interviews, we propose establishing university innovation hubs as a new asset-based strategy for the Northern Metropolis University Town. These hubs are defined as concentrated nodes centred on anchor research institutions to strengthen university-industry collaboration, amplify research impact, and attract exceptional talent worldwide. Although Hong Kong has limited experience in developing its I&T sectors, it is strategically positioned as a regional education and research hub, home to world-renowned universities and possessing robust research and development (R&D) capabilities. To build clear competitive advantages, it is imperative to fully leverage the potential of universities and research institutions to cultivate dynamic university-industry-government partnerships that turbocharge I&T development.

Policy recommendations:

1. **Start planning the layout early to facilitate overall planning of the Northern Metropolis**
   - Set up dedicated offices to collect suggestions and coordinate planning for the university town's development.
   - Align with the three key industries in the Northern Metropolis and provide necessary talents and technical support.

- Encourage universities to propose development plans based on their strengths and needs. Initiate the planning process for the university town in the Northern Metropolis early.

2. Rationale for Scale Study Planning

- Optimise scale based on available funding to ensure that the funding can support the whole project.
- Analyse land supply and design appropriate scale.
- Schedule its development in phases to gradually achieve scale and aggregation effects.
- Make reasonable arrangements for the distribution of the university town based on industrial development plans.

3. Promoting Industry-University-Research Cooperation and Technology Demonstration Research

- Collect industry talent demands and cultivate urgently needed talents. Collaborate with companies to jointly train research students.
- Universities can provide targeted short-term talent training and offer courses on emerging technologies.
- Increase funding to incentivise university-industry collaboration and create synergies.
- Provide scenarios and funding for technology demonstration and validation.
- Promote the translation of R&D achievements into products, and realise the commercialisation of technologies.
- Formulate mechanisms for reasonable distribution of benefits in university-industry collaboration to motivate researchers and facilitate sustainable university development.

4. Simultaneous planning of supporting facilities

- Strengthen regional supporting planning and establish a special group to coordinate the construction of university towns and surrounding supporting facilities.

- Satisfy the rigid demands of top talents for housing, transportation, healthcare, education, culture, and leisure to create a liveable environment.
- Build a community atmosphere and provide a good quality of life.
- Introduce attractive policies to draw and retain talents, addressing issues like housing, healthcare, and education for children.

5. Create a good science, technology, and innovation ecology

- Attract and encourage more young people to study science, technology, and innovation-related subjects through financial incentives like teaching allowances or interest-free loans.
- Streamline administrative procedures for scientific research projects to increase researchers' initiative.
- Establish distinctive innovative activity exclusive to the northern metropolitan area, provide platforms for talent exchange and activities to facilitate communication among talents.
- Simplify procedures for tech talents to travel between mainland China and Hong Kong.

6. Promote legal safeguards and governance structures

- Provide clear legal guarantees for the university town's development to ensure continuity and sustainability.
- Set up dedicated government bodies to coordinate and manage the development and address related issues promptly.
- Standardise the construction and operation mechanisms of the university town to ensure sustainable development.

II. Background

This study analyses the potential for developing a university town within Hong Kong's Northern Metropolis to promote I&T, providing policy recommendations to the government. It examines the complex factors involved in transforming the Northern Metropolis into a leading technology hub according to the broader economic development strategy.

With reference made to our country's policy support for Hong Kong, as underlined in the "Outline of the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Long-Range Objectives Through the Year 2035" (the 14th Five-Year Plan) and the "Outline Development Plan for the Guangdong-Hong Kong-Macao GBA" (the Outline Development Plan), the Hong Kong SAR Government (the Government) proposed to expand and consolidate the Northern Economic Belt to become the Northern Metropolis in the report entitled "Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030". Published on 6 October 2021, the "Northern Metropolis Development Strategy Report" outlined the blueprint for developing the Northern Metropolis.

Capitalising on the geographical advantages of the Northern Metropolis being adjacent to Shenzhen and thus the synergy of integrated development of the two cities, the Government will dedicate effort to build a complete I&T industry ecosystem and to develop the I&T industry into Hong Kong's second economic engine. The Northern Metropolis will also be developed into a region that will be good for people to live, work, and travel. According to the Government's estimate, the Northern Metropolis will eventually accommodate about 2.5 million residents and provide about 650,000 jobs, of which about 150,000 (about 23.1%) will be jobs in the I&T industry.

The Northern Metropolis Development Strategy also proposed that advanced steps should be taken to plan for major territory-wide and region-based facilities, such as tertiary educational institutions, private hospitals, and recreational facilities, at suitable areas and locations. Indeed, international examples have demonstrated that clusters of tertiary educational and advanced research institutions can significantly contribute to the development of I&T industries and inject vibrancy into city development.

It can be seen that the Northern Metropolis will play a pivotal role in the future of Hong Kong's I&T industry and economic development. It is a vast and long-term development project, involving a wide range of areas, fields, industries, and levels that requires a complete and comprehensive development plan to achieve the visions and goals of the Government.

On the road to developing the I&T industry in the Northern Metropolis, formulating a series of policies on technological research infrastructure, cultivation and attraction of technological research talents, establishment of I&T businesses, and so on are indispensable and closely linked to the overall infrastructure and facilities within the Northern Metropolis. Many sectors of our society have different opinions on, and proposals for, the development policy of the Northern Metropolis.

A university town can be defined as a cluster region formed by local, international, and mainland Chinese universities, scientific research institutions, and enterprise research centres. The geographical location of the university town can be reasonably distributed in combination with the industrial planning of the Northern Metropolis to maximise synergies. This clustered ecosystem of diverse academic and research institutions, aligned with the surrounding economic priorities, is the essence of an effective university town. Some have advocated for building a university town in the Northern Metropolis in which local tertiary institutions can set up their branches to cultivate a wide array of professionals needed for the future development of Hong Kong.

Many cases worldwide have shown that a cluster formed by higher education and technological research institutions can effectively promote and foster I&T development. This study aims to systematically analyse and discuss the development, direction, and potential of building a university town in the Northern Metropolis under the framework of the Northern Metropolis Development Strategy. In addition, it also seeks to provide recommendations on the formulation of relevant policies for the Government.

III. Hong Kong's Need for a University Town

Hong Kong aims to become a global I&T hub, but currently faces a shortage of science, technology, engineering, and mathematics (STEM) talent estimated at 200,000 workers by 2030. Even with increases in STEM graduates, factors like 'brain drain' mean that more talent needs to be nurtured. A university town can help achieve this by connecting industry and higher education to promote talent retention, student opportunities, and local economic benefits.

Hong Kong universities also face acute land shortages, hampering expansion of teaching and research facilities. Creative underground expansion has provided some relief but more space is needed. The "Northern Metropolis Development Plan" provides a prime opportunity to address this, with the Northern Metropolis's proximity to Shenzhen uniquely positioning it to better integrate Hong Kong with the GBA in terms of innovation, infrastructure, industry, and living environment. Its location makes it an ideal bridge between Hong Kong and mainland China by facilitating collaboration and knowledge exchange through the planned Innovation and Technology Park; enhancing connectivity via new transport links; jointly developing strategic industry clusters to boost economic momentum, including expansion of financial services with Qianhai; and providing comprehensive housing, healthcare, education, leisure, and tourism facilities.

The Government has committed an unprecedented HK$150 billion to I&T development and Northern Metropolis infrastructure, cementing Hong Kong's role as a leading Asian hub for I&T success. This includes huge funds for strategic investments, talent attraction, manufacturing upgrades, enterprise growth, and infrastructure.

3.1. Fostering Talent

Hong Kong has set its sights on becoming a global I&T hub. However, for that to occur, the city has to increase its number of STEM-trained talents to bridge the gap between talent demand and supply. Additionally, according to Hong Kong Science and Technology Parks spokesman, the "technopole" in the Northern Metropolis will create at least 165,000 jobs, with 120,000 of these jobs being I&T-related.

Based on University Grants Committee statistics, this gap can only be filled by increasing the current and projected number of STEM-based graduates. From 2015 to 2022, Medicine, Dentistry, and Health students increased from 10,389 to 12,547, Science students increased from 15,880 to 18,313, and Engineering and Technology rose from 19,006 to 19,364. Even with the 49,866 STEM talents who graduated in 2022, factors such as trending population loss due to aging, retirement, and the proportion of graduates who do not enter the workforce should be accounted for. Indeed in 2022, Hong Kong experienced its highest net population loss since 1991. This is reflected in the almost 50% increase in information and communications job vacancies (UGC, 2022).

Coupled with the brain drain that Hong Kong is facing and the increased demand for I&T talent, there remains the fact that this talent must be sourced from somewhere. As primary and secondary school students are geared to consider I&T pathways enthusiastically, universities must have the resources and abilities to continue nurturing this talent. This is where the pool of resources and facilities provided by a Northern Metropolis University Town will come into action.

3.2. Current Insufficient Land Capacity

The acute shortage of land is felt not only in the housing sector but also in the higher education sector. Hong Kong has five higher education institutions ranked in the top 100 of the QS World University Rankings. Universities feel pressured to reflect this reputation, but they cannot easily expand teaching and research spaces due to land shortages. According to HKUMed's Director of Development and Infrastructure, Professor Chan Ying-shing, HKUMed desires a larger research lab to meet international standards and "there is also a lack of laboratories for research." In addition, student enrolment has tripled in some faculties in the last twenty years, but campus size has not matched this rate of expansion, placing pressure on universities to find space. Tables 1 and 2 provide a contemporary snapshot of the campus size, total student enrolment, and total faculty headcount at Hong Kong's eight UGC-funded universities and two overseas studies, which are studied in Chapter five of this report, respectively.

In the last two decades, Hong Kong's top research universities have resorted to creative measures such as digging underground and moving existing infrastructure to construct facilities. One notable example of this is Hong Kong University's Centennial Garden Campus which was established by digging underground caverns to relocate the Western Freshwater Service Reservoir and release usable land for construction. Working within Hong Kong's space constraints, universities have also approached strengthening development by setting up campuses in China.

This is a unique milestone project for land use, as there is currently a lack of tangible and significant space that the top universities can collaboratively share and conduct research activities in. Achieving a community like this will allow for an efficient solution to the land shortage issue that universities face, facilitate multilateral innovation, and grow an innovation economy.

Table 1: 8 UGC funded Hong Kong Universities' campus size, total student enrolment, and total faculty headcount

University Name	Campus size (in hectares)	2021/22 student enrolment (sub-degree, undergraduate, research and taught postgraduate)	2021/22 faculty headcount (staff employed in academic departments)	2021/22 average school area available to students and staff (in square meters)
Chinese University of HK	137.3	20,175	5,829	53
University of Hong Kong	14	20,696	6,792	5
City University of Hong Kong	15.6	13,491	3,119	9
Hong Kong Polytechnic University	9.2	17,489	4,931	4
Hong Kong University of Science and Technology	60	11,462	2,924	42
Hong Kong Baptist University	12.88	7,724	2,145	4
Education University of Hong Kong	12.5	7,653	1,491	14
Lingnan University	8.6	2,777	795	24

Table 2: Global case study universities' campus size, total student enrolment, and total faculty headcount

	Campus size (in hectares)	2021/22 student enrolment (undergraduate and postgraduate)	2021/22 faculty headcount (staff employed in academic departments)	2021/22 average school area available to students and staff (in square meters)
Stanford University	8,180	17,326	2,304	4,169
University of Tsukuba	258	16,542 (as of 2021)	4,608 (as of 2021)	122

3.3. Industry and Higher Education Connectivity

A university town will facilitate a 'Town-Gown Relationship'. This relationship refers to the connectivity between industry and higher education, promoting community building, talent retention, and local economic benefits. The nature of the relationship varies by town; however, it implies a community dynamic between the town and adjacent universities.

This dynamic allows for university-business partnerships, which are important for talent retention and student satisfaction, benefiting both industries and higher education institutions. The key benefit of placing industries in the locality of academic institutions is the fostering of community. One case study reported that participants who resided in university areas where they were interested in obtaining local summer employment felt a larger sense of belonging in their community. In the long term, this supports student retention in the local area. The symbiotic relationship between higher education institutions and industries allows for talent retention. According to a case study conducted in Florida, human creativity, or I&T human talent, fosters the growth and development of cities. When "creative" talent is centred in one region, "rather than jobs forcing people to relocate, companies cluster in order to draw from the concentrations of talented people."

The benefit for students, on the other hand, is that industry partnerships allow for a thriving networking environment. This means that students can find the best opportunities suited to their I&T interests. This is also beneficial to the Government as it will allow universities

to connect their research to social needs through collaboration with industry and the local community. This aligns with the 14th Five-Year Plan's goals for Hong Kong's I&T development.

The industry partnerships present in university towns can be structured with the support of the government, creating a university-industry-government "triple helix" that will create a cohesive innovation ecosystem. As the selected case studies of this report will demonstrate, much of the innovation-driven economic success arose from industry partnerships that universities formed — through university towns.

3.4. The Northern Metropolitan Area as a Prime Location for GBA Connectivity

According to the Outline Development Plan, released in 2019, to fully leverage the comprehensive advantages of Guangdong, Hong Kong, and Macao, deepen cooperation between the mainland and Hong Kong and Macao, and support the integration of Hong Kong and Macao into national development, cooperation among cities in the GBA will be continuously promoted in aspects such as innovation, infrastructure, industrial systems, ecological civilisation, and living circles under the principle of "One Country, Two Systems". The plan addresses and resolves prominent discrepancies, such as excess production capacity and imbalance between supply and demand structures, that currently exist between cities in the GBA. For example, Hong Kong's economic growth lacks sustained and stable support. Efforts will be made to make the GBA a world-class bay area and city cluster participating in the international competition system and leading China's economic, innovation, science and technology, and institutional development.

Hong Kong's economy is predominantly service-oriented, with the service industry accounting for 93.4% of its gross domestic product (GDP) in 2022 (Yeung, 2023). Since the outbreak of the COVID-19 pandemic, Hong Kong's economy has been severely impacted; its real GDP decreased by 6.5% in 2020, a significant intensification from the 1.7% decrease in 2019 (Yeung, 2023). This situation requires comprehensive restructuring and transformation measures to address the challenges it presents and facilitate sustainable

growth. Re-industrialisation is one of the solutions proposed by the Government. In December 2022, the Government released the "(香港創科發展藍圖, 2022)" (the "I&T Blueprint"), which outlined the next five-to-ten years of I&T development in Hong Kong. The I&T Blueprint aims to strength the I&T ecosystem, propel "new industrialisation", augment the pool of I&T talent as a catalyst for robust growth, foster digital economy expansion, transform Hong Kong into a smart city, and actively integrate Hong Kong with the overarching national development agenda, whilst nurturing its role as a bridge connecting mainland China and the global community.

If Central is Hong Kong's bridge to the world, then the Northern Metropolis will become Hong Kong's bridge to the mainland. These two bridges will connect Hong Kong from north to south and will drive the development of a series of industries along the way, including infrastructure construction, housing supply, healthcare systems, and education redistribution. This will play a crucial role in upgrading Hong Kong's economy and industries.

The Outline Development Plan also mentions supporting enterprises, universities, and research institutes in Guangdong, Hong Kong, and Macao to jointly build high-level collaborative innovation platforms and promote the translation of scientific and technological achievements into deliverables and products. Sha Tin Science Park is undoubtedly a good location for this, and serves as a good example. This area will also help deepen innovation cooperation between Guangdong, Hong Kong, and Macao, gather international innovation resources, enhance the ability to translate scientific and technological achievements into deliverables and products, and strengthen cooperation in scientific and technological innovation. Currently, there seems to be a lack of a platform or region for coordinating these activities, and the University Town may be a potential choice.

3.5. HK I&T and Northern Metropolis Development Investment by Government statistics

Table 3: Development indicators

	Development Vision	2016 (Figures of 2014)	2022 (Figures of 2020)	2027 (Figures of 2025)	2032 (Figures of 2030)
1. R&D					
1.1	Gross Domestic Expenditure on R&D (GERD) as a ratio to GDP	0.74% (HK$16.727 billion)	0.99% (HK$26.554 billion)	1.3%	2%
1.2	GERD per capita	HK$2,306	HK$3,575	HK$5,000	HK$9,000
1.3	Public: Private Ratio of R&D Expenditure	56:44	58:42	50:50	40:60
2. Start-ups					
2.1	Number of start-ups operating in co-working spaces, incubators and accelerators	1 065	3 755 (2021)	About 5 000	About 7 000
2.2	Number of unicorn enterprises (accumulative)	0	12	18	30
3. Talent					
3.1	Number of I&T practitioners	35 450	45 310	60 000	No less than 100 000
3.2	Number of I&T practitioners per 1 000 labour force	9.15	11.56	16.54	28.05
4. Industry development					
4.1	Contribution percentage of manufacturing sector to GDP (at basic prices)	1.2%	1.0%	1.5%	5%

Note. Sourced from the Hong Kong Innovation and Technology Development Blueprint.

The Government has made an unprecedented strategic push to develop the city into a leading I&T hub. Massive funds of HK$150 billion have been committed, including the

US$22 billion Hong Kong Growth Portfolio and HK$5 billion Strategic Tech Fund. Attracting talent is a key focus, with expanded research subsidies and allowance increases up to HK$35,000 for highly skilled researchers. The Top Talent Pass Scheme aims to draw premier global talent as well.

Boosting manufacturing is supported through the Re-industrialisation Funding Scheme, providing matching subsidies up to HK$15 million for setting up smart production lines. The new HK$30 billion Co-Investment Fund also makes strategic investments to attract enterprises to scale up operations in Hong Kong. Venture capital and startups receive support via HK$2 billion in government matching funds, which have drawn over HK$7.4 billion in private capital.

Smart city development is progressing through the 10 million-user Faster Payment System and major infrastructure projects like reserving space for a future high speed rail station. With substantial funding, talent incentives, enterprise support, and next-gen infrastructure, this strategic push aims to cement Hong Kong as Asia’s premier hub for innovation, technology, and economic success.

IV. To review and study I&T development in Hong Kong and the GBA

The 14th Five-Year Plan positions Hong Kong as an international I&T hub. In response, the Government has released the "Northern Metropolis Development Strategy Report" outlining plans to develop the area into a metropolitan city with I&T as its economic engine. Establishing a university town here can promote Hong Kong's I&T development. The "I&T Blueprint" provides a roadmap for developing the ecosystem, and the University Town can help achieve key strategies around enhancing research capabilities, fostering an entrepreneurial culture, attracting talent, and enabling academia-industry collaboration. The "Hong Kong Smart City Blueprint 2.0" (the "Smart City Blueprint") also provides guidance on leveraging technologies like smart mobility, living, environment and governance to improve quality of life and sustainability. Learning from global university town experiences reveals important success factors: integrating the university seamlessly into urban planning; developing the surrounding ecosystem with research parks and incubators; promoting multidisciplinary collaboration across academia and industry; phased development with long-term vision and short-term goals; attracting international talent; ensuring connectivity and transport links; enabling university-industry partnerships and commercialisation; embedding sustainability principles; and governance by an independent body. With astute planning and implementation, the University Town in the Northern Metropolis can become a catalyst for Hong Kong's development as a global I&T hub. It can nurture home-grown technological capabilities and talent, enable impactful research, support technology commercialisation and knowledge-based industry growth, provide a vibrant ecosystem for startups and entrepreneurs, and increase Hong Kong's competitiveness and strategic value as a world city. The University Town will also exemplify how smart city technologies can enhance quality of life and environmental sustainability. By learning from global best practices, the University Town can be thoughtfully developed into a key driver of Hong Kong's future. Some companies and organizations offer help to develop Hong Kong's I&T development, such as Hong Kong Science & Technology Parks Corporation, Hong Kong Cyberport Management Company Limited and The Hong Kong Productivity Council. Besides, the importance of government actions and initiatives cannot be ignored.

4.1. Hong Kong and the GBA as a future International I&T Hub

The 14th Five-Year Plan, published in March 2021, illustrates the role and important position of Hong Kong in the development of the country. In addition to consolidating and enhancing the development of Hong Kong as four traditional centres – International Financial Centre, International Trade Centre, International Shipping Centre, and Centre for International Legal and Dispute Resolution Services in the Asia-Pacific Region – it is more important to add four new centres to enhance, build, and develop, including an International Aviation Hub, International Innovation and Technology Centre, Regional Intellectual Property Trading Centre, and East-meets-West Centre for International Cultural Exchange.

In response to the mission of establishing the International Innovation and Technology Centre, the Hong Kong government has already taken action in planning and development. As early as 2017, the Hong Kong government signed a the "Memorandum of Cooperation on Promoting the Joint Development of the Lok Ma Chau Loop Area between Hong Kong and Shenzhen" with the Shenzhen Municipal People's government, laying a solid foundation for the next stage of development in northern Hong Kong. In October 2021, the government released the "Northern Metropolis Development Strategy Report", which clearly stated that it planned to develop Northern New Territories into a metropolitan area that is a good place for people to live, work, and travel. With I&T industry as its economic engine, this will serve as Hong Kong's second economic belt outside of Central and provide a better opportunity to integrate Hong Kong into the overall development of our country, as shown in **Error! Reference source not found.**.

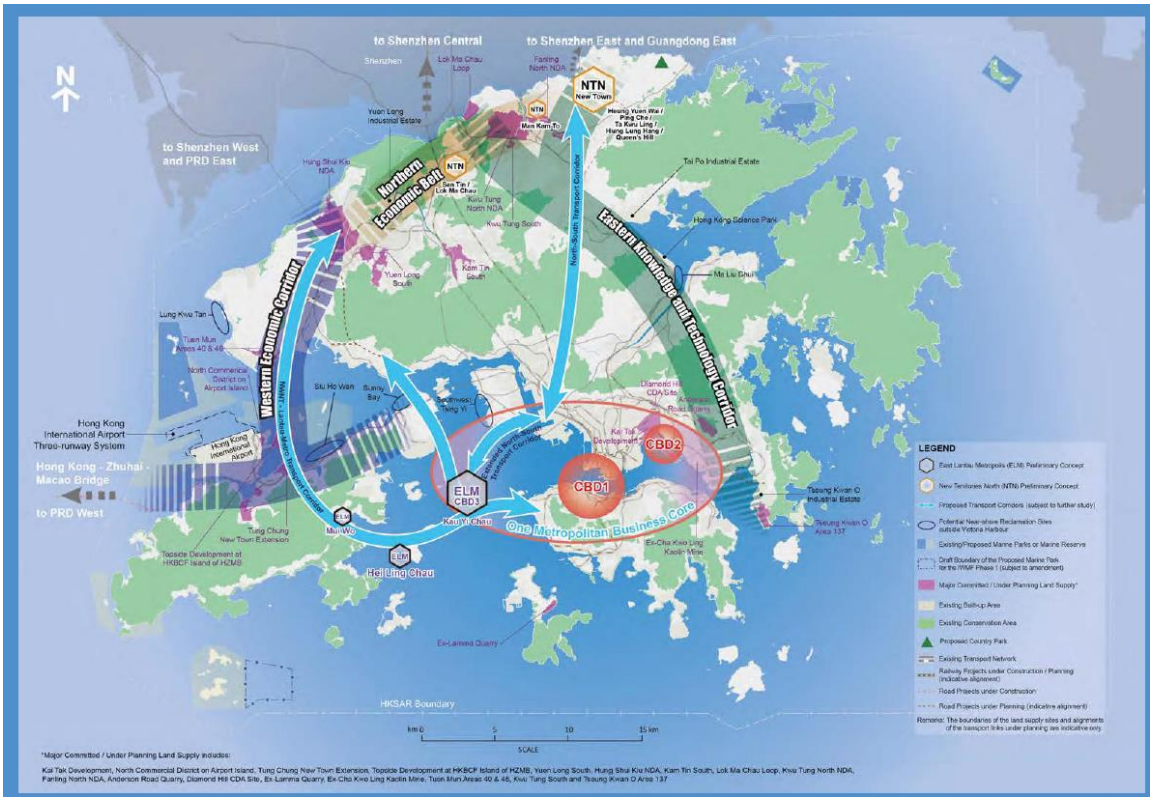

Figure 1: Conceptual Spatial Framework| source: Northern Metropolis Development Strategy Report, 2021

4.2. Hong Kong's existing I&T resources and institutions

According to the Global Innovation Index (WIPO, 2022), Hong Kong remains in a world-leading position, ranked from 11th to 14th in the recent years thanks to Hong Kong's I&T resources and institutions. Hong Kong's high quality of university education is well-known all over the world because it has the highest concentration of high-quality universities (5 world top 100 universities), surpassing international metropolises, including London, New York, Tokyo, etc. Besides, Hong Kong possesses 6 Hong Kong Branches of Chinese National Engineering Research Centres, 7 Research and Development Centres, 16 State Key Laboratories and 22 Chinese Academy of Sciences (CAS) Joint Laboratories, which provide various types of platforms for scholars and researchers to further research and transform their innovative ideas into practices, thereby attracting high number of world-renowned scholars and experts with proven track records, marked with revolutionary and forward-looking outcome in their respective fields.

Some companies and organizations offer help to develop Hong Kong's I&T development, such as Hong Kong Science & Technology Parks Corporation, Hong Kong Cyberport Management Company Limited and The Hong Kong Productivity Council. Besides, the importance of government actions and initiatives cannot be ignored. HKSAR established the Innovation, Technology and Industry Bureau to transform Hong Kong into a knowledge-based economy development and an innovation hub for technology and released 3 blueprints related to I&T development, including Smart City Blueprint, Smart City Blueprint 2.0 and Innovation and Technology Blueprint. Other resources associated with innovation and technology are shown in Table 4, like innovation infrastructures and support schemes.

Table 4: Hong Kong's existing scientific and technological resources and institutions

Type	Name	Description
Institutions, research centres and laboratories	5 world top 100 universities	• Hong Kong University • Chinese University of Hong Kong • City University of Hong Kong • Hong Kong University of Science and Technology • Hong Kong Polytechnic University Attract high number of world-renowned scholars and experts who possess revolutionary and forward-looking outcome in their respective fields
	Hong Kong Science & Technology Parks Corporation	Established in 2001, providing holistic and comprehensive services to meet the needs of companies at different stages
	Hong Kong Cyberport Management Company Limited	Owned by the Hong Kong SAR Government, cultivating talent, promoting entrepreneurship among youth, supporting start-ups, fostering industry development by promoting strategic collaboration with local and international partners, and integrating new and traditional economies
	The Hong Kong Productivity Council	A multi-disciplinary organisation, market-led applied R&D in smart products, smart manufacturing, automation, new materials, surface treatment, smart mobility, green transportation and environmental technology and providing consultancy, technology transfer, training and other support services

	7 Research and Development Centres	• The Automotive Parts and Accessory Systems R&D Centre • The Hong Kong Research and Development Centre for Information and Communications Technologies • The Hong Kong Research Institute of Textiles and Apparel • The Hong Kong R&D Centre for Logistics and Supply Chain Management Enabling Technologies • The Nano and Advanced Materials Institute Limited • The Advanced Manufacturing Centre (in the coming years) • The Microelectronics Centre (in the coming years)
	6 Hong Kong Branches of Chinese National Engineering Research Centres	Chinese National Engineering Research Centres (CNERCs) serve as major impetus in providing engineering research and consultancy support to the industries, like National Rail Transit Electrification and Automation Engineering Technology Research Centre and National ASIC System Engineering Research Centre
	16 State Key Laboratories	The State Key Laboratory (SKL) scheme is one of the major national science and technology development schemes and today Hong Kong has 16 laboratories, like Chemical Biology and Drug Discovery hosting by Poly U, heading by Prof WONG Kwok-yin.
	22 Chinese Academy of Sciences (CAS) Joint Laboratories	Aimed for work together on highly specific scientific topics between Hong Kong universities and CAS research institutes, like the CAS AMSS-PolyU Joint Laboratory of Applied Mathematics
	7 Hong Kong campuses and facilities spreading across the GBA	• Zhuhai (the Hong Kong Baptist University) • Longgang, Shenzhen (campus and hospital of the Chinese University of Hong Kong) • Nansha, Guangzhou (the Hong Kong University of Science and Technology) • Foshan (the Hong Kong Polytechnic University) • Dongguan (the City University of Hong Kong)

		• Nanshan and Futian, Shenzhen (campus and hospital of the University of Hong Kong) • Zhaoqing (the Hong Kong Metropolitan University)
	The Greater Bay Area Association of Academicians (GBAAA)	Established on April 1, 2021 as a non-profit organization registered in Hong Kong. Combining Hong Kong's strengths in scientific research and its advantages as an international city and aimed to bring together leading scientists in the region to foster cross-disciplinary exchange and collaboration and promote technology and popular science education
Infrastructures	Hong Kong Science Park	Located in Pak Shek Kok, cover an area of 22 hectares, more than 1,100 technology companies and over 11,000 R&D practitioners, providing advanced equipment and software platforms in support of R&D work and stimulating professional exchange, investor matching, business development and commercialisation
	Cyberport	Hong Kong's digital technology flagship and incubator for entrepreneurship with over 1,900 members including over 800 onsite and close to 1,100 offsite start-ups and technology companies.
	The Data Technology Hub	Located in Tseung Kwan O Industrial Estate (TKOIE), aimed to accommodate uses ancillary or complementary to the data transfer operations and global telecommunications
	The InnoCell	Near to the Science Park, and providing around 500 residential spaces with flexible design and facilities such as shared workspaces
Initiatives	Innovation and technology fund (ITF)	there are 17 funding schemes under the *ITF*, with various objectives including supporting R&D, facilitating technology adoption, nurturing technology talent, supporting technology start-ups and fostering an I&T culture, like *Innovation and Technology Venture Fund* (*ITVF*) and *Technology Start-up Support Scheme for Universities* (*TSSSU*)
	Technology Talent Admission Scheme (TechTAS)	Started at May 2018 and provided fast-track arrangements for overseas and mainland research and development talent.

	STEM Internship Scheme	Launched in 2020, encourage STEM students to gain innovation and technology ("I&T")-related work experience during their studies and to foster their interest in pursuing a career in I&T after graduation
	Reindustrialisation and Technology Training Programme (RTTP)	Launched in August 2018, RTTP aims to subsidise local enterprises on a 2(Government):1(enterprise) matching basis to train their staff in advanced technologies, especially those related to "Industry 4.0".
	Government blueprints	released • *Hong Kong Smart City Blueprint* in December 2017 • *Hong Kong Smart City Blueprint 2.0* in December 2020 • *Hong Kong Innovation and Technology Blueprint* in December 2022

4.3. The “I&T Blueprint as a Roadmap

Research is an important part of the I&T ecosystem. Without research and innovation development, it is difficult to drive the vigorous development of the I&T industry. Universities in Hong Kong undertake the role of upstream and midstream research in the I&T ecosystem, whilst public research and commercial institutions are mostly engaged in midstream and downstream applications and industrial chains. Connecting scientific research results with social needs can help the I&T ecosystem develop sustainably. Based on this, the “Northern Metropolis Development Strategy Report” has clearly stated that the Hong Kong government will develop the San Tin Technopole into Hong Kong’s Silicon Valley, providing a total of about 148,000 I&T posts which can embrace the I&T industry with R&D. The current problem is how to accelerate the development of I&T and break down horizontal and vertical barriers between upstream, midstream, and downstream. Building a university town in the Northern Metropolis may be one feasible solution.

The “I&T Blueprint” is a long-term strategy document that outlines the government's vision and plan for developing the I&T industry in Hong Kong and is designed to ensure that the city remains competitive and at the forefront of technological innovation. It is a

comprehensive strategy that aims to position Hong Kong as a leading international I&T hub. It outlines various strategies to boost the city's R&D capabilities, promote technology adoption and commercialisation, foster a vibrant ecosystem for innovation and entrepreneurship, and attract global talent to support the growth of the I&T sector. Some of the specific initiatives outlined in the "I&T Blueprint" include the establishment of research clusters and innovation labs, the promotion of fintech and e-commerce, and the provision of funding and support for startups as well as small and medium-sized enterprises.

The government is also exploring innovative development models by accelerating the development of the San Tin Technopole in the Northern Metropolis to provide capacity for developing science and technology parks and advanced pilot production bases. The "I&T Blueprint" and the plan to build a university town in the Northern Metropolis are closely related. Building a university town in the Northern Metropolis can play a significant role in promoting the development of Hong Kong's I&T economy.

The "I&T Blueprint" helps create a conducive environment for I&T. It outlines various measures to enhance the city's R&D capabilities, such as increasing funding for R&D, improving the quality of research, and promoting collaboration between academia and industry. Building a university town with state-of-the-art research facilities and advanced infrastructure can provide a conducive environment for I&T. The "I&T Blueprint" also emphasises the need to foster an entrepreneurial culture in Hong Kong to support the growth of the I&T sector. A university town can provide an ideal platform for nurturing entrepreneurial talent and supporting startups by offering access to funding, mentorship, and networking opportunities. The "I&T Blueprint" also recognises the importance of attracting global talent to Hong Kong to support the growth of the I&T sector. A university town with world-class facilities and a vibrant research community can be a powerful magnet for attracting talented researchers, scientists, and entrepreneurs worldwide. The "I&T Blueprint" highlights the need for closer collaboration between academia and industry to promote the commercialisation of R&D outcomes. A university town can facilitate such collaboration by bringing researchers, entrepreneurs, and industry professionals together in a common ecosystem.

The “I&T Blueprint” can serve as a roadmap for building a university town in the Northern Metropolis to promote the development of Hong Kong’s new I&T economy. By creating a conducive environment for I&T, promoting entrepreneurship, attracting global talent, and encouraging collaboration between academia and industry, establishing a university town in the Northern Metropolis aligns with the goal of the “I&T Blueprint” to develop a robust ecosystem for I&T development.

4.4. Insights from the “Smart City Blueprint”

The “Smart City Blueprint” aims to leverage I&T to enhance the quality of life in Hong Kong and promote sustainable development. It outlines various strategies to promote the adoption of smart city technologies, including smart mobility, smart living, smart environment, smart people, smart government, and smart economy. Building a university town with advanced smart infrastructure in the Northern Metropolis can provide a platform for I&T development and can benefit from the “Smart City Blueprint” in several ways.

First, the “Smart City Blueprint” recognises the importance of promoting smart mobility to improve the efficiency and sustainability of transportation systems. A university town with advanced smart mobility solutions can promote sustainable and efficient transportation systems, reducing the need for private cars and reducing traffic congestion. Smart mobility solutions such as bike-sharing, electric vehicles, and autonomous shuttles can provide enhanced connectivity and accessibility to students, researchers, and industry professionals with convenient and sustainable transportation options. Additionally, adopting smart parking systems can optimise the use of parking spaces, reducing the demand for additional parking infrastructure.

Second, the “Smart City Blueprint” also emphasises the need to promote smart living to enhance the quality of life in the city. A university town with smart living solutions can improve the quality of life of students, researchers, and industry professionals. For instance, smart homes with advanced energy management systems and Internet of Things (IoT) devices can provide a comfortable and healthy living environment. Smart healthcare systems can promote wellness and support preventive care, whilst smart public spaces with advanced lighting, air quality, and noise management systems can create a healthy and pleasant environment for studying and working.

Promoting a sustainable environment to support the development of a smart city is the third smart area in the "Smart City Blueprint". A university town with a sustainable environment can support the development of Hong Kong's I&T economy. For example, adopting renewable energy sources such as solar and wind power can provide a reliable and sustainable energy source. Additionally, implementing smart waste management systems can reduce waste and promote recycling, whilst adopting green building standards can promote sustainable development and energy efficiency.

Fourth, the "Smart City Blueprint" recognises the importance of smart people in the development of a smart city. It recognises that a knowledge-based economy is essential for developing a smart city. A university town offering high-quality education, research opportunities, high quality of life, affordable housing, convenient transportation, and diverse cultural and recreational activities can attract and retain talented individuals and provide a conducive environment for I&T development. The culture of innovation and entrepreneurship in a university town can provide opportunities for students, researchers, and industry professionals to develop and commercialise new ideas and technologies. The "Smart City Blueprint" also points out the importance of lifelong learning in supporting the development of a smart city. A university town that offers opportunities for lifelong learning, such as continuing education programmes, can help individuals acquire new skills and knowledge to adapt to changing technologies and industries.

Fifth, the "Smart City Blueprint" emphasises the need to promote smart government to enhance the efficiency and transparency of public services. A university town with smart governance systems can improve the efficiency and transparency of public services. The adoption of digital platforms for public engagement can improve citizen participation and feedback, whilst the use of smart data analytics can improve decision-making and resource allocation. Additionally, implementing smart city technologies such as smart lighting and water management systems can reduce the cost of public services whilst improving the quality of life of students, researchers, and industry professionals.

Last, a smart economy is characterised by a high level of connectivity, innovation, and productivity, and it relies on advanced technologies such as artificial intelligence, IoT, and blockchain. Fintech is an important sector that is growing rapidly in Hong Kong. Technology can also enhance the tourism and legal industries. A university town can

support the development of fintech, smart tourism, and lawtech by providing education and training programmes in financial, tourism, and legal technologies, as well as incubation and acceleration programmes for startups. A university town can also establish partnerships with financial institutions, tourism operators, legal firms, and technology companies to promote the development of innovations in these areas.

It can be seen that the "Smart City Blueprint" can provide insights into building a university town in the Northern Metropolis to promote the development of Hong Kong's I&T economy. By leveraging smart city technologies, a university town can provide a conducive environment for I&T and enhance the quality of life of students, researchers, and industry professionals.

There are many university towns around the world, and they are mainly divided into two types: traditional university towns and innovative university towns. Traditional university towns generally originate from universities with a long history and gradually form a state of integration between the city and the university over time, such as Oxford and Cambridge in the United Kingdom and Delft in the Netherlands. Innovative university towns, on the other hand, aim to create economic value by directly serving society with scientific research results. They are often driven by national strategic goals, integrating university resources to achieve industry-university-research integration, such as Tsukuba University Town in Japan (Henini, 1999). The establishment of a university town in the Northern Metropolis combines these two types, aiming to create economic value and build a new city. Therefore, learning from past university towns' experiences and lessons is necessary.

Figure 2: Hong Kong-Shenzhen Innovation and Technology Park (under construction) | source: Northern Metropolis Development Strategy Report, 2021

V. Global Case Studies of University Towns and Science Parks

University towns, where the identity and pulse of the city or region are inextricably tied to the influence of higher education institutions, have become hubs of talent, innovation, and economic growth around the world. This paper explores the development and contributions of successful university towns in the United States, Japan, Singapore, South Korea, and China.

It first examines the rise of Silicon Valley, anchored by Stanford University, and Tsukuba Science City, anchored by the University of Tsukuba in Japan in the 1970s. Driven by government initiatives and "triple helix" collaborations between academia, industry and government, these university towns fostered technology clusters that revitalised local economies. The paper then analyses how Singapore Science Park and South Korea's Daedeok Innopolis leveraged proximity to multiple research universities to become thriving Asian innovation hubs since the 1990s.

Turning to China, Beijing's Future Science City and Liangxiang University Town align academic programmes with local pillar industries, translate research on-site, and customise talent cultivation to drive economic upgrading. Suzhou University Town concentrates top domestic and foreign universities to supply high-level human capital and technologies to Suzhou Industrial Park. Guangzhou University Town has catalysed thousands of startups and attracted billions in venture funding through its incubators and innovation platforms.

In conclusion, across different countries, successful university towns share common features of strong university-industry integration, abundant innovation resources, vibrant high-tech clusters, and measurable contributions to local economic and social development. They exemplify how world-class academic institutes can be a boon to their host cities and regions when close partnerships are forged.

A quintessential characteristic of the image and experience of university life is the campus. The campus is, according to Bromley (2006), "the prime symbol of institutional life – a separate space and place for the academic community". Despite being a highly complex

institution with linkages, resources, and commitments to regions and communities beyond its locale and vicinity, the college campus is a community of its own – an ecosystem of students, faculty members, university personnel, and other individuals who are directly or indirectly linked with the social fabric constituting higher education and "university life".

The college campus and community does not exist in a social vacuum. More often than not, it is constructed or developed in an existing village, town, or city. The relationship between the two communities is encapsulated in the general term "town-gown relationship". Though varying case-by-case, a town-gown relationship refers to the town-university (or town-college) dynamics and (formal and informal) arrangements regarding a variety of factors, ranging from off-campus student housing, to university-business partnerships (e.g., discounted rates on goods and services based on university affiliation), to infrastructure development and service delivery (Bromley, 2006; Rousmaniere, 1997).

In the context of a college whose influence on the character, composition, and vibrancy of a town's community life is ubiquitous, the town can be referred to as a "college town". The "college" is the core identity of a college town, as its direct influence (e.g., senior university staff hold advisory positions or are council members of schools, hospitals, and urban planning boards) and indirect influence (e.g., through attracting students, capital, and intellectuals) on the town's economic, social, cultural, and political life are omnipresent (Filion et al., 2004; Miller, 1963). On a micro-level, student involvement, for example living in off-campus accommodation, volunteering, or participating in the local economy as a consumer, becomes a significant shaping force of college towns (Rousmaniere, 1997). The college itself too shapes the town through admitting or recruiting talented young people, attracting investment, and creating markets that the town can capitalise on (Rousmaniere, 1997). On a macro-level, the development of college towns is planned by state-civil society relations, for example in government interventions to create favourable conditions for the college's growth (e.g., campus expansion through land reform policy) (Rousmaniere, 1997).

In contrast to regular metropolitan towns, college towns uniquely experience urban revitalisation, infrastructure development, and overall improved economic prospects (e.g., through increased tourism, beautification and restoration, and high concentration of students) (Bromley, 2006; Filion et al., 2004). As Bromley (2006) put it, "colleges and

universities are often described as ‘economic development engines’ and they serve as ‘anchor institutions’ in many neighbourhoods and municipalities”. Yet, the mere presence of a college campus does not directly translate to long-term positive development for the town. Similarly, a good town, whilst crucial to attracting potential students and prospective faculty members, might not necessarily adapt in its entirety to a college within its vicinity.

Rather, it is through the joint efforts of university, industry, and government that truly successful, long-lasting college towns have emerged. This university-industry-government arrangement, which grew in popularity during the 20th Century, has been termed by Etzkowitz and Leydesdorff (1995) as the “triple helix”. Historically, against the backdrop of increasing international competition or wars, the “triple helix” was encouraged by national governments to increase a country’s competitiveness in economic, military, and technological capacities (Etzkowitz & Leydesdorff, 1995; Hall, 1997).

5.1. World-renowned college towns and science parks abroad

5.1.1. Silicon Valley, USA

Stanford University and Stanford Research Park (formerly known as Stanford Industrial Park), which is the anchor institution of Silicon Valley, in the San Francisco Bay Area, for instance, has a history of university-military-government relations, going as far back as supporting the USA’s war effort in World War II (Hall, 1997). Supporting the financially struggling Stanford University, Stanford Industrial Park was built in 1951 as a high-tech park for scientific research and technological development (Sandelin, n.d.). Its major contracts during the early 1950s came from the military and affiliated departments with involvements in the Cold War (Hall, 1997; Sandelin, 2004). These early efforts, as well as the establishment of successful tech startups later in the 20th Century, helped transform the reputation of Stanford University and elevated the Park to its acclaimed name of “Silicon Valley” (see Figure 3).

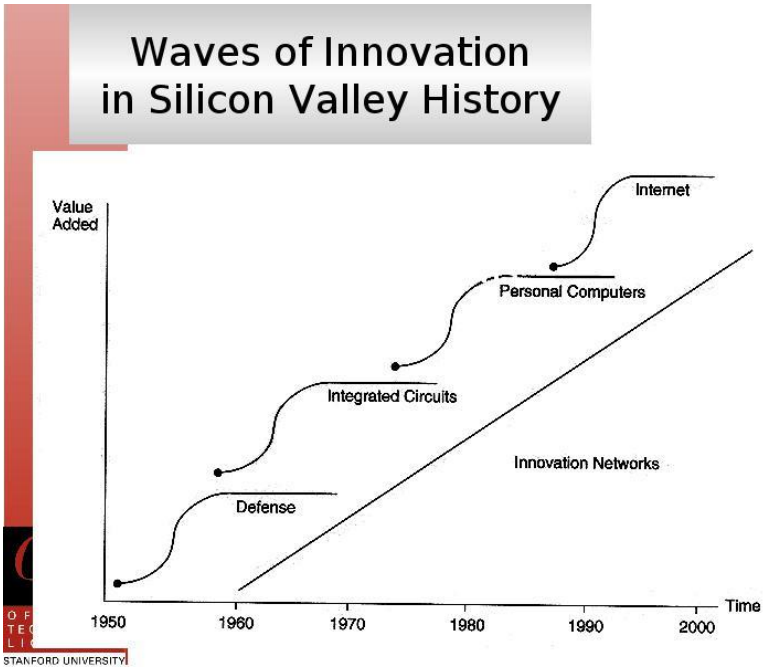

Figure 3: The development of Silicon Valley over time | source: Slide 9 of Sandelin (n.d.).

At the time, the idea to reuse the surrounding land of a regional college (the valley and land around Stanford was originally populated with fruit orchards; see Sandelin, 2004) to facilitate the development of hubs and/or parks to attract "excellent faculty and employees and high levels of research grants, charitable donations, corporate investments, and government support" (Bromley, 2006) was novel. Up until then, few colleges had initiatives to re-develop their land holdings into parks with intricate infrastructure development in order to enhance mobility and connectivity between residential complexes, industrial buildings, laboratories, teaching facilities, and leisure and entertainment amenities.

A systematic survey study sought to explore Stanford University's efforts In promoting innovation and entrepreneurship, and their impact on the national economy, in 2011. In total, out of 143,482 alumni[1] (i.e., Stanford graduates from the 1930s to the present), 27,783 provided responses (approximately 19.4% response rate). Also, 1,134 faculty (out of 1,903 faculty members) (59.6% response rate) and 974 research staff at Stanford completed the survey (Eesley & Miller, 2017).

It was sent to143,482 out of 191,332 living Stanford University degree-holders (i.e., alumni) (approximately 75.0%).

Based on the survey findings, it was estimated that 39,900 companies had been launched in connection with Stanford University (Eesley & Miller, 2017). In terms of economic impact, based on the report's findings, since the 1930s, approximately 5.4 million jobs had been created and annual global revenues of $2.7 trillion had been accrued as a result of these 39,900 companies (Eesley & Miller, 2017). If we account for firms based in California alone, an estimated 18,000 companies existed, providing 3 million jobs and accruing approximately $1.27 trillion in annual worldwide sales (Eesley & Miller, 2017). The report further estimated that "if these companies collectively formed an independent nation, its estimated economy would be the world's 10th largest" (Eesley & Miller, 2017).

Stanford has cultivated a thriving entrepreneurial ecosystem. According to the survey, around 29% of the alumni founded a for-profit or non-profit organisation; 32% of alumni were self-described investors, employees, or board members of a startup in the past; and 25% of faculty respondents reported incorporating or being among the founders of an entrepreneurial firm during their career. Furthermore, based on the alumni responses, there were 349 venture capital investors and 2,572 angel investors (Eesley & Miller, 2017).

The University has a long history of providing classes, seminars, programmes, and other opportunities to encourage entrepreneurship and innovation. For instance, students of Stanford are able to participate in activities organised by the Center for Entrepreneurial Studies, the Stanford Venture Studio, and the Stanford Technology Ventures Program. Furthermore, many firms in Silicon Valley collaborate with the Business School and/or School of Engineering to co-teach classes or get involved in related programmes. Thus, classes are taught not only by faculty members, but also entrepreneurs and domain-specific experts (e.g., start-up specialists or individuals who have expertise in securing funding). This tradition relates to a core part of Stanford's approach to encouraging entrepreneurship, which is "to bring together cutting-edge theory and real-world expertise in the classroom" (Eesley & Miller, 2017). A notable example is the Industrial Affiliates Program, where, according to the website, "Stanford faculty and students can learn about industry perspectives and priorities, and corporate members are exposed to new ideas and research directions" (Stanford University, 2023). In addition, there are various competitions, networking programmes, and mentor-mentee programmes available to encourage students' exploration of startups and entrepreneurship. Student associations, such as the Stanford Entrepreneurship Network, support these initiatives. A good example in this regard is

Stanford Angels & Entrepreneurs (SA&E), an alumni association that aims to connect potential entrepreneurs and investors. As the report stated, “the alumni-driven organization provides networking and funding opportunities for students, alumni and startups plus educational programs to both angels and entrepreneurs” (Eesley & Miller, 2017).

Crucial to Stanford’s success in entrepreneurism and innovation are the close connections between alumni, Silicon Valley, and the University. According to the report, “forty percent of Stanford students find jobs through some form of networking, and the men and women who lead Silicon Valley’s most innovative companies interact regularly by visiting campus to lecture, collaborate with faculty, and share ideas with the next generation of entrepreneurs currently filling classrooms” (Eesley & Miller, 2017). Thus, it should be of little surprise that over 50% of Stanford Research Park companies employ Stanford University graduates (Stanford Research Park, 2023).

From the perspective of alumni, ‘giving back’ is a key motivator in staying connected with their alma mater. According to the report, many alumni return to the university (e.g., to recruit, lecture, collaborate with, and mentor students) and maintain links with the Bay Area more generally. For example, “thirty-nine percent of all alumni founded firms located within 60 miles of Stanford – or roughly a one hour’s drive” (Eesley & Miller, 2017). This commitment is not found among locals alone, but also among international students who attended Stanford: “15 percent (i.e., 2,600 persons in the survey) of graduate students from outside the United States stayed in the Bay Area and contributed to the region’s robust infrastructure and entrepreneurial spirit” (Eesley & Miller, 2017).

5.1.2. University of Tsukuba, Japan

Developed during the 1970s, Tsukuba Science City was the first “academic new town” established in Japan, housing national laboratories, institutes, and research agencies. Tsukuba Science City was born from visionary ambitions to promote science and technology, as well as forward-thinking pragmatic concerns regarding reducing overpopulation in Tokyo (Hall, 1997; Takahashi, 1981). According to Takahashi (1981), the Tokyo government decided in 1963 to establish a pioneering academic new town in Tsukuba, which at the time was not urbanised, with its characteristic essence (or “nucleus”) being the concentration of research and higher education institutions. The decision to

develop the urban space as a "town" was made in order to "provide the city with a high level of culture and other amenities so that the space for research and educational activities offers an adequate environment with good living conditions for research, educational staff and students" (Takahashi, 1981). Tsukuba Science City sat at the centre of the city, with the surrounding peripheries forming the suburban district (Takahashi, 1981). As Takahashi (1981) noted, the development of Tsukuba Science City had a strong impact on labour (i.e., restructuring the labour market from predominantly agricultural jobs to non-agricultural jobs among the native inhabitants) and population size (i.e., vastly increasing the number of urban residents in the area). Figure 4 shows a blueprint of Tsukuba Science City.

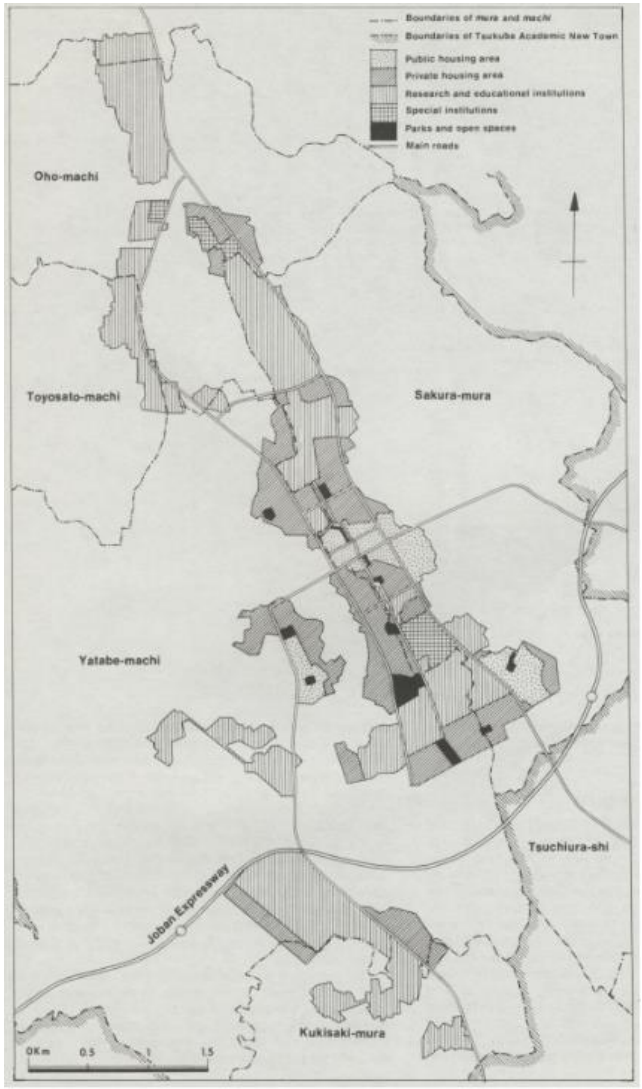

Figure 4: Tsukuba Science City or Academic New Town | Source: Takahashi (1981).

In the cases of Tsukuba and Stanford, the development of the science and technology parks led to the creation of new towns and communities. In both cases, the "triple helix" facilitated urban development in a way that positioned academic research and innovation

as the beating heart of the town. As "college towns", according to Miller's (1963) definition, they assumed centrality in the fabric of community life, qualified by how much power they had in dominating town decision-making processes, relative to other institutions. Consequently, the surrounding towns in Tsukuba and Stanford were intractably influenced by the increased industry partnerships, development of start-ups, migration of intellectual workforce and other working professionals, and concentration of private capital and public funding (Hall, 1997; Sandelin, n.d.; Takahashi, 1981). In short, these institutional initiatives fuelled economic revitalisation and urban development.

As the largest I&T hub in Japan, Tsukuba Science City is home to 29 educational and research institutes. Around 20,000 people work in research institutes at Tsukuba Science City.

Based on materials published by the Ibaraki Prefectural Government on the University of Tsukuba and Tsukuba Science City, the University has one of the largest numbers of university-created venture companies in Japan (Ibaraki Prefectural Government, 2022). As of November 2021, according to one brochure from the Prefectural Government, 394 venture companies have been created (Ibaraki Prefectural Government, 2022). The brochure further stated, "the amount of funding raised has increased rapidly in recent years, surpassing 5 billion yen in FY2018" (Ibaraki Prefectural Government, 2022). Figure 5 provides more details on the number of venture companies created and the funds raised by the University's venture companies.

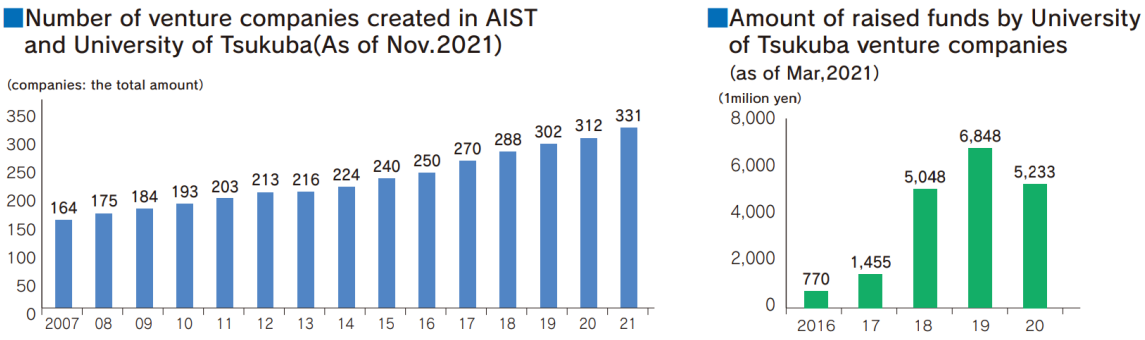

Figure 5: Number of venture companies established and funds raised by venture companies | source: Ibaraki Prefectural Government (2022, p.7).

Table 5 presents some of the basic characteristics of Stanford University and the University of Tsukuba. Both universities and their respective innovation and technology hubs are renowned and well-established in their respective countries.

Table 5: Basic characteristics of Stanford University and the University of Tsukuba

	Stanford University	**University of Tsukuba**
Country/region	Palo Alto, California, United States of America	Tsukuba, Ibaraki, Japan
Public or private	Private research university	Public research university
Year established	Established in 1891, but founded in 1885[1]	Established in 1973, but founded in 1872
Size of the land owned by the university	8,180 acres[4] (= approx. 33.1 km^2)	258 hectares[5] (= 2.58 km^2)
Year established (their flagship I&T hub)	Silicon Valley, established in 1951	Tsukuba Science City, established in 1963[2]
Size of the land occupied by the I&T hub	1,854 square miles[8] (= approx. 4,801.8 km^2)	28,400 hectares[9] (= 284 km^2)
Number of start-ups	39,900 companies[1]	394 companies[3]
Number of I&T facilities and laboratories	Among other smaller laboratories under Stanford's seven schools, it has 18 independent laboratories, centres, and institutes.[4]	29 national research institutes and more than 200 private research organisations.[3] It accounts for more than 30% of Japan's national research institutes.[5]
Notable start-ups	Google, Yahoo!, Nvidia, TSMC, Cisco Systems, Netflix, Tesla Motors, Nike, Gap Inc.[1]	Cyberdyne Inc., S'UIMIN Inc.[3]
Number of graduates/talents nurtured	220,000 Stanford alumni (among other prize winners and notable alumni, Stanford has 21 Nobel Laureates and 36 Nobel Prize winners)[6, 7]	One in 10 residents in the city of Tsukuba are researchers. The University of Tsukuba has three Nobel Laureates[5]

Note. [1] Eesley & Miller (2017); [2] Tsukuba Science City Network (2022); [3] Nature.com (March 20, 2019); [4] Times Higher Education (2023a); [5] Times Higher Education (2023b); [6] Stanford University (2023b); [7] Stanford University (2023c); [8] Jarvie (2020); [9] Ministry of Land, Infrastructure, Transport and Tourism (n.d.).

A great part of Stanford's success is attributable to President J. Wallace Sterling and the Vice President and Provost Frederick E. Terman. The inception of the technology-focused park (i.e., Stanford Research Park) and the underlying idea of cultivating close university-industry partnerships and a symbiotic ecosystem of knowledge and innovation transfer are credited to these two visionary leaders. According to the 2011 survey report by Eesley and Miller (2017), Sterling and Terman envisioned the park to be "a place where startups can find space to work, colleagues to bounce ideas off of, equipment to share and the constant stimulation that comes with new blood from the university… [in short,] to provide industry with access to the university and to offer researchers a change to try out their ideas in the business world". This "pioneering" entrepreneurial spirit is deeply entrenched in both the University and Silicon Valley, and they are renowned for it. For instance, among respondents who became entrepreneurs in the past decade, 55% reported choosing to study at Stanford because of its entrepreneurial environment (Eesley & Miller, 2017).

The University of Tsukuba and its Tsukuba Science City followed a different development trajectory. Unlike Silicon Valley, which was nurtured by industry-university partnerships and a steady stream of talent and expertise primarily running through Stanford University (Eesley & Miller, 2017), Tsukuba Science City enjoyed vast expansion due to support and investment from the national government (e.g., the government passed laws that sped up construction and expansion and increased resourcefulness and international outreach) (Nature.com, March 20, 2019; Takahashi, 1981). As Gonzalez Basurto (2016) mentioned, Tsukuba Science City was the first of its kind in Japan – an I&T city-park that was funded by the national government. The Science City was to lead the way forward in scientific research and technological innovations for the nation. Government involvement in nurturing strategic sectors and infrastructure is not atypical of Japan's governance style. What is unique to the story of the University of Tsukuba and its Science City, however, is that one key underpinning motivation for their creation was to reduce overpopulation and overcrowding in Tokyo. This is a major area of impact and contribution that distinguishes the case of University of Tsukuba/Tsukuba Science City from that of Stanford/Silicon Valley.

There are challenges in both regions. For the University of Tsukuba, first, its ability to stimulate startups may rely less on the existing financial infrastructure than on the cultural value system that permeates Japan's educated populace (Suzuki et al., 2002). Unlike the

"business-owning" cultural aspirations and entrepreneurial spirit promoted in the United States, in Japan, prestige, fame, and respect are gained by working in large corporations. Put plainly by Suzuki et al. (2002), "highly educated people prefer to remain in larger corporations and thus only a limited number of charismatic people start up their own businesses".

A second – possibly connected – challenge concerns the collaboration between the University of Tsukuba and Tsukuba Science City. In short, unlike the relationship between Stanford University and Silicon Valley, the network and transference (e.g., of knowledge, human capital, and opportunities) between the two entities in Tsukuba still need development. According to Gonzalez Basurto (2016), writing on the opinion of one board member of the University, "although Tsukuba is a 'very good' university, it would be better if partnerships with more research institutes in the Science City were strengthened and deepened … 'a lot of times students and professors at the university don't recognize the relationship with the Science City.'"

In recent years, the University of Tsukuba and Tsukuba Science City have sought to tackle both challenges. They have reaped benefits from increased links to private enterprises set up in the Science City, joint research projects with foreign partners, funding from foreign grant-making bodies, and startup mentorship programmes (Nature.com, March 20, 2019). Importantly too, as Figure 6 shows, new plans for cultivating a "startup-friendly city" were put into motion in December 2018. The startup ecosystem, including the creation of a Tsukuba Startup Park, is nurtured by increased investment in infrastructure development as well as international partnerships and academic exchange, for example with Cambridge Innovation Center (Ibaraki Prefectural Government, 2022).

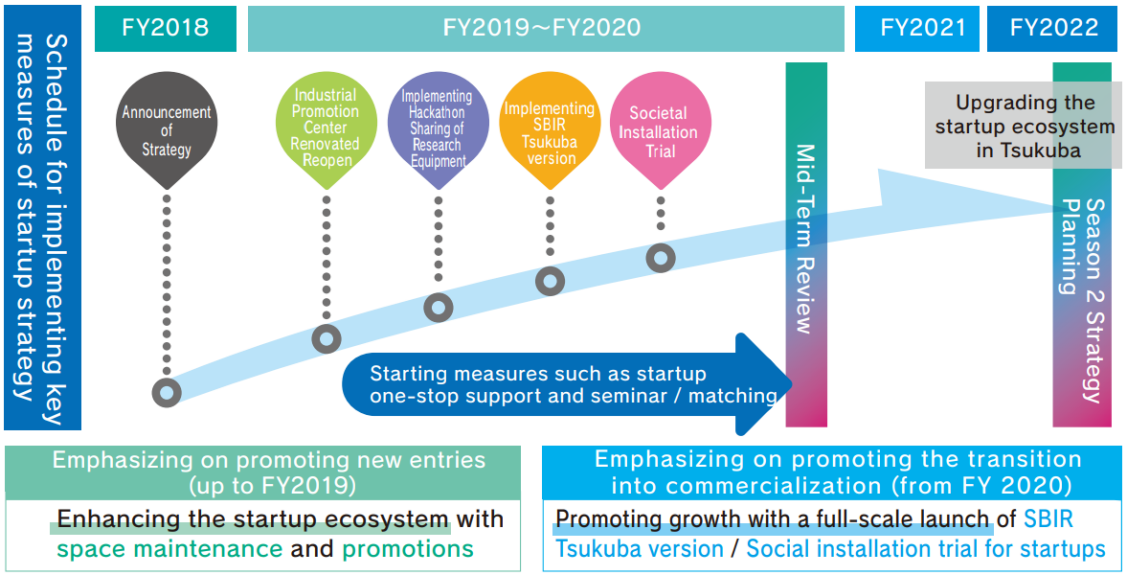

Figure 6: Strategy for growing a supportive startup ecosystem in Tsukuba Science City | Source: Ibaraki Prefectural Government (2022, p.8).

A third challenge facing the University of Tsukuba, which is related to a greater extent to its capacity to promote a welcoming college town, is its inclusiveness of non-Japanese-speaking persons. In an effort to increase their global competitiveness and contribution to the national economy, the national government targeted both the University and the Science City as strategic institutions for internationalisation (Gonzalez Basurto, 2016). Attracting talent from abroad and foreign interest are integral to this mission. Yet, recent literature and news reports have found that non-Japanese-speaking students and scholars face difficulties in being accepted and assimilated into the University and Science City due to the language barrier (Gonzalez Basurto, 2016; Tran, April 3, 2023). For non-Japanese-speaking scholars, based on a news report in the *Japan Times*, difficulties with the language barrier are compounded by biased recruitment, workload management, and promotion practices that discourage long-term commitment to the university (Tran, April 3, 2023). A recent effort by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) to support research excellence in the University of Tsukuba and other strategic high-standing universities in Japan may help solve the nagging problem of failing to attract and retain overseas talent (Tran, April 3, 2023). It remains to be seen if this initiative will be successful or not.

For Stanford, a longstanding challenge faced is the availability of affordable housing for its students, research support staff, and faculty. The origins of this problem are multi-faceted and complex, not least because of national-level vulnerabilities (e.g., economic

recession and inflation), state-level vulnerabilities (e.g., rising housing prices in California), and close proximity to Silicon Valley (which, for example, creates a large demand for executive suites or luxury housing options). It is a recurrent plight that has only seen gradual movement towards reaching a sustainable and satisfactory solution. As documented in the school's newspaper *The Stanford Daily*, in 2010, Palo Alto topped the charts of the most expensive college town to reside in (McGirr, November 18, 2010). Low land supply for new housing developments (against the increasing demand for housing) adversely impacts the ability of Stanford to perform effectively as an employer, on the one hand, and as an educator, on the other hand. Doctoral students and postdocs in particular have been hard pressed by the strong reverberations of increasing housing prices and rent. One subsidised housing project – the Escondido Village Graduate Residences (EVGR), which was built in 2017 for Stanford graduate students – for example, was met with dissatisfaction by the community of graduate students due to its high price point as an "affordable" student housing option (Bagdasarian, May 25, 2021; Dhawan, March 3, 2020). It was reported that rent prices in EVGR and other graduate student housing options provided by Stanford accounted for (on average) as much as 30%-40% of the monthly stipend offered to doctoral students (Bagdasarian, May 25, 2021; Dhawan, March 3, 2020).

Stanford has made some strides in addressing affordability issues. Notably, it established an Affordability Task Force (ATF) in 2018 to deal with a range of affordability concerns from the Stanford community, ranging from on-campus housing to childcare. Between 2018 and 2022, the ATF worked on gathering views from the Stanford community and launching initiatives and programmes that directly addressed major concerns, such as housing affordability issues for graduate students, postdocs, and faculty (see Stanford Affordability, 2023 for more details on the activity timeline of the ATF). Also, Stanford expanded its campus for the first time to Redwood City in 2019 (Berman, November 22, 2019). Among other objectives, the Redwood City campus expansion served to provide greater supply and options for affordable housing for Stanford employees, particularly early career employees such as postdocs (Berman, November 22, 2019). Whilst this strategic development is a significant milestone for Stanford (i.e., branching out from its well-established college town in Palo Alto), it remains to be seen how the new campus can foster a similar sense of community and belonging between members of the "gown" and "town" in Redwood City.

The success of Silicon Valley and Stanford University, individually and together as an ecosystem of innovation and technological development, inspired science park projects around the world. The experiment with Tsukuba Science City and the University of Tsukuba gave governments in the Southeast Asian region confidence in the possibility of achieving economic prosperity and global competitiveness through investing in I&T. In recent years, based on evaluations by global leaders in the technology industry, KPMG's annual report series on "Technology Innovation Hubs" show a consistent trend of I&T hubs from the Southeast Asian region attaining global recognition. As shown in Table 6, cities in Japan, South Korea, China, and Singapore have found themselves ranked in the top 10 list of world-leading I&T hubs.

Table 6: Leading I&T hubs ranked by global technology industry leaders

	2017	2018	2019	2020	2021
1	Shanghai	Shanghai	New York	Singapore	Singapore
2	New York	Tokyo	Beijing	London	New York
3	Beijing	London	London	Tel Aviv	Tel Aviv
4	Tokyo	New York	Tokyo	Tokyo	Beijing
5	London	Beijing	Shanghai	New York	London
6	Berlin	Singapore	Taipei	Shanghai	Shanghai
7	Chicago	Seoul	Singapore	Beijing	Tokyo
8	Washington	Bengaluru	Seoul	Seoul	Bengaluru
9	Boston	Tel Aviv	Boston	Bengaluru	Hong Kong SAR
10	Tel Aviv	Berlin	Austin	Hong Kong SAR	Austin; Seattle

Note. Data extracted from KPMG reports on I&T hubs (2017; 2018; 2019; 2020; 2021).

There are a variety of factors, such as the regulatory environment, availability of investment funding, and track record of successful startups, that one could deduce as being essential for establishing a resilient, responsive, and productive I&T hub. Based on survey responses from approximately 500 to 800 global technology industry leaders, Figure 7 compiles the results from recent KPMG reports on the factors that are determined as being conducive to building competitive, long-term I&T hubs. Interestingly, factors commonly associated with established campus towns were voted as being the most important for establishing I&T hubs: an urban locale that attracts young professionals, a pipeline of

skilled talent, modern infrastructure (such as high-speed bandwidth), and at least one research-intensive university in the vicinity (KPMG, 2020; 2021).

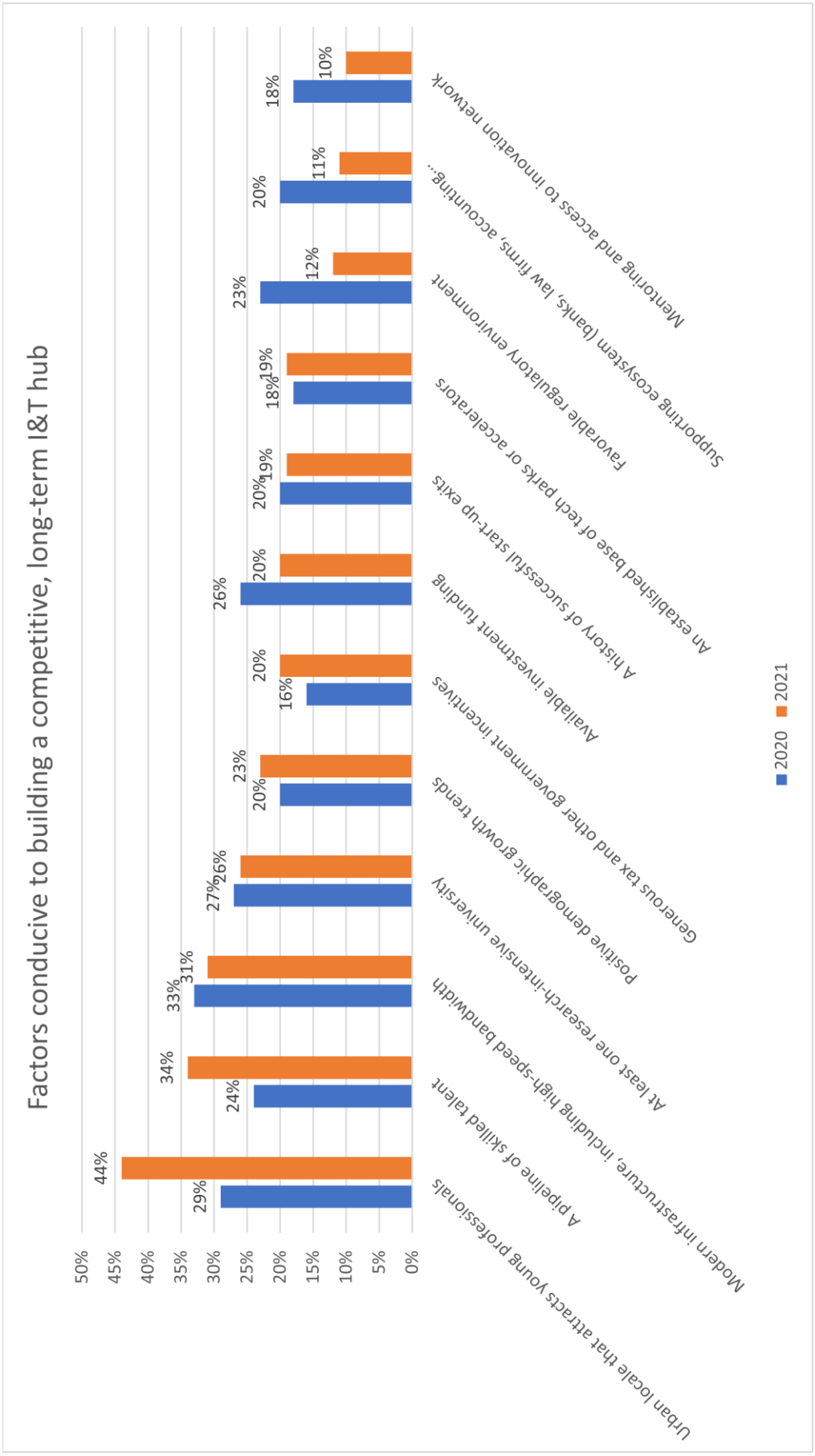

Figure 7: Factors conducive to building a competitive, long-term I&T hub. Source: KPMG (2020; 2021).

As the following sections demonstrate, unlike the previously discussed cases of Stanford and Tsukuba, an innovation and knowledge cluster can benefit from having more than one research-intensive university in its immediate vicinity. Singapore Science Park in Singapore and Daedeok Innopolis in South Korea are stellar examples of I&T hubs with connections and close spatial proximity to more than one research-intensive university.

5.1.3. Singapore Science Park in Singapore

Originally conceptualised in the 1970s, Singapore Science Park's construction kicked off in 1981, and the Park was officially opened in 1984. The Park was a key development that closely aligned with Singapore's national agenda to achieve global competitiveness by becoming a leading I&T city. As Phillips and Yeung (2003) explained, the Park was developed through "various [government] initiatives to generate agglomeration economies for R&D activities (for example, superior physical infrastructure, generous financial incentives and the nearby location of universities and research institutes)". Apart from receiving significant investment from the government, the Park also received support from various agencies under the Ministry of Trade and Industry (e.g., through the Economic Development Board and Jurong Town Corporation) to ensure a favourable location for R&D development and close proximity to research-intensive universities (e.g., the National University of Singapore and Singapore Institute of Technology are within walking distance from the Park, whilst Singapore Management University, Nanyang Technological University, Singapore University of Social Sciences, and Singapore University of Technology and Design are within driving distance), polytechnics (e.g., Singapore Polytechnic), research laboratories and agencies (e.g., the Agency for Science, Technology and Research [A*STAR]), healthcare institutions (e.g., the National University Hospital and Alexandra Hospital), and other institutions that are part of the innovation process or community development (e.g., lifestyle amenities). Infrastructure development of the Park expanded further during the 1990s and early-2000s with the construction of its second phase (i.e., Singapore Science Park 2 [SSP2]) (Singapore Science Park, n.d.). Figure 8 shows a topographical illustration of the Park and its neighbours.

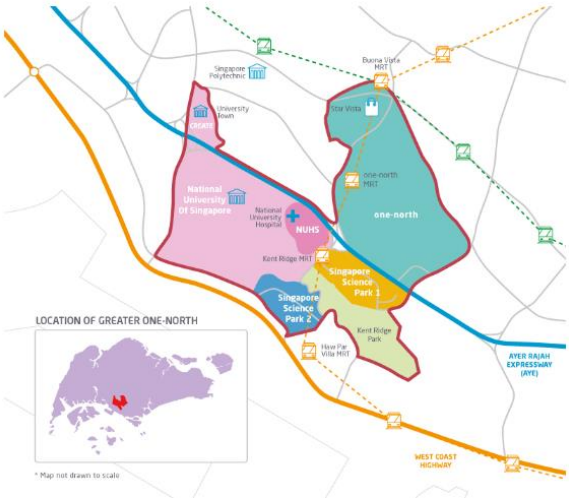

Figure 8: Singapore Science Park | Source: Singapore Science Park (n.d.).

Table 6 presents some basic information about Singapore Science Park.

Table 7: Basic characteristics of Singapore Science Park

Number of universities	All six public universities are within walking or driving distance
Year established (their flagship I&T hub)	Singapore Science Park, established in 1984
Size of the land occupied by the I&T hub	55 hectares[1] (= approx. 0.55 km^2)
Number of I&T facilities and laboratories	Over 350 multinational companies, local companies, and laboratories[1]
Number of listed companies	/

Note. There is no readily available information on the number of listed companies that are tenants of Singapore Science Park. However, there are a number of notable listed companies that have branches or headquarters in the Park, such as The Walt Disney Company, Ubisoft, Canon, and Fujitsu. Singapore Science Park (n.d.).

Singapore Science Park continues to enjoy strong government support and has made significant strides in developing state-of-the-art infrastructure. Notably, in 2019, the government announced its plan to invest millions of dollars to achieve full 5G coverage in the Park, affording unique opportunities for tenants in its ecosystem to engage in advanced R&D activities and technological developments (CNBC, June 27, 2019). More recently, a major addition to the Park was officially announced – the "Geneo" life sciences and innovation cluster/hub (CapitaLand, 2023). Expected to be fully operational by 2025, Geneo aims to draw firms and I&T talent with its state-of-the-art facilities and features that span commercial, R&D, educational, and recreational purposes (Yi, June 27, 2023). A 180,600-square mile development project in the Singapore Science Park, Geneo will include, among other offerings, a coworking laboratory space for startups with a focus on life sciences, diverse lifestyle amenities and entertainment, and housing (e.g., serviced residences) for tenants. Furthermore, approximately 44% (or 80,000 square miles) has been set aside for the expressed purpose of facilitating biomedical R&D activities (Yi, June 27, 2023). Overall, according to CapitaLand (2023), it is expected that Geneo will increase the I&T workforce in Singapore Science Park by around 75% (i.e., from 12,000 to 21,000 persons).

With the two above-mentioned strategic moves, Singapore is demonstrating well its commitment to promoting high-tech economic growth. High-quality infrastructure, advanced information networks, strong linkages to world-class universities and research institutes, a close proximity to Singapore's central business district, and strong support from the Government, venture capital funds, and community partners are just some of the key characteristics of Singapore Science Park that are certain to continue drawing foreign investment, multinational corporations, promising I&T firms, and talented I&T professionals. One potential challenge that the island country needs to address, however, is the issue of rising rent costs (Zalizan & Ong, May 12, 2023). There has been a steady increase in rent prices over the years, which alarmingly reached an apex last year of an annual increase of nearly 30% in private rental prices (Goh, January 27, 2023). This problem potentially impacts the ability of Singapore to be an attractive destination for I&T talents. For example, residential areas near Singapore Science Park, such as Queenstown or Buona Vista, have experienced rising property prices and rental costs (Goh, January 27, 2023). The increase in costs has posed some threat to the country's ability to retain foreign talents, as some expats are considering moving out of Singapore due to the increased rent

prices (see Zalizan & Ong, May 12, 2023). If Singapore wishes to remain internationally competitive as an I&T powerhouse of the Asia-Pacific region, a solution to appease renters or alleviate the burden of paying rising rent costs out-of-pocket needs to be devised.

5.1.4. Daedeok Innopolis in South Korea

The conceptualisation of Daedeok Innopolis (before 2005, Daedeok Science Park and University Town, or simply Daedeok Science Town) was finalised for construction in 1973. As Kim, Lee, and Hwang (2014) wrote, its final design benefitted from "benchmarking Japan's Tsukuba Science City". As a government-driven initiative, Daedeok Science Town was to form a national research-intensive cluster that would encourage local economic growth and global scientific competitiveness. The cluster would involve an agglomeration of research-intensive universities, public and private research institutes, non-profit organisations, and support agencies facilitating R&D activities (Oh & Yeom, 2012).

In the 1970s and 1980s, Daedeok Science Town was an area for conducting high-level scientific research with public research institutes and publicly-funded national universities (Oh & Yeom, 2012). However, in recognition of the need to engage in applied research, commercialise research output, and promote more positive relationships with the local economy and community (i.e., Daejeon Metropolitan City), the Science Town experienced its turning point. Mirroring Silicon Valley, construction began on a high-tech industrial zone, named Daedeok Techno-Valley, and this zone linked with the Science Town to expand the hub's overall function, character, and image (Oh & Yeom, 2012). In the 1990s and 2000s, the boundaries between Daejeon Metropolitan City and the Daedeok Valley (comprising the Science Town and Techno-Valley) became virtually blurred, as R&D activities, a talented and skilled workforce, start-up culture, and infrastructure development became ubiquitous with the city.

Since 2005, Daedeok Innopolis has achieved recognition as a "hub for global technology commercialisation, combining R&D, business, and production" (Oh & Yeom, 2012). As its backbone, Daedeok Innopolis maintains close cooperation between industry, academic institutions (e.g., Chungnam National University, Daeduk University, Hannam University, and KAIST), R&D institutes, people, and the government (Korea Innovation Foundation,

2019a). This effort is helped by supportive public agencies, such as the Korea Innovation Foundation. The Korea Innovation Foundation was established in 2005 as a key platform nurturing and supporting the Innopolis business ecosystem (Korea Innovation Foundation, 2019a). For instance, it helps with facilitating the dissemination and commercialisation of research findings, whilst also assisting competitive tenants to enter global markets (Korea Innovation Foundation, 2019b) (see Figure 9 for more details).

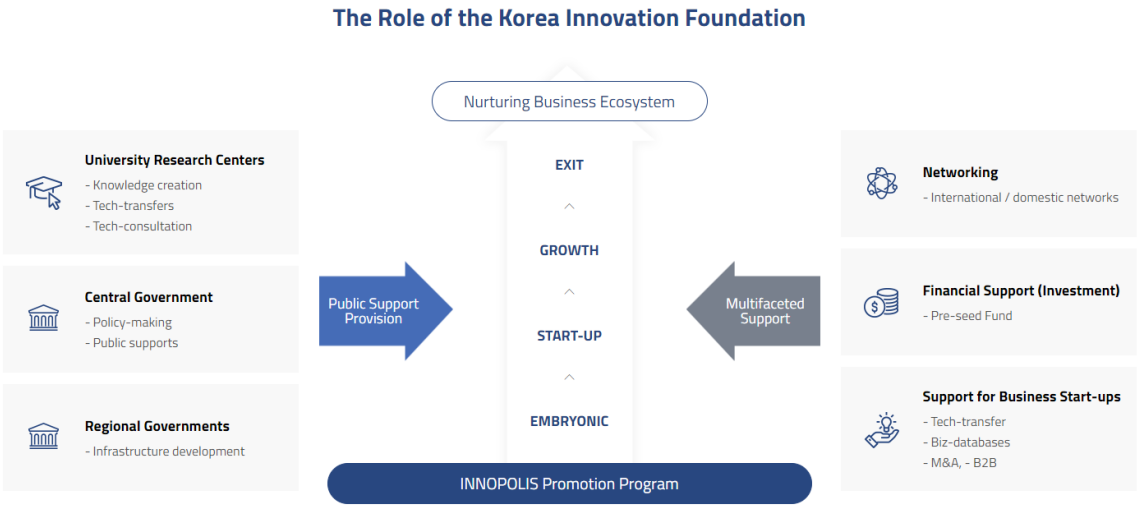

Figure 9. Mission of the Korea Innovation Foundation | Source: Korea Innovation Foundation (2019b).

The commercialisation of high-tech products, by leveraging robust R&D outputs and a skilled workforce from nearby research-intensive universities, is one of the key objectives of Daedeok Innopolis and a key stage in its 'virtuous circle' operation model (see Figure 10 for the full model).

Figure 10: The Daedeok Innopolis model | Source: Korea Innovation Foundation (2019c).

As of December 2021, there were a total of 1,655 technology transfers, 34,795 international patent registrations, 80,026 domestic patent registrations, and 86,140 employees (Korea Innovation Foundation, 2021). Also, around 56 enterprises have been listed on the KOSDAQ (see Table 8 for other basic information about the Daedeok Innopolis).

Table 8: Basic characteristics of Daedeok Innopolis

Number of universities	7 universities[1]
Year established (their flagship I&T hub)	1973
Size of the land occupied by the I&T hub	27.8 km^2 [2]
Number of I&T facilities and laboratories	39 government and public research institutes, and 2,356 corporations[1]
Number of listed companies	56 enterprises in Innopolis are listed on the KOSDAQ[1]

Note. [1] Korea Innovation Foundation (2021); [2] Oh & Yeom (2012).

The close partnerships between the government, universities, and research institutes have helped Daedeok Innopolis maintain a steady growth since its inception. With assistance from the government in 1999, Daedeok Innopolis was able to successfully kick-off commercialisation of its research results, yielding high production and exports thereafter, whilst also drawing I&T talents to the innovation cluster (Kim, Kim, & Lee, 2022). In terms of long-term sustainability, Daedeok Innopolis appears to be resilient and on an upward growth trajectory, not least due to its steady domestic supply of highly educated I&T professionals and strong government support (Kim et al., 2022; Webb, 2007).

Although strides are being made in promoting the regional integration and interactions between Daedeok Innopolis and local actors (such as firms and intermediary government agencies in Daejeon), an issue that needs consistent monitoring and problem-solving is the cooperation and mutual support between administrators and authorities in the national government, Daejeon metropolitan city, Daedeok Innopolis, local communities, and other relevant regional actors (e.g., Kim et al., 2014). Continued support for each other would ensure the long-term sustainability and competitiveness of the innovation cluster.

5.2. University Towns in Mainland China

5.2.1. Future Science Park and Liangxiang Higher Education Park in Beijing

Located in the south of Changping District, Beijing Future Science Park spans 170.6 square kilometres, with a planned construction area of 87.2 square kilometres, including a built-up area of 71.01 million square meters.

The Park is poised to become a new tech hub in the Chinese capital, as part of Beijing's ambitious endeavour to create a national sci-tech innovation centre. It serves as a platform for advanced research in the fields of energy, manufacturing, and medicine, featuring a layout pattern of "Two Zones and One Centre"—an east zone, a west zone, and a central green space.

Specifically, the east zone will be developed into a globally influential strategic "Energy Valley" aimed at propelling China's energy industry, and the west zone, designated as a life science park, is evolving into a promising world-class "Health Valley", which will act as a catalyst for the advancement of China's healthcare sector. Shahe University Park in the west zone, which comprises six colleges, is designed as a research, education, and innovation community with a complete array of functions, fostering a university-based technological innovation system that integrates production, education, research, and operations. As a hub for healthcare innovation, the "Health Valley" benefits from a wealth of global resources in medical innovation. The "Energy Valley" is known as one of the areas with the richest set of elements of innovation in energy, boasting a host of state-owned enterprises and advanced technologies. Shahe University Park plays a vital role in promoting basic research and personnel training. Great efforts are focused on building the Future Science Park into a world-leading hub for technological innovation.

To date, the Science Park has accommodated 60 national and municipal key laboratories, nearly 20 provincial R&D centres, and 24 engineering technology centres affiliated with national-level or municipal-level institutions. Additionally, it is home to 12 academician-led research centres, 22 postdoctoral workstations, and 23 collaborative innovation bases. Furthermore, over 1,100 innovation-driven enterprises have already established their presence in the area.

Liangxiang Higher Education Park, situated in Fangshan District, is home to five universities with a combined total of approximately 55,000 teachers and students. It has emerged as a hub of intellectual innovation and a high-tech business incubator, promising to be a vibrant centre for the entire region. Following a roadmap that integrates research and talent training into industry development, people at the Liangxiang Higher Education Park are working to promote the industrial application of scientific and technological advances through closer cooperation between universities, enterprises, and the local government. This concerted effort aims to provide a more decisive impetus for industrial transformation and upgrading in Fangshan District and even across southern Beijing.

Through concerted efforts of Fangshan District's government and three universities located within Liangxiang Higher Education Park, three new R&D centres have been completed and put into operation. These centres focus on engineering medicine research and application, traditional-Chinese-medicine-based healthcare, and biodegradable bio-based materials, respectively. The three centres have contributed to incubating enterprises in related industries through their available projects involving pilot studies and trials. Nearly 10 programmes have been initiated for the commercialisation of new advances.

Currently, 309 enterprises are being incubated in four leading incubators accredited by the People's Government of Beijing Municipality, resulting in the creation of 1,666 jobs. Beijing University Student Entrepreneurship Park (Liangxiang Park) has been established to provide training for college students interested in starting their own businesses. So far, Liangxiang Park has seen the initiation of 160 projects of this nature.

With its development rooted in local plans and policies, a college town is closely connected to the local community. For one thing, the local government actively attracts universities and institutions with proven research capabilities in high technology to support major industries underpinning the local economy and satisfy their demands. In turn, universities collaborate with industries to strengthen the leading position established by industries with local characteristics. For another, in leveraging the strong academic disciplines and R&D resources of a college town, the local government will formulate guidelines and policies that lay the foundation for structural improvement and upgrading of local industries.

Benefiting from the abundant innovation resources brought by local universities, the People's Government of Beijing Municipality is dedicated to shaping an economic structure that highlights high technology. Beijing is actively cultivating and forming two internationally leading pillar industries, four "Beijing Intelligent Manufacturing" industries that leverage local strengths, four innovatively linked "Beijing Service" industries, and a batch of future frontier industries in order to build the "2441" system for high-end technological industries and institute the 2.0 upgraded version of the high-end technological industries. Among them, the two internationally leading pillar industries are the new-generation world-leading IT industry and medical care; the four "Beijing Intelligent Manufacturing" industries include integrated circuits, intelligent networked automobiles, intelligent manufacturing and equipment, and green energy and energy conservation; the four innovatively linked "Beijing Service" industries include block-chain and advanced computing, science and technology services, smart cities, and content consumption; and the batch of future frontier industries refers to biotechnology and life sciences, carbon reduction and neutrality, new materials, quantum information, optoelectronics, new memory storage, brain science, and brain-computer interfaces. These industries form a high-tech network that helps upgrade current industries.

In Fangshan District, the pillars of the economy span from the petrochemical industry, processing of coal and other fuels, intelligent emergency response, and transport equipment manufacturing to new materials. Based on the resources of the college town, healthcare and technological innovation services are playing a strategic role in local economic development. During the 14th Five-Year Plan period, Fangshan District is directing its efforts towards alternative energy, new materials, healthcare, and intelligent manufacturing, aligning with the distinctive disciplines of universities within Liangxiang Higher Education Park. The universities leverage their strong disciplines by initiating and organising research projects that respond to market demand. The Fangshan District government, on the other hand, provides support through enacting favourable polices and enabling industrial systems to promote the commercialisation of new advancements. Researchers working on small projects can access commercialisation services within the west zone itself. For projects involving manufacturing, Zhongguancun Science Park facilitates a seamless transformation from laboratory results to deliverables and ultimately to products by providing contiguous places for both research and production.

Changping District sets great store by industries such as electronic information industry, automobiles and transportation equipment, equipment manufacturing, biology and medicine, and basic and new materials. It will continue to develop its digital economy, new infrastructure, modern agriculture, cultural tourism, and leisure industries.

The advantages brought by college towns are particularly evident in the sci-tech service industry. With a view to boosting high-tech industries, the People's Government of Beijing Municipality has focused on key areas such as Zhongguancun Science Park, Huairou Science Park, Future Science Park, Beijing Economic and Technological Development Zone, and Tongzhou District as the city's sub-centre. In 2020, the professional, scientific, and technical services sectors in Beijing yielded an output value of nearly 300 billion yuan, with a year-on-year growth rate of 6% and a compound growth rate of 11%.

The construction of Peking University Town highlights the risks and challenges associated with bringing in private developers to fund major infrastructure projects. When private developers were enlisted to help build Peking University Town, it likely seemed like a reasonable solution, as the government lacked sufficient capital resources. However, the lack of adequate funding amongst these private developers ultimately crippled the project and led to a string of problems. In the initial demolition and construction stage, the developers' shortage of capital meant progress was very slow. This severely delayed the overall timeline for building the university town. Later, as financial issues compounded, developers faced capital chain issues that brought most construction to a standstill. As a result, parts of the town remain unfinished and are simply vacant wastelands. Expectations for the project have certainly not been met. The number of universities settling in the town is far fewer than planned, and teacher and student populations are consequently also lower.

The Future Science and Technology City serves as a prime example of the mismatch between plans and reality. It was intended to house 80,000 students, yet today enrolment sits at just over 20,000. This stark difference reveals the flaws in relying on private developers who lack the financial means to fully execute such an ambitious and expensive project. In retrospect, stronger oversight and contingency plans for potential funding crises may have helped avoid some of these pitfalls. The challenges faced by Peking University Town should serve as a cautionary tale when considering similar public-private

partnerships on major infrastructure and development initiatives. Sufficient capital and strict oversight are essential.

5.2.2. University Towns in Suzhou

College towns in Suzhou are located in both the east and west of the city. In the east lies the science and education innovation zone, situated on the east bank of Dushu Lake in the industrial park. In the west, we find Suzhou International Education Park, on the west bank of Shihu Lake in Wuzhong District. The college towns are home to 33 renowned universities and research institutions from China and beyond, with nearly 80,000 students and teachers. Over the past two decades, the college towns have transformed Suzhou from a city with limited higher education resources into a vibrant hub that enjoys rich, high-quality educational offerings and a front-runner in pursuing higher-education internationalisation. The college towns have also brought numerous international cooperative projects accredited by the Ministry of Education, thus driving Suzhou's dynamic growth through the integration of enterprises, universities, and research institutes.

The college towns in Suzhou have tailored their development to satisfy the specific needs of industries within the city and adapted their talent training programmes to "customise" college graduates for urban development.

The colleges have integrated their growth with the economic progress of Suzhou Industrial Park by providing undergraduate and postgraduate programmes in line with key emerging industries and crucial supporting fields. By doing so, they have successfully nurtured high-calibre talents who are in high demand for the industrial transformation and upgrading of the Park. Through collaborative efforts with local enterprises, the colleges have started providing "well-targeted classes" to support tech-driven startup companies by nurturing "customised" personnel and developing cutting-edge technologies. Regarding the coordinated industry-university-research development supported by the local government, colleges increasingly engage with enterprises in the Park in an effort to build research institutions or practical bases for graduate students and seek closer cooperation in technology research and development. By 2020, the first batch of instruction centres integrating technical training and academic education had been built, "well-targeted classes" had started, and the "apprenticeship training system" had been instituted. This has

led to the formation of a robust mechanism for collaboration between academia and industry.

In Suzhou, approximately 45% of college graduates choose to seek employment or start their own businesses within the city; a total of 15 national-level research institutes have been established there, with a multitude of brilliant scientists ready to make their contributions. Furthermore, tens of thousands of talented individuals emerging from there are shining bright across the country and on the world stage. Suzhou has truly become a dynamic powerhouse with an ever-expanding talent pool. As the science and education innovation zone enters a new stage of leap-forward development, higher education plays an increasingly significant role in the economic and social progress of the Park. It will generate fresh momentum for the Park to evolve into a world-class high-tech park, a first-class pilot free trade zone, and a new centre in Suzhou embracing a glorious future.

The problem facing Suzhou University City is the relatively low quality of higher education institutions. It has only one “Double First-Class” university, and no internationally renowned universities. This leads to lower-quality students, especially at the postgraduate level, making it difficult to improve overall quality. It also results in lower-quality scientific research and innovation.

To address this, existing universities in Suzhou could be upgraded by providing more funding, resources, and autonomy. Helping these universities gain “Double First-Class” status and international recognition would attract high-performing students and faculty. Scholarships and incentives could also draw top students from across China. Investing in research facilities and industry collaborations could boost innovation. Reforming recruitment and evaluation systems to attract and retain excellent professors is also important. Allowing these universities more flexibility in student admissions based on merit could help them select better-quality students. More funding should also be allotted for graduate education.

In summary, a systematic approach is needed to improve the research environment, teaching quality, faculty, and student body at Suzhou’s universities. Strategic upgrades can enhance the quality of higher education institutions in Suzhou University City. The government should make this a priority.

5.2.3. Guangzhou Higher Education Mega Center

Located in Panyu District in southeast Guangzhou, Guangzhou Higher Education Mega Center (HEMC) spans an area of 34.4 square kilometres and has attracted 12 universities and colleges to settle here. It is a national first-class college town in South China, recognised as an "information port" and "intelligence centre" for talent training, scientific research, and international exchanges. HEMC boasts integrated industry-university-research development and is systematically exploring new pathways for regional innovation-driven growth. To this end, it has carried out innovation mechanism reforms, developed a collaborative governance system for social innovators, and incubated a financial service system. It has taken steps to build an internationalised incubation system to encourage innovation. These efforts have resulted in overall improvements to the innovation and entrepreneurship ecosystem within HEMC, and have helped create a sound operating mechanism that facilitates startups and incubation.

HEMC boasts 213 key laboratories (including 13 national-level ones), 149 research centres for engineering technology, and eight institutions for advanced research. It also houses three national incubators, two provincial innovation and entrepreneurship demonstration bases, four national-level makerspaces, and one innovation and entrepreneurship demonstration site, as well as the Guangdong-Hong Kong-Macao Youth Entrepreneurship Incubator and the Guangzhou-based Guangdong-Macao Young Entrepreneurs International Industry Accelerator. Makerspaces of various kinds occupy an area of 43,600 square meters, with over 300 projects under incubation. Nearly 400 science and technology enterprises are incubated or stationed in the innovation and startup demonstration bases, including 60 key enterprises, 16 high-tech companies, and 15 enterprises above designated size with an annual revenue of at least 20 million yuan.

The 2021 List of Unicorn Companies features 1,058 businesses worldwide. Of the ten enterprises listed and headquartered in Guangzhou, two are located in HEMC's innovation and entrepreneurship demonstration base, accounting for one-fifth of the total. In 2020 alone, such bases in Guangzhou contributed a revenue of 2.74 billion yuan, accumulating over 3 billion yuan to date, and created more than 8,000 jobs. Ten companies have attracted

direct financing, with a total investment of over 300 million yuan and a valuation exceeding 1.5 billion yuan.

HEMC has also stimulated the development of the surrounding infrastructure, which means a better life for local residents. Tourists can enjoy themselves in places of interest including Guangdong Science Center and Lingnan Impression Garden. Sports enthusiasts will delight in the Sports Center specially built for HEMC, as well as numerous small sports venues and stadiums. Shoppers can explore several large malls and nearly 100 supermarkets, with Guangzhou University Business Center and GOGO Xintiandi serving as popular destinations for local college students. Local education resources include a number of kindergartens, two primary schools, a junior high school, and a senior high school. Notably, the junior and senior high schools affiliated with Guangzhou University have made the list of the best local schools. In terms of healthcare, Guangdong Provincial Hospital of Traditional Chinese Medicine has recently opened up its branch in the Higher Education Mega Center, and many more on-campus clinics are available at local universities. An extensive transportation network has been established, with a number of new subway lines, trams, and docks put into use and several highways, bridges, and tunnels under construction.

Distinct characteristics can be observed among the college towns in Beijing, Suzhou, and Guangzhou. It is evident that each of them possesses unique cultural traits and has made remarkable contributions to their respective communities in terms of technological advancements as well as economic growth. Both Beijing Future Science Park and Liangxiang Higher Education Park integrate their development with the overall planning of disciplines. They have implemented comprehensive management practices to ensure effective institutional support for their growth. Moreover, they have ventured into innovative operating models that align with the needs of local industries, aiming for coordinated development with the local economy. Dushu Lake Sci-Edu Innovation District in Suzhou has been committed to the strategy of integrating production and education, with its primary focus being to facilitate local industries by creating an enabling business environment and establishing top-notch industrial innovation clusters. These efforts will further enhance Suzhou's capability to translate the Innovation District's strengths in education, research, and talents into tangible economic performance and growth. HEMC, with independent innovation and entrepreneurship as the core driving

force, is devoted to building a comprehensive innovation incubation system. The system incorporates “pre-incubators, incubators, accelerators, and industrial parks”, facilitating the entire process of industrial application of high-tech advancements, from “nurturing inchoate ideas to launching entrepreneurial projects, establishing startups, and forming industry clusters”. By integrating the innovation chain into the industrial chain, this initiative aims to extend the benefits of scientific and technological innovation incubation to a wider audience. It will not only prove the value of technological innovation but also provide a strong technological underpinning for industrial transformation and economic growth in the Guangdong-Hong Kong-Macao GBA.

A major problem faced by Guangzhou University City is that the road planning implemented in the early stage imposes great limitations. For example, a road passes through a school, cutting a whole school into several areas. This is inconvenient for teachers and students commuting between the living area and teaching area and creates potential safety hazards. In addition, the design of key road intersections in University City is unreasonable. After the growth, development, and completion of surrounding facilities, such poor designs often lead to long-term congestion.

With some creative redesigns focused on community needs and open collaboration with the city, Guangzhou University City’s transportation woes could be turned into a model multi-modal transit network benefitting students, faculty, and staff alike. The potential is there if infrastructure can match the vision.

5.3. Key findings

Hong Kong can learn from both the successful and unsuccessful experiences of university towns worldwide. Key successes include comprehensive planning aligned with national goals, extensive customised facilities, promoting multidisciplinary collaboration and industry partnerships, developing a vibrant innovation ecosystem, and providing a good transit system and good amenities. However, major pitfalls involve insufficient funding, inadequate land supply, lack of urban integration, overly ambitious scale, weak commercialisation pathways, and complex governance.

Hong Kong can learn from the comprehensive planning and development aligned with national strategic goals seen in Tsukuba and Chinese university towns, which provide policy support and resources; the provision of extensive facilities and infrastructure tailored to research, education, business, and living needs, which Stanford exhibited in its expansions, thus providing space to grow; the promotion of multidisciplinary collaboration and university-industry partnerships through shared labs, projects, and talent exchanges, at which Daedeok Innopolis excelled; the development of a surrounding innovation ecosystem by attracting companies, startups, and investment, as achieved by Singapore Science Park; good transportation links, affordable housing, and amenities for attracting and retaining talent, as in Delft; and independent governing bodies to enable oversight and continuity, as Tsukuba Science City Development Authority demonstrated. By assimilating these global best practices, Hong Kong can develop a world-class sustainable university town.

Hong Kong can learn from the insufficient funding that stalled Tsukuba Science City's construction, so financing models need examination; the inadequate land supply that constrained Stanford's growth, so space needs require attention; the lack of urban integration that created problems in Guangzhou University Town, so alignment with the Northern Metropolis masterplan is important; the overly ambitious scale and dispersed layouts that limited resource sharing in some Chinese towns, so a balanced scope is preferable; the weak industry linkages and commercialisation pathways that hindered Tsukuba initially, so close university-industry partnerships are key; and the governance complexities and power imbalances that affected Tsukuba Science City, so streamlined coordination is needed. By prudently assimilating these failure lessons, Hong Kong can avoid major pitfalls in developing its university town.

By strategically applying global best practices whilst avoiding common pitfalls, Hong Kong can develop a sustainable world-class university town in the Northern Metropolis. For example, (*The Tsukuba Science City Construction Law*, 1970) made clear provisions for the planning, construction, and management of different areas of the university town, providing strong support for the continuous promotion of construction and protecting it from being affected by governmental and/or policy changes over time. Despite this, the construction and relocation of Tsukuba University Town in Japan took more than 20 years from planning to completion. One of the reasons was that it missed the golden period of

economic development. Other university towns show the same phenomenon except for the Guangzhou Higher Education Mega Centre, as shown in Table 9. This requires astute planning, sufficient resources, optimised space use, robust academia-industry linkages, streamlined administration, and a balanced scale. Prudently assimilating insights from international precedents can catalyse this initiative's development into a key driver of Hong Kong's emerging I&T economy.

Name	Country	When planed	When started	Estimated construction period	When finished	Whether delay
Tsukuba (Tsukuba-Science City Network, 2022)	Japan	1963; Cabinet approved construction	1967; Construction work began	10 years	1980; Most of the relocation of universities and institutions complete	Yes, three years delay
Singapore Science Park (Phase I) (National Library Board Singapore, 2021)	Singapore	1979; Jurong Town Corporation (JTC) outlined a programme	1981; The site was cleared for development of the science park	2 years	Estimated 1983;	Yes, Six-month delay
Daedeok Science Town (Kang et al., 2021)	South Korea	1973; Establishment of the master plan for the Daedeok R&D Complex	1974; construct the foundation of Daedeok Research Complex	8 years	1992;	Yes, 10 years delay because launched new Daedeok Industrial Base Development Plan
Guangzhou Higher Education Mega Centre (Phase I) (Guangzhou government, 2002)	China Mainland	2001; Guangzhou University Town Development Plan launched	2002; Guangzhou University Town Construction Plan launched	\	2004;	No

Table 9: Construction Timeline of Main University Towns

VI. Stakeholder Opinions from Hong Kong Universities

This report summarises perspectives from university leaders in Hong Kong on developing an effective shared university town. Interview respondents conveyed a common vision for the town to become a global hub advancing knowledge, talent, innovation, and quality of life through partnership. However, distinct views exist on optimal strategies for achieving this goal.

The prospect of developing a new university town in the Northern Metropolis has been eagerly embraced by key stakeholders. The leadership across the region's eight major universities has voiced resounding support, eager to participate in planning and establish robust government communication channels. Stakeholders emphasised that the new university town must prioritise distribution justice in expanding access to learning for Northern Metropolis residents. With the area expected to house 1.5 million residents, developing adequate education infrastructure is imperative. The university town presents an opportunity to equitably equip the Northern Metropolis with the same quality of higher education resources available in other districts. This would address unequal access issues and provide more affordable options for local youths. Beyond benefiting students traveling to study there, the town's programmes should also be designed to upskill workers and meet employment needs of local industries. This distributive approach caters to both existing and incoming residents across socioeconomic backgrounds. Universities can collaborate with policymakers to optimise programmes and admissions pathways for Northern Metropolis students. By consciously embedding principles of distribution justice centred on elevating local communities, the university town can uplift the Northern Metropolis as a district of abundant opportunities.

A foremost impetus is the severe lack of expansion space hampering existing campuses. State-of-the-art facilities for teaching and research, especially upgraded scientific apparatuses, are sorely needed to maintain educational excellence and boost academic competitiveness. Attracting an influx of elite talent from across the globe is another hoped-for outcome. Transportation infrastructure is a critical priority, with convenient transit links essential to fully harness the synergies of clustered campuses. Enabling seamless mobility between universities will facilitate collaboration and exchange among students

and faculty across diverse disciplines, catalysing an innovative ecosystem whilst concurrently promoting young people's STEM interest and careers. Stakeholders highlighted the need for policies that smooth talent and academic resource flows between Hong Kong and the GBA. This includes enabling mobility for students, faculty, researchers, and workers to allow fuller participation in educational and research collaborations across the region. The university town's capacity could be leveraged to host cross-boundary exchanges, shared facilities, and collaborative degree programmes or research projects. Policy reforms around data sharing and sample transfers are also critical for increasing joint studies and optimising collective capabilities. By formulating cooperative frameworks, infrastructure, and governance mechanisms tailored to the university town context, connections between innovators and institutions across Hong Kong and the GBA can be strengthened. This policy-enabled integration will amplify the educational and technology resources accessible to all, catalysing innovation through opening channels for dynamic pan-regional exchange.

Strategic scientific facilities aligned with cutting-edge industries should be guided by proactive government intervention. The proximity of science and tech business parks provides a prime opportunity to fuse academia, enterprises, and policymakers in shaping the knowledge economy of the future. The focus is on addressing immediate challenges through applied research and education serving real needs, then leveraging the adjacent GBA's research and innovation advantages. Elevating liveability and amenities to enrich the area is also key to attracting and retaining talent. By coalescing the various elements of the university town into a dynamic and stimulating hub, the collective intellectual capital of the region can be fully harnessed. With astute planning aggregating critical masses of ideas, people, and resources, the northern university town can fulfil its immense potential. The stakes are undoubtedly high, but the potential upside for the metropolis and GBA is huge.

6.1. Importance of interviewing selected interviewees

The leaders of local universities in Hong Kong, especially the vice presidents, are more aware of the overall development direction of Hong Kong's higher education sector and the positioning and professional layout of each institution. Consulting with them can ensure that the planning of the university city meets the long-term planning and

development needs of the higher education sector. At the same time, the vice presidents also have a better understanding of the teaching and scientific research situation of each university, and can give more practical suggestions, which will help to properly arrange the departmental setup, number of school buildings, and supporting facilities in the university town.

In addition, extensive consultation involving local university leaders can reflect the inclusiveness of the university town planning process and represent the interests and voices of major universities. This will help the design of the new university town not only meet the needs of social development, but also take into account the interests of universities so as to increase its sustainable development capability. Moreover, extensive consultation with local university leaders, especially vice presidents, is of great significance for ensuring that the planning of university towns meets the development needs of the higher education sector in Hong Kong. This will help create a university town that meets the needs of society, conforms to the long-term development plans of the higher education sector, and takes into account the interests of various universities.

From the perspective of the development of the higher education sector in Hong Kong, in the next 5-10 years, considering the process of integrating into the GBA and the development of the country, as well as the country's higher requirements for personnel training, Hong Kong's higher education sector will face the pressures of transformation and upgrading and the situation of coexistence of opportunities. In this context, the construction of a university town with a larger scale and more complete functions can provide a solid platform and space guarantee for the long-term development of universities.

However, in order to build a university town that truly meets the higher education sector's development needs, it is necessary to get rid of the mentality of eagerness for quick success and to gather consensus and strength. Therefore, early consultation with local colleges and universities, especially the opinions of the middle- and high-level leaders of each university, is particularly critical to planning. This will help the design of the university town to be more scientific and reasonable, and the setting of various supporting facilities to be more in place. After moving into the university town, colleges and universities will also be able to integrate into the new environment more smoothly, and various teaching and scientific research efforts can be put on the right track faster and maximise their

effectiveness. To sum up, policy researchers should advocate extensive consultation with local university leaders, especially the opinions of vice presidents of universities, in the planning of university towns. This not only contributes to the scientificity and rationality of the overall design of university towns, but also helps colleges and universities to begin operating faster after moving in, exerting the ultimate effectiveness of building a new university town. This is a critical step in planning a truly sustainable university town.

6.2. Interview Results and Summary

There is a shared vision among respondents for developing a university town in Hong Kong's Northern Metropolis into an innovation hub that can drive progress in the areas of knowledge, economy, and society. However, distinct perspectives exist on optimal strategies and models for achieving this vision. By synthesising complementary insights through open cooperation, the university town could emerge as a vibrant intellectual and industrial nexus for sustainable prosperity. Interview respondents conveyed a consistent goal of attracting global talent and investment to a high-quality living and working environment optimised for partnership and exchange. They proposed aligning development with national and regional strategies, including GBA integration, and advised optimising curricula, research, and facilities to meet contemporary demands. Some recommended focusing on areas like traditional Chinese medicine, culture, entrepreneurship, and technology. However, varying approaches to improving higher education—for example, through branch campuses, inter-university collaboration, credit transfer, and teacher exchange—require balancing resource constraints and avoiding redundancy.

Support from companies and governments is vital. Companies can partner with universities in innovation and talent training. Governments can increase funding, promote cooperation, and support educational reform. Policies should correspond to universities' needs. Investing strategically across education, industry, and living sectors can maximise synergies and minimise costs. Clarifying the positioning and advantages of each university and company enables optimised cooperation and resource sharing. Competition spurs progress, but communication and consensus building are also key. Whilst distinct in their perspectives, the interview respondents conveyed a balanced vision for an innovation ecosystem that advances society collectively. By integrating complementary insights

through cooperation, this vision can transform into reality. Comprehensive policymaking and strategic investment are required to cultivate an environment where knowledge, industry, and community intersect for shared gain. With open dialogue, prudent planning, and support across sectors, the university town could emerge as a striking urban innovation district. It could become a global talent magnet, intellectual and economic nexus, and centre of social progress by tailoring curricula, facilities, and opportunities to regional demands. By synthesising the perspectives of education and industry experts, Hong Kong can shape a vibrant future-facing community oriented toward sustainable prosperity. Overall, developing an impactful university town requires integrating diverse insights through collaboration to ensure the broadest progress.

In summary, the interview respondents provided both a shared vision and distinct perspectives on strategies for meaningful university town development. By synthesising their complementary insights through open cooperation, this initiative could fully realise its potential to advance society in a balanced manner. Comprehensive policymaking and strategic investment across education, industry, and community require dialogue to drive sustainable shared progress.

6.2.1. The Necessity of a University Town

Whilst Hong Kong universities agree on the potential benefits of a shared university town, including driving knowledge exchange, innovation, and talent cultivation, distinct perspectives require open dialogue to develop a balanced strategy. Integrating development with national and regional strategies can amplify impact, but planning must suit higher education institutions' unique positioning. Curricula and research should address social and economic needs, focusing on areas like traditional Chinese medicine, culture, entrepreneurship, and technology, but prudent investment is needed to avoid redundancy. With visionary planning and support across sectors, a shared university town could accelerate an innovation ecosystem attracting top talent and enabling growth. Thoughtfully designed based on diverse input, it may emerge as a globally competitive hub advancing society through integrated learning, discovery, and commercialisation at the nexus of knowledge, industry, and community.

6.2.2. Increase Multilateral Engagement

Crafting an impactful shared university town requires input and support from diverse stakeholders to develop a balanced policy and strategy. Government leadership is crucial to convene and coordinate across sectors, but companies, educators, non-profits, and communities also make essential and distinct contributions. Whilst increasing multilateral involvement introduces complexity, the rewards of partnership outweigh the challenges it brings. Governments fund planning, incentivise cooperation, and establish feedback mechanisms. Companies and non-profits inform opportunities for industry-university collaboration and innovation. Community groups enhance liveability, inclusiveness, and cultural richness. Cross-sector engagement is challenging yet vital, requiring vision and mediation to translate differences and cultivate shared purpose.

Though stakeholders operate based on distinct standards and values, open exchange can clarify the responsibilities of and benefits for each, enabling cooperation at the nexus of knowledge, industry, and society. Community participation, though demanding, leads to human-centred outcomes. Overall, a genuinely shared vision and cooperative framework are fundamental to progress. Facilitating understanding between educators, industry, and urban planners is key. Whilst ambitious, this initiative requires consolidated insight across public and private domains to maximise opportunity. With governments spearheading coordination across divisions, and the rewards of partnership outweighing the issues arising from increased complexity, developing an impactful shared university town through multilateral engagement is achievable.

6.2.3. Conditions Required for an Effective University Town

Developing an effective shared university town demands a clearly articulated and shared vision across stakeholders to provide direction. Aligning on priorities for advancing knowledge, cultivating talent, building innovation capacity, and enhancing quality of life enables partnership essential for success.

Strong government support through responsive policies, funding, incentives, and facilitating cooperation across sectors is vital. Governments increase resources for planning and development, optimise conditions for industry-university collaboration, and attract companies and investment. They also coordinate across divisions and stakeholder

groups. Comprehensive planning tailored to contemporary challenges and the higher education sector's strategic positioning is required. Consolidating insight across stakeholders suits strategic goals, addresses skills gaps, and meets urban planning aims. Coordinating education, research, industry, infrastructure, and living sectors maximises opportunities. A high-quality living and working environment with excellent facilities, equipment, and programmes attracts top talent, enabling exchange and collaboration. Housing, transportation, healthcare, recreation, and childcare considerations are also important. Ongoing cooperation and feedback mechanisms across stakeholder groups through inter-institutional partnerships, public-private partnerships, and discussion forums are therefore essential, identifying changing needs, evaluating progress, and enabling responsive adjustments.

Incentives and support structures for innovation and entrepreneurship include grants, incubators, accelerators, business pitch competitions, mentoring programmes, and investment funds. By catalysing new ideas, skills, and ventures, these power a knowledge economy. Opportunities for open exchange and serendipitous connection across disciplines, sectors, cultures, and fields include common spaces as well as organised events facilitating dialogue and relationship building, which drive interdisciplinary thinking, new partnerships, and a vibrant community. With vision, policy support, planning, and investment tailored to local needs, a university town could accelerate development of an urban innovation ecosystem attracting top talent and enabling growth. However, success relies on partnership across education, industry, government, and community. Facilitating understanding and cooperation is key, though demanding, and the rewards of collaboration outweigh the challenges it poses. An effective shared university town demands partnership: cooperation enables coordination. By maximising insight and opportunity across domains, this initiative may advance knowledge, economy, and society through exchange designed for shared progress. Overall, cooperation comes first.

6.2.3.1. Accessible Location

An accessible location near public transit infrastructure like metro stations is essential for attracting top talent, enabling participation, and facilitating knowledge exchange. This includes local and international students, professors, industry partners, and residents. Easy access makes the university town convenient and liveable for a wide range of beneficiaries.

Strong transportation connections provide opportunities for serendipitous encounters and unplanned interactions that catalyse new ideas, partnerships, and ventures. This is especially important for cultivating an innovation ecosystem. Proximity to an international airport is also beneficial for global exchange. An accessible location supports environmental sustainability by reducing reliance on private vehicles. This is consistent with broader social aims for more liveable cities and transitions to sustainable energy and mobility systems. Good public transit options minimise traffic and emissions.

For higher education institutions, an accessible location provides greater access to resources, facilities, and opportunities concentrated in urban centres. This includes libraries, laboratories, healthcare institutions, entertainment and recreation options, and pipelines to employment - all advantageous for attracting and retaining top students and faculty. An accessible location with employment opportunities, affordable housing, and community services nearby suits the needs of faculty, students, and young professionals wanting to minimise costs and commuting time. This contributes to perceptions of liveability, ease of living, and good quality of life - all of which are factors that influence talent competitiveness. Strong transportation infrastructure amplifies potential connections between education, research, industry, business, and community sectors in a shared university town. This enables partnership and opens pathways for knowledge and technology exchange through movement of people and ideas. Overall, an accessible central location is optimal for cultivating intersections of sectors that drive innovation.

In summary, an accessible and well-connected central location provides significant benefits for developing an effective shared university town. By enabling participation, exchange, serendipity, sustainability, and access to resources, a central location with strong public transit amplifies potential for cooperation across education, research, industry, and community sectors. This powers opportunities at the nexus of knowledge, economy, and society that fuel collective progress through partnership designed for mutual gain. Overall, ease of access is key. A shared university town demands connectivity at its core.

6.2.3.2. Holistic Infrastructure

Housing, accommodation, and public transit options should suit the needs of diverse groups including students, faculty, young professionals, families, and seniors. Affordable

living options with good connectivity minimise costs of living and make the university town accessible and liveable for people at different life stages.

High-quality facilities for education, healthcare, recreation, childcare, and elder care contribute to good quality of life, community wellbeing, and talent attraction competitiveness. They are also consistent with the mission of a shared university town to cultivate knowledge, partnership, and progress. Commercial zones should provide employment opportunities, spaces for new businesses, and retail options for daily living. This attracts companies and investors, enabling partnership and industry-university collaboration. It also makes the area liveable by minimising the need to commute outside the community.

Green recreational spaces encourage active living, wellness, and community cohesion. They provide areas for unstructured interaction, exchange, and relationship building outside work or study environments. Contact with nature enhances health, creativity, and quality of life. Community amenities should reflect cultural and lifestyle needs to suit Hong Kong's diverse, cosmopolitan population. This includes spaces for arts, culture, entertainment, dining, nightlife, and worship/spirituality. Vibrant community life appeals to talent and fuels a culture of openness, driving exchange.

Well-designed infrastructure with walking paths, cycling networks, and smart mobility options enables sustainable living and transportation. It also opens space by reducing needs for congested road networks and parking lots. Supporting active mobility and transit-oriented lifestyles helps realise broader goals for liveability. Optimising conditions for commercialising new ideas and intellectual property contributes to a culture of innovation and knowledge economy vitality. Resources, incentives, funding programmes, and business mentoring or pitching opportunities can catalyse startups and technology ventures.

In summary, holistic infrastructure encompassing housing, education, recreation, healthcare, commercial, community, and mobility considerations is essential for developing an effective shared university town. By enhancing liveability, wellbeing, talent attraction competitiveness, and innovation potential, high-quality and well-designed facilities across sectors amplify opportunities for partnership, progress, and a shared vision of prosperity through knowledge creation and exchange.

6.2.3.3. Smart City

With research, talent, and entrepreneurial ecosystems concentrated in proximity, a university town will accelerate innovation and development of smart technologies through cooperation. Cross-disciplinary exchange can lead to reimagining the future of cities. Connections built during initial planning provide a foundation for partnership, reducing misalignment in deploying technologies or policy.

A testbed will trial smart solutions, scaling up promising options and containing less useful ones. An educated base provides feedback to improve technologies based on experience. Digital infrastructures already connect the area, enabling deploying smart technologies. Makerspaces and skills programmes develop capacity for co-creating solutions. Concentrated resources power innovation. Vibrant community life in a liveable place means people want to interact using new technologies. Smart cities meet human needs, enhancing wellbeing, prosperity, and sustainability. Principles of sustainable development and liveability employed in planning the university town align with optimising efficiency, improving life quality, and building resilience through transitioning to smart systems. The vision of a future city will inform progress.

Most importantly, a culture of open collaboration provides opportunities for co-creating, deploying, and improving smart solutions to advance economy, society, and environment together. But success relies on vision, understanding, and good faith: connection before technology or policy. Achieving a shared vision demands good faith; self-interest alone will not suffice.

6.2.3.4. Proximity to Industry

Being located near major business districts and industrial areas in the north provides opportunities for partnership, talent exchange, and commercialising intellectual property. Close ties between universities, researchers, and companies facilitate knowledge transfer, skills training for in-demand roles, and technology venturing. This cultivates an innovation ecosystem.

Several interviewees noted the roles of professional relationships and serendipitous encounters in driving collaboration. Proximity of education, research, and industry provides space for unplanned meetings and interactions, strengthening personal

connections that lead to new ideas or ventures. Though complex, the rewards of cooperation can outweigh the challenges. Developing the university town near existing infrastructure and transportation routes in the north minimises costs and environmental impacts, whilst enabling access from other areas. Students, faculty, and workers can benefit from nearby employment opportunities, amenities, and services. This also suits industry needs for convenience. Overall, an accessible central location has advantages.

However, some interviewees suggested industry should not overly influence priorities for education and research. Academic autonomy and freedom of thought are important for open inquiry, social critique, and independence. Whilst contributing to economy and society, universities have different functions than companies. Balancing roles and responsibilities are key but complex. Other interviewees noted that rather than proximity alone, success relies on aligning visions and priorities across sectors. Effective partnership demands mediating different interests through open communication and commitment to mutual benefit. Though location matters, shared purpose and reciprocal understanding have greater influence. Connection comes before place.

Some argued that a university town could attract new industries to the area. With talent, knowledge, and innovation concentrated nearby, companies may relocate or establish bases to access resources for growth. Meanwhile, others saw opportunities for revitalising existing districts through partnerships designed to foster inclusive prosperity across social groups.

Interviews with university leadership revealed a shared vision for the Northern Metropolis University Town to become a world-class hub advancing knowledge, talent, innovation, and quality of life through partnership. However, they expressed varied perspectives on optimal strategies, including balancing local access and global ambitions, overcoming land constraints, strengthening industry and government ties, integrating with national and regional policies, focusing research and curricula, attracting investment and talent, and elevating amenities and culture. Despite nuanced opinions, stakeholders agreed that astute planning to consolidate insights and optimise opportunities could enable the university town to fulfil its immense potential as an intellectual and economic catalyst propelling Hong Kong’s development. Open communication and cooperation across education, industry, government, and community is key to materialising a meaningful shared vision.

VII. Discussion and Conclusion

The university town initiative presents major advantages and opportunities for Hong Kong's innovation and technology development, but also faces challenges around funding, land constraints, governance, and integration that necessitate astute planning and phased implementation.

7.1. Advantages of Building a University Town in the Northern Metropolis

As mentioned in Section 4.2, Hong Kong and GBA possess rich I&T resources and institutions, like Hong Kong Science Park and Cyberport. Also, various funds are set to support the I&T development. But there are still problems we need to solve. Unicorn companies, for example, are used to evaluate the effectiveness and outcome of the start-up ecosystem. According to HURUN Global Unicorn Index 2022 (Hurun, 2022), GBA has a total of 62 unicorns, with 33 in Shenzhen, 19 in Guangzhou, but only 7 in Hong Kong.

One of the primary contributors to the limitations in Hong Kong's I&T sector is the geographical dispersion of organizations. For instance, significant entities like Cyberport, Science Park and various research centres in universities, like the University of Hong Kong, the Hong Kong Polytechnic University and the Chinese University of Hong Kong, are spread out across different areas from Hong Kong Island, Kowloon Peninsula and the New Territories. Consequently, this spatial fragmentation hinders effective collaboration and in-depth exchanges among researchers.

Furthermore, the dispersed locations also present challenges regarding the need for more comprehensive industrial chains and skilled workers in these regions, impeding the successful translation of research outcomes into tangible results. DJI, a prominent drone unicorn whose founder hails from Hong Kong, highlights the advantages they experienced in Shenzhen—a neighbouring city with a robust industrial ecosystem and an ample pool of highly skilled workers. These factors have facilitated the establishment and growth of businesses with greater cost efficiency and productivity.

To address these issues, the establishment a University Town in the northern metropolitan area aims to overcome these prevailing challenges within Hong Kong's innovation and technology sector. By creating a concentrated hub that brings together various organizations, research centres and universities within a single location, it seeks to foster collaboration, knowledge sharing, and interdisciplinary exchanges among researchers. Additionally, this collective environment aims to facilitate the development of robust and interconnected industrial chains, thereby expediting the transformation of research outcomes into practical applications. According to the Northern Metropolis Development Strategy Report, this area will provide over 150,000 I&T jobs for the young generation, and the University Town would serve as a magnet for attracting and retaining skilled workers, catalysing further advancements in innovation and technology within Hong Kong.

Significant and more advantages can be identified from the establishment of college towns, including:

1) establishing a distinctive city brand;
2) attracting excellent scientific research resources and high-calibre talents;
3) cultivating a skilled workforce;
4) stimulating social innovation and entrepreneurship, leading to positive technology spillover;
5) supporting local industries by enhancing the local industrial structure; and
6) expanding the sci-tech service industry for higher output value and more jobs.

Hong Kong boasts significant advantages that can enable the successful development of a world-class university town in the Northern Metropolis. The central and Hong Kong governments have clearly demonstrated their commitment to strengthening Hong Kong’s position as an international I&T hub. This provides robust policy support for major investments in frontier research and advanced facilities essential for a university town.

Hong Kong is already home to several top globally-ranked universities that attract elite research talent from across the world. The city is also a magnet for international students due to its cosmopolitan environment, vibrant student life, and reputation for academic excellence. Hong Kong’s extensive transport links and strategic location as a regional gateway enable convenient access that facilitates research partnerships and institutional

collaborations. Moreover, Hong Kong has a thriving ecosystem for technology transfer and nurturing start-ups, thanks to the enterprising culture fostered by its universities and deep industry linkages. With its financial clout and robust intellectual property protection, Hong Kong furnishes an ideal base for commercialising new discoveries. Building on these robust foundations, the Northern Metropolis University Town can catalyse Hong Kong's innovation capabilities. By concentrating intellectual capital, nurturing technology entrepreneurs, and accelerating knowledge exchange, the university town can become a powerhouse to propel Hong Kong's ascent as a leading global I&T centre.

7.2. Problems Facing the Construction of a University Town in the Northern Metropolis

However, it is crucial to address the following challenges:

1) achieving efficient land utilisation;
2) ensuring a stable flow of government funding and favourable policy supports;
3) gaining a keen understanding of University Town's real distinction;
4) designing clear plans for both short-term and long-term development; and
5) enhancing the local infrastructure network to support the college town.

Problems faced by university towns around the world

1. Funds

Lack of financial resources was a common problem during the construction of Songjiang University Town in Shanghai, China (Ruoppila & Zhao, 2017). Although the government promised to provide land and cover all land-related costs after negotiations, construction costs still posed a big problem for universities because commercial banks were unwilling to provide loans with long-enough terms to universities, making it difficult to start the project. In the case of Tsukuba University Town, although funding came from public funds, there were still problems with funding shortages that led to delays during construction (Bloom & Asano, 1981).

2. Land supply

During the construction of Guangzhou University Town, conflicts arose between residents and the government due to land acquisition compensation issues. During the construction of Tsukuba University Town, soaring land prices resulted in the university town being

scattered instead of contiguous, which caused problems such as inconvenient traffic and low communication (Bloom & Asano, 1981).

3. University Relocation

During the planning stage of Songjiang University Town in Shanghai, the Songjiang District government was particularly concerned about the partial or complete relocation of universities (Ruoppila & Zhao, 2017). For example, they were not satisfied with only receiving universities teaching arts majors, and were keen on having universities teaching engineering to drive the development of local industries. During the relocation time, some universities may change or adjust their previously-made plans. For example, 43 research institutions and universities were initially set to be located in Tsukuba University Town in Japan by 1976, but the target date was later changed to 1980 to allow relocation to be completed.

4. Resource Sharing

The original intention behind establishing university towns was to integrate resources better, break down barriers, and promote the exchange of ideas between universities. However, the reality is that university towns in China tend to be too large and dispersed. For instance, Guangzhou University Town covers an area of 4,300 ha and is simply a gathering of many universities. Students find the time cost of going to other universities is too high, which may encourage them to engage only in activities on their own campuses, resulting in repeated construction and waste of resources. Figure 11 provides a summary of selected university towns in China.

Table 1
Selected university towns in China.

Name	Province/municipality	Areas (ha)	Students (10,000)	Investments (100 million yuan)	Year of planning/ construction
Xianlin University Town	Jiangsu/Nanjing	3400	10	50	2002
Changzhou University Town	Jiangsu/Changzhou	667	6	25	2002
Songjiang University Town	Shanghai	300	17	25	2000
Chongqing University Town	Chongqing	2000	20	100	2003
Beijing Jili University Town	Beijing	200	2	8	2000
South University Town	Liaolin/Shenyang	180	10	40	2000
Jiaonan University Town	Shandong/Qingdao	2500	5	57	2004
West University Town	Shanxi/Xi'an	4000	10	85	2001
Fuzhou University Town	Fujian/Fuzhou	2000	10	30	2001
Shenzhen University Town	Guangdong/Shenzhen	1200	25	14	2000
Guangzhou University Town	Guangdong/ Guangzhou	4300	15	300	2002

Sources: data obtained from Shangguan, 2005, A study of the present conditions and the models of college town development in our country (Chongqing University, thesis); and other news sources; compiled by the author.

Figure 11: Area, number of students, and size of investments of selected university towns in China | Source: Li et al., 2014.

5. Power Structure

Traditional university towns are mainly centred on universities, such as the small university towns of Ann Arbor, Michigan and State College, Pennsylvania in the United States, where universities play an important role in community affairs (Miller, 1963). However, one of the characteristics of the Japanese government is its extreme vertical integration. Government agencies do not communicate well with each other, and jealousies abound as they compete for desirable programmes and necessary funds in the actual operation of Tsukuba University Town. As a result, only a few facilities are shared (Bloom & Asano, 1981). This has stifled the vitality and output efficiency of science and technology there.

6. Population Loss

The essence of a university town is still the town, and the three elements a town should be concerned with are work, life, and rest. In the early stages of Tsukuba University Town, the lack of daily consumption, leisure, and communication facilities for residents led to a situation where many people living there spent their weekends in Tokyo or other cities.

Whilst developing a university town presents enormous opportunities, Hong Kong also needs to address some key challenges for successful implementation.

Firstly, huge capital investments are required for constructing new campuses, acquiring equipment, and recruiting talent. Careful planning and phased development will be necessary to ensure availability of funding to sustain the ambitious vision. Secondly, the university town's land use, layout, and transportation must be meticulously designed with future expansion in mind. The site area needs to adequately accommodate the full scale of the envisaged university town. Thirdly, the mix of programmes and degrees offered should align with the priority industries planned for the Northern Metropolis. This will ensure the talent pipeline meets key workforce needs. Fourthly, streamlined governance structures are necessary for efficient administration across multiple institutions within the university town. Finally, productive town-gown relationships and industry-university-research cooperation must be fostered to create a virtuous cycle of research, commercialisation, and talent development for sustainable growth.

Although surmountable, these issues need to be proactively addressed right from the planning stage for the university town to achieve its full potential as Hong Kong's next-generation innovation powerhouse.

7.3. Policy recommendations on building a University Town in the Northern Metropolis

To successfully develop a world-class university town, Hong Kong needs to adopt a thoughtful and well-coordinated approach right from the initial planning phase. Some policy recommendations are suggested and each suggestion is discussed from short-term to long-run.

Policy recommendations

1. **Start planning the layout early to facilitate overall planning of the Northern Metropolis**

To facilitate the overall planning of the Northern Metropolis, the layout and development of the university town needs to be strategized early. Dedicated offices should be set up to gather inputs, suggestions and coordinate the planning process for the university town. A specific office can be established just for this purpose of aggregating recommendations and consolidating related plans. The programmes and research priorities of the university town should align closely with the three key industries earmarked for the Northern Metropolis - healthcare technology, artificial intelligence, and advanced manufacturing. This will allow the university town to supply the necessary specialised talent and technical support to catalyse growth in these sectors. Individual universities should also be encouraged to put forth development plans and proposals that optimally leverage their existing institutional strengths and future needs. By proactively initiating the planning process for the university town early, it can be coherent integrated into the overall masterplan for the Northern Metropolis right from the outset. This foresighted approach will maximise synergies and strategic advantages.

In the short term, the government must continue pushing forward with strong construction efforts, ensuring land acquisition and the relevant system establishment can be completed timely. Once construction is finished and the project enters the operational stage, long-term strategies should be implemented to avoid the problems experienced by the Science

City in Tsukuba, Japan. To achieve this, we propose changing the government-led system, simplifying the approval process and delegating authority to universities or organizations. This will encourage the transformation of innovative technologies and bolster the efficiency of scientific and technological achievements. Additionally, establishing a series of incentives will be crucial.

In the long run, it is important to avoid issues such as the waste of resources and duplication of construction that have been observed in university towns in China. A strong emphasis should be placed on sharing and communication within the university town. This spirit should be incorporated into the campus code and effectively disseminated through various channels like media and mail to everyone studying or working in the university town.

2. Rationale for Scale Study Planning

To ensure the sustainable development of the university town, the scale and scope should be optimised based on a pragmatic assessment of available funding and land resources. The overall scale needs to be rationally designed to match funding levels, so that financial capabilities can support the entire multi-year project. At the same time, detailed analysis of land supply in the Northern Metropolis is imperative, to determine the appropriate construction scale and spatial footprint for the university town. Given the long-term nature of this undertaking, reasonably scheduling the development in graduated phases can progressively build up the scale and achieve agglomeration benefits over time.

In the past, the cost of building a university town was often borne by students through increased tuition fees, but this has been proven unworkable (Ruoppila & Zhao, 2017). Not only will it make it difficult for the university town to recover its costs, but it will also lead to the loss of many talents. Paying for construction costs through the commercialisation of education or attracting venture capital investment and linking it to the overall economic output of the university town to obtain returns may be feasible alternatives. However, a problem to consider is that new modes require detailed feasibility and operability demonstrations, and the risks brought by such funding also need further evaluation. In the short term, the government should establish an investment promotion team dedicated to the Northern Science City. This team should formulate policies and incentives to attract investment. Reference can be made to current incentives and best practices to maximize

the attraction of the area. The government should actively engage with investment institutions, showcasing a strong willingness to cooperate in the northern metropolitan area. This can be done through visits, news media coverage, and other promotional activities.

To address the financial burden during the construction period, the government should explore alternative funding channels. One such option is to leverage the financial strength of Hong Kong to attract social capital and private investment. This can help share the financial burden and ensure the timely completion of the project. In the medium term, it is important to identify projects with high potential and provide them with encouragement and support. This can include funding, resources, and infrastructure to facilitate their development. By doing so, these projects can serve as role models and attract other innovative companies and start-ups to move to the area. This will help raise the visibility of the northern metropolitan area and contribute to the formation of a favourable ecosystem for innovation and technology. To ensure sustainable development, it is crucial to establish long-term partnerships with different industries and organizations. This can involve collaboration, knowledge sharing, and resource exchange to drive local development and create economic benefits. The government should actively attract and encourage more entrepreneurs to move into the northern metropolitan area by offering support, incentives, and a conducive environment for start-ups. This will not only benefit the entrepreneurs, but also stimulate venture capital investment and contribute to the overall growth of the community.

In addition, the distribution and layout of the university town should be judiciously aligned with the broader industrial development blueprint for the Northern Metropolis. Undertaking meticulous planning and studies around land use, spatial efficiency, construction feasibility and institutional requirements is key to designing the appropriate, contextual scale and distribution to match the planned industries. By taking a measured approach to planning the scale, funding, land use, phasing, and distribution, the university town can be intentionally designed for viable and enduring success.

3. Promoting Industry-University-Research Cooperation and Technology Demonstration Research

To maximise the impact of the university town, robust partnerships between academia and industry need to be forged. This requires collecting data on talent demands from industry

and strategically cultivating graduates with urgently needed skillsets. Companies can collaborate with universities to jointly train research students and provide them professional opportunities. Universities can offer targeted short-term courses on emerging technologies to deliver industry-relevant training. Increased funding and incentives should be provided to encourage university-industry R&D collaboration and create synergies. Facilities and resources for technology demonstrations and validation pilots can help test innovations for real-world viability. Structured mechanisms are needed to facilitate the translation of R&D breakthroughs into market-ready products and technologies. Additionally, reasonable distribution models for intellectual property rights and commercialisation profits should be instituted to motivate researchers whilst also enabling the sustainable development of universities. By bringing together stakeholders across academia and industry to co-create talent pipelines, research solutions, and commercial sable technologies, the university town can become an engine of innovation, technology translation, and growth for priority industries. The purpose of establishing the University Town in the Northern Metropolis is mainly to promote I&T development, directly serve society with scientific research results, and generate economic value. The integration of production, education, and research is the core factor that should be considered in developing this university town. The University Town can share some campus facilities, save land, electronics, time, and other resources, promote interdisciplinary learning for students and researchers, and strengthen exchanges between colleges and universities.

In the short term, the government should maintain close contact with relevant enterprises from the initial stages of planning the university town. This includes setting up research institutes and providing experimental sites and production workshops. This approach ensures that after the establishment of the university town, barriers between upstream and downstream industries within the vertical system can be broken down. Additionally, it facilitates horizontal exchanges among tertiary institutions. Urgent action is also required to engage with the universities in Hong Kong to clarify which faculties and organizations will be relocated to the university town. This is crucial for their future development and interests. It may be necessary to have in-depth consultations and discussions on whether the university town should be dominated by engineering institutions or should include a range of different institutions. Clarifying these details will optimize the scale and scope of the site.

In the medium term, universities and industries should collaborate to identify key emerging technology areas that require urgent talent development and research breakthroughs. Targeted degree programmes, research projects, and commercialisation initiatives can then be launched to address these strategic needs. Robust incentivization structures are needed to encourage researchers and students to participate in these priority domain projects. Multi-stakeholder advisory boards should provide guidance and feedback to ensure the initiatives achieve maximum societal and economic impact. By channeling efforts towards tackling concrete technology and talent gaps, the university town can build distinctive capabilities and value.

4. Simultaneous planning of supporting facilities

Planning for supporting infrastructure and amenities needs to occur in tandem with the development of the university town. Regional facilities planning should be strengthened to seamlessly integrate and coordinate the construction of the university town with surrounding housing, transportation, recreation, healthcare, commercial, and other services. The facilities and urban environment need to fulfil the rigid demands of top talents by providing quality housing, convenient transportation, excellent healthcare, education for children, vibrant culture and leisure offerings. By cultivating a dynamic, liveable community atmosphere with a high standard of living, the university town can become a talent magnet. Attractive policies are required to draw and retain talent, addressing pressing concerns around issues like affordable housing, access to healthcare, and schooling options for children. With meticulous planning across sectors to create a flourishing ecosystem and living environment, the university town can successfully attract and retain the premier global expertise essential for catalysing innovation.

It is of utmost importance to establish a high-level coordination and management committee, similar to that of Tsukuba University Town, to effectively coordinate and manage the relationship between the university town and the surrounding areas in a short time. This committee should specifically focus on the housing, transportation, and commerce facilities. Referring to the Northern Metropolitan Area Development Report, it is recommended to incorporate a separate chapter in the development plan for the northern university town explicitly addressing the connectivity between the university town and neighbouring facilities like transportation, industry, accommodation, and recreation. This

chapter should have a clear timeline for the completion of each aspect. During the construction phase, setting up a monitoring group is necessary to ensure proper progress and prevent delays. It is crucial that the university town and related infrastructure are completed and ready for use simultaneously, as any delays can negatively impact the attraction of the area. An area of concern is the availability of land, which should be adequately prepared in advance to avoid setbacks.

In the long run, the maintenance and operation of the facilities become crucial. It is recommended to establish a dedicated care and maintenance team through a bidding process to avoid frequent repairs that could disrupt the normal functioning of the university town. For instance, road damage and railway maintenance issues must be promptly addressed. An essential consideration is the commercial viability of the area, as it directly influences the number of people who would be inclined to stay in the region for various activities like shopping and entertainment. Meanwhile, policies and initiatives to attract and retain leading talent could include housing subsidies, expedited residency pathways, competitive packages, and dual career hiring support. Top-tier international schools, childcare services, healthcare facilities, and transit links are essential for meeting families' needs. Networking programs help new recruits integrate, while grants assist spousal employment and ventures. By holistically addressing the pressing concerns of high-caliber recruits through housing assistance, immigration incentives, employment perks, educational access, community building, and family support, the university town can become a globally competitive talent magnet. Tailoring policies and amenities to the needs of researchers, faculty, workers and their families is key to effectively attracting and retaining the talent imperative for flourishing as a dynamic hub of knowledge, technology and progress.

5. Create a good science, technology, and innovation ecology

To nurture a vibrant ecosystem of science, technology and innovation, policies and initiatives should aim to attract more youth to pursue STEM education and careers. Providing financial incentives like teaching allowances, scholarships or interest-free loans for science and technology programmes can encourage STEM participation. Streamlining administrative procedures involved in research funding and projects reduces bureaucratic hassles and empowers greater researcher autonomy and productivity. Platforms for exchange between students, researchers, entrepreneurs and industry professionals

facilitate communication and relationships, sparking new collaborations. Simplifying cross-boundary travel and exchange procedures enables freer flow of talent between Hong Kong and mainland China, opening up partnerships. By creating a supportive environment for STEM education, research administration, talent engagement and mobility, a dynamic culture of innovation can flourish.

It is essential to foster a vibrant I&T atmosphere within the city. This can be achieved through hosting expositions, creating tourist routes and fostering an innovative mindset. A feasibility study should be conducted to assess the cultivation of such an atmosphere, providing the foundation for a number of proposals. During the intermediate stage, organising academic and innovative activities in the northern metropolitan area would be beneficial. It is imperative to keep detailed records and perform analyses to facilitate continuous improvement. These initiatives will contribute to the local tourism economy and provide residents with the opportunity to experience and engage with novel technologies. Examples of this could be setting up driverless pilot zones and self-charging roads, as well as creating augmented reality communities. By offering unique and futuristic experiences, the region will attract individuals looking to settle down rather than just seek short-term employment opportunities. In the long run, it is crucial to establish 1-2 distinctive innovative activities exclusive to the northern metropolitan area. This will help build the brand of the area as an innovation and technology hub, necessitating long-term exploration, sustained investment, and perseverance.

6. Promote legal safeguards and governance structures

In order to avoid potential problems arising from changes in government and policy, it is recommended to specially formulate relevant legal provisions for the construction and operation of university towns. Long intervals between the planning stage and the construction stage are not a good thing. Now is the time for the country and Hong Kong to care about and focus on developing the I&T industry. Scientific planning and agenda formulation should be started as soon as possible.

In the short term, it is important to develop a clear construction and law development schedule by starting early to outline important milestones and deadlines. This can help ensure that progress is made in a timely manner and that all tasks are completed within the expected timeframe. The government should also collaborate closely with Shenzhen's and

national long-term planning initiatives to align goals and maximize advantages. This will help create synergy so that the development of laws in the Northern Metropolitan Area aligns with broader strategies and objectives.

As for a medium-term suggestion, it is necessary to establish a dedicated supervisory group to oversee the formulation process of laws. This group should be responsible for monitoring progress, providing guidance and offering incentives to motivate timely completion. Regular assessments should be conducted to evaluate the progress and identify any challenges or bottlenecks that must be addressed. Moreover, incentivize individuals and teams involved in the law-making process to ensure motivation and timely completion. These incentives can be in the form of rewards, recognition, or other incentives that encourage individuals to meet their responsibilities and contribute to the success of the project.

The final suggestion is to establish a Northern Metropolitan Area Law Preparation Committee, which means creating a dedicated committee that focuses on the preparation and development of relevant laws for the region. This committee should have a mandate to hear, collect, and set laws tailored to the needs and characteristics of the Northern Metropolitan Area. This will ensure that local operating, tax, and other essential laws are effectively developed and adhered to in the long term.

To develop a world-class university town in the Northern Metropolis, Hong Kong can learn from global best practices while avoiding common pitfalls. Comprehensive planning should align with national development goals and be initiated early to enable integration with the wider region. Extensive facilities customised to institutional needs provide space to grow. Multidisciplinary collaboration across academia and industry needs promotion through joint labs, projects and talent exchanges. Phased development enables gradual scale-up whilst maintaining long-term vision. Attracting international talent is key, so transit links, housing, healthcare, recreation and community building are important. Enabling commercialisation and university-industry partnerships fosters innovation ecosystems. Sustainability principles should be embedded regarding energy, waste and transport. Independent governance bodies will provide oversight on operations. Proactive policies and planning are vital across several key areas. Master planning should integrate

the university town early on, gathering diverse inputs. Pragmatic scale alignment to funding and land will enable viable growth. Robust academia-industry partnerships will link research to economic and talent needs. Supporting infrastructure and amenities must fulfil talent demands. Incentives and streamlining will stimulate innovation and exchange. Legislative safeguards and governance structures will ensure efficiency, quality and sustainability. With meticulous planning across sectors, the Northern Metropolis University Town can fulfil its immense potential as a magnet for talent and the fulcrum of Hong Kong's emerging role as Asia's innovation hub.

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About the Policy Research Centre for Innovation and Technology

The Policy Research Centre for Innovation and Technology (PReCIT) was founded in 2022 as a university-level interdisciplinary policy research centre. Led by Prof. Christopher CHAO, Vice President (Research and Innovation) of PolyU and Director of PReCIT, and Prof. Eric Wing Hong CHUI, Head of the Department of Applied Social Sciences and Co-Director of PReCIT, the Centre aims to support Hong Kong's I&T development in the GBA via interdisciplinary collaborative research, including but not limited to carbon-neutral cities, I&T development in the GBA, and the Belt and Road Initiative's development in Southeast Asia.

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