Executive Summary

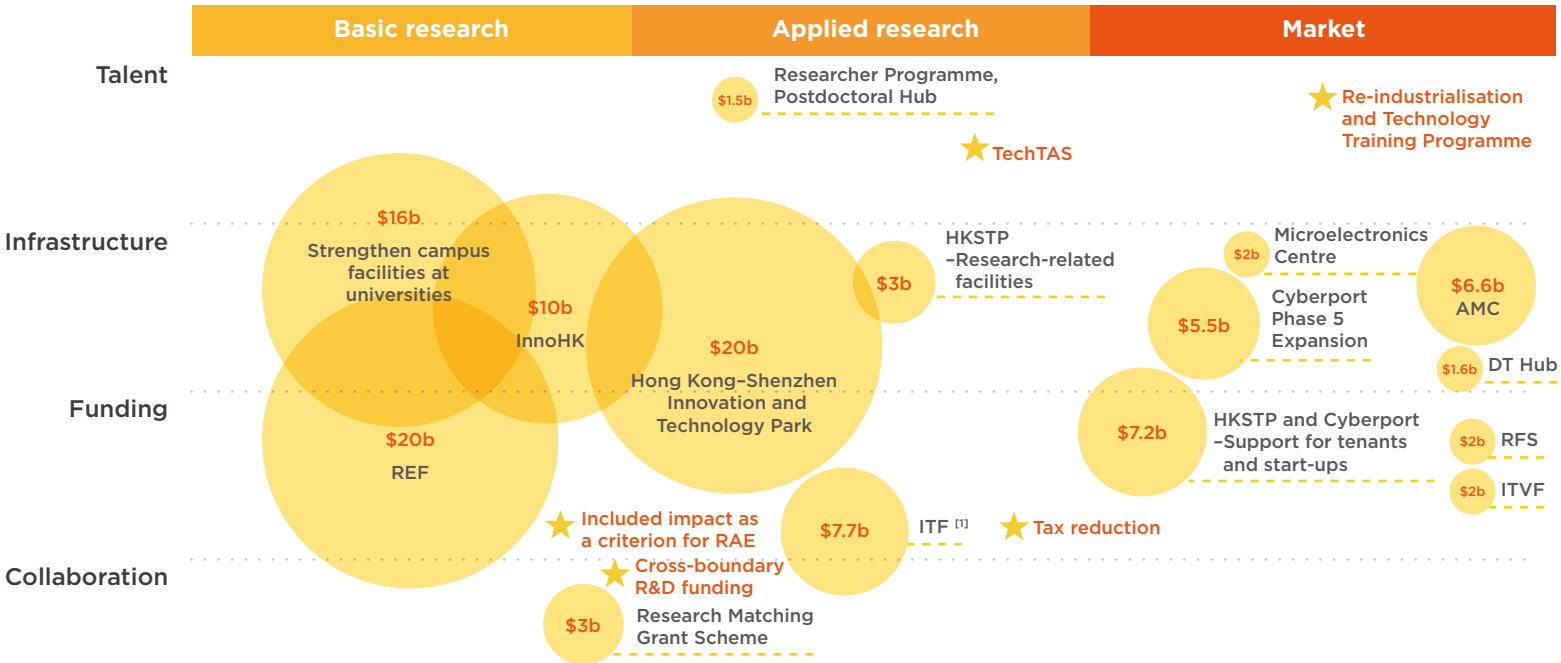
Universities' Research is the Competitive Edge for the Development of the Innovation and Technology Ecosystem in Hong Kong

Since December 2015, when Our Hong Kong Foundation (OHKF) published its first science and technology innovation report, entitled *The Ecosystem of Innovation and Technology in Hong Kong*, the Government has devoted significant efforts to boosting the development of science and technology innovation in Hong Kong, largely consistent with the recommendations that OHKF has put forward **(Figure I)**.

A lot of our recommendations were related to universities because they are potentially the game-changer for the entire ecosystem. Hong Kong has a relative competitive edge in certain areas of basic research, and it is vital that Hong Kong capitalises on this edge. In fact, according to the 2021 QS World University Rankings, six of the seven Hong Kong universities listed in the ranking saw an improvement from the previous year, demonstrating that the quality of basic research continues to rise in Hong Kong.

Furthermore, 50.4% of Hong Kong's total expenditure in research and development (R&D) took place in universities in 2018. This shows that universities play a dominant and outsized role in Hong Kong's innovation ecosystem, as university research constitutes a much lower portion of the overall R&D spending in the United Kingdom (23.6%) and the United States (12.9%).

Figure I. The current Government's efforts to boost the development of science and technology innovation in Hong Kong



Notes:

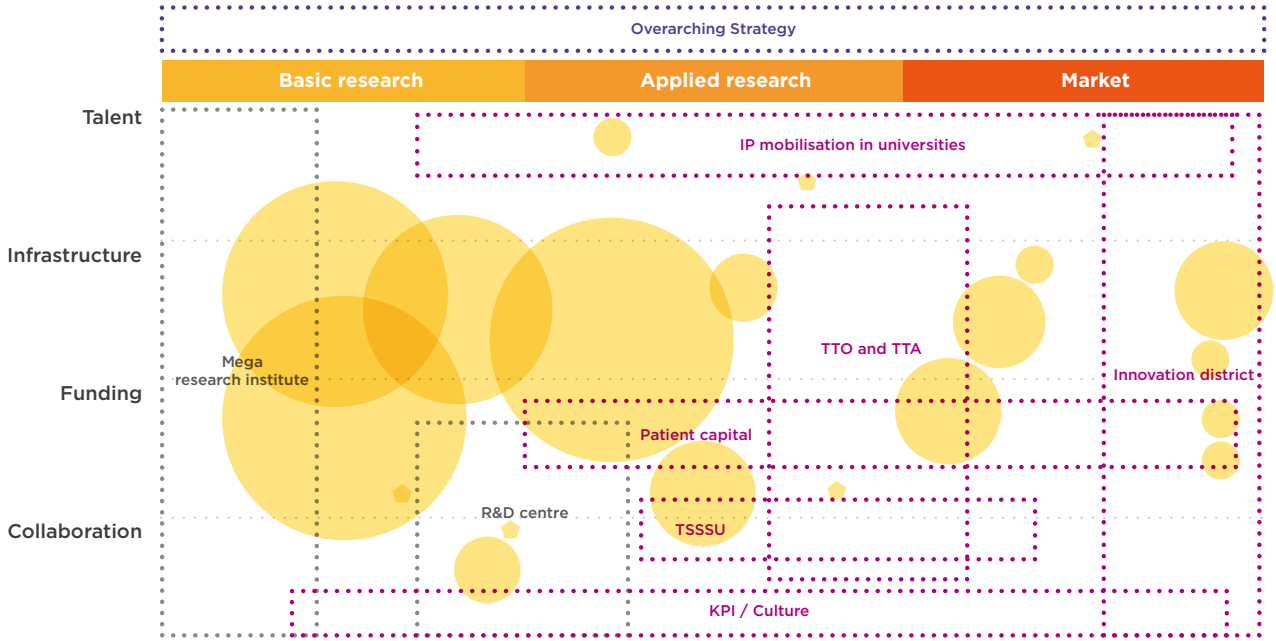
[1] This amount is sourced from seven funding schemes that support R&D, including the Innovation and Technology Support Programme, the Mainland–Hong Kong Joint Funding Scheme the Guangdong–Hong Kong Technology Cooperation Funding Scheme, the Partnership Research Programme, the Midstream Research Programme for Universities, the Enterprise Support Scheme and the Research and Development Cash Rebate Scheme.

[2] This list is not exhaustive and only includes schemes that are over HKD 1 billion and some of the most significant policies.

[3] REF stands for Research Endowment Fund. ITF stands for Innovation and Technology Fund. TechTAS stands for Technology Talent Admission Scheme. AMC stands for Advanced Manufacturing Centre. DT Hub stands for Data technology Hub. RFS stands for Re-industrialisation Funding Scheme. And ITVF stands for Innovation and Technology Venture Fund.

Hong Kong is beginning to reap the benefits from these policy initiatives, and there is a stronger momentum driving the local innovation ecosystem forward. Nonetheless, there remain significant gaps that the Government must address, particularly in strengthening basic research and knowledge transfer (between the stage of applied research and market). Therefore, OHKF released its second science and technology innovation report focusing on basic research (the grey dotted lines and the delineated areas in **Figure II**), entitled *Unleash the Potential in Science and Technology Innovation: Develop Hong Kong into an International R&D Powerhouse*, in December 2019. This third report focuses on knowledge transfer (the purple dotted lines and the delineated areas in **Figure II**).

Figure II. Recommendations by Our Hong Kong Foundation (dotted lines)



Note: [1] TTO stands for Technology Transfer Office. TTA stands for Technology Transfer Alliance; TSSSU stands for Technology Start-up Support Scheme for Universities.

Knowledge Transfer, together with Teaching and Research, are Commonly Accepted to be the Three Main Missions of Universities

Beyond the traditional missions of teaching and research, universities across advanced economies are increasingly focusing on their third mission of knowledge transfer. Knowledge transfer drives innovation by transforming knowledge generated in laboratories into actual products and services that could deliver economic and social benefits to society. One of the most famous examples is the discovery of penicillin, which was discovered by Alexander Fleming by accident. Researchers at the University of Oxford built upon Fleming's findings and managed to turn penicillin into a life-saving drug that became the hallmark of modern science. Fast forward to the present day, university researchers, collaborating with various commercial partners, may once again save the day with their COVID-19 vaccines. In Hong Kong, spin-off companies from universities, such as SenseTime, Xcelom, and DJI, have generated disruptive technologies with transformative impacts on the world as well.

Nevertheless, beset by a late start and without a full appreciation of the importance of knowledge transfer, universities in Hong Kong are lagging behind their foreign peers, such as the University of Oxford, Harvard University, Stanford University, and Massachusetts Institute of Technology (MIT), across a broad range of knowledge transfer indicators.

- In 2019, the Chinese University of Hong Kong (CUHK) was granted the most patents among Hong Kong universities, with 202 patents, compared with 434 granted to the University of Oxford and 781 to MIT.
- The cumulative number of active spin-off companies associated with each local university in 2019 ranged from 10 to 29, compared with 109 for the University of Cambridge and 145 for the University of Oxford. In addition, 25 and 24 new spin-off companies were formed at MIT and Stanford University (respectively) in 2019 alone.
- The combined total income from intellectual property (IP) rights in 2019 for all Hong Kong universities totalled HKD 100.1 million, which is dwarfed by the HKD 762.8 million generated by Harvard University and HKD 799.1 million generated by the University of Oxford.
- In 2018, the income from IP accounted for 0.26% of the University of Hong Kong (HKU)'s research expenditure, comparing to 2019 figures of 5.69 % for Cambridge University and 15.22% for the University of Oxford.

Strengthening Knowledge Transfer is the Key to Unlocking the 'Treasures' in Universities for the Development of Innovation and Technology Ecosystem

Given this circumstance, this report will put forward seven recommendations, including twenty detailed suggestions. By strengthening knowledge transfer, Hong Kong can better tap into the 'treasures' (scientific research findings) in the universities to foster a vibrant innovation and technology ecosystem. We believe these recommendations will enable Hong Kong's world-class basic research to be transformed into viable products and services that will exert profound economic and social impacts and lead Hong Kong to a better tomorrow.

RECOMMENDATION 1.

Foster a culture conducive to knowledge transfer in universities by enhancing the assessment framework and funding allocation linkage

Although the University Grants Committee (UGC) and Hong Kong universities have recognised knowledge transfer as the third mission of universities, they have yet to fully embrace it. Although a culture that is conducive to knowledge transfer has improved over the last few years, it remains largely absent among campuses in Hong Kong. The Government, as the primary funder of universities, has a responsibility to foster such a culture.

To begin with, the Government should gather and disclose more data related to universities' knowledge transfer activities, taking note of such data disclosure in the United States and the United Kingdom. The second step should be to enhance the assessment framework for knowledge transfer to make it comparable to the audits conducted by the Quality Assurance Council and the Research Assessment Exercise, which would respectively correspond to the university's mission of teaching and research. The third step should be to simultaneously increase the recurrent funding for knowledge transfer while allocating such funding based on the enhanced assessment framework. Finally, technology transfer offices (TTOs), which serve as an integral knowledge transfer infrastructure for universities, should be able to keep a percentage of the net profit generated from their university's IP based on their performance to further stimulate a culture conducive to more active knowledge transfer.

RECOMMENDATION 2.

Enhance IP mobilisation by offering more flexibilities and options for researchers to commercialise their research

Hong Kong universities trail behind in institutional IP policy with relatively conservative terms, stifling the mobilisation of IP and thus hindering knowledge transfer. For example, patents created by faculty members and staff are owned by universities unless inventors buy out the patent at relatively unaffordable prices, whereas some global peers allow inventors to assume full ownership if the invention is independently commercialised. In terms of licensing revenue sharing, Hong Kong universities distribute only 25% to 50% of revenues to inventors under university-led commercialisation processes, while overseas institutions adopt more generous revenue-sharing terms. Therefore, we recommend that local universities provide greater flexibility in regards to patent ownership and licensing policies.

As well as IP policy, outside practice regulations should be relaxed to create more flexibilities for faculty members and staff to commercialise their research. Currently, academic personnel are only permitted four days per month for outside practice. To align with innovative universities abroad, Hong Kong universities should relax their outside practice regulations, for example, to allow and encourage activities related to knowledge transfer during vacation and annual leave.

RECOMMENDATION 3.

Improve university research commercialisation through Technology Transfer Offices and a Technology Transfer Alliance

University TTOs serve as a key infrastructure for knowledge transfer and commercialisation. To enhance the effectiveness of such technology transfer units, we recommend that TTOs should provide more dedicated and specialised staffing support for researchers and constitute governing committees with more industry practitioners. Furthermore, we recommend that local TTOs band together to form a technology transfer alliance (TTA). While TTOs focus more on the earlier stages of research commercialisation, the TTA will concentrate on establishing and maintaining a university–industry network, by providing a platform to match technological needs with solutions, and by hosting exhibitions and roadshows.

RECOMMENDATION 4.

Strengthen the Technology Start-up Support Scheme for Universities

To enhance the commercialisation of R&D outcomes and increase entrepreneurial support for start-ups, we recommend that universities strengthen the education and training components of Technology Start-up Support Scheme for Universities (TSSSU) and conduct co-assessment with private incubators and accelerators. More importantly, we recommend that TSSSU establish two phases of funding. While the first phase will provide a condition-free grant for verifying technical feasibility and developing prototypes, the second phase will require start-ups to seek funding from private investors or collaborate with industry partners to test the commercial viability of the start-up. It is equally important that the Government offers tax incentives to encourage private investment in TSSSU start-ups.

RECOMMENDATION 5.

Utilise the Future Fund to provide patient capital and deep-technology investment strategy to nurture local spin-offs

One of the notable competitive edges in universities' research in Hong Kong is in biotechnology, which is a classic example of 'Deep Tech'. Deep Tech can have big social impacts, but it also requires substantial R&D costs, as well as long time to reach the so-called 'market-ready' maturity. Deep Tech would need capital that has a much longer investment horizon than most of the private funds currently in the market. One of the few prominent examples is IP Group, a leading intellectual property commercialisation company that aims to evolve great ideas into world-changing businesses.

We understand that the Government announced in the 2020-21 Budget to use a portion of the Future Fund to invest directly in projects with a 'Hong Kong nexus' and this portion is called 'the Hong Kong Growth Portfolio'. We are supportive of this to increase the productivity of local strategic industries. It would be even better if the Hong Kong Growth Portfolio would be used, not only to support local industries, but also to invest in local Deep Tech coming out from our universities. This would increase the long-term productivity of our economy, create more options for our universities researchers, and potentially generate new industrial opportunities. This can be done by engaging companies similar to IP Group in a classic Limited Partner / General Partner arrangement.

RECOMMENDATION 6.

Establish a high-level Science and Development Office to advise the Chief Executive and the Cabinet, provide strategic directions for overall public R&D funding, and identify use cases to be piloted by public bodies

We are pleased to see that the Government has set up both the Steering Committee on Innovation and Technology (SCIT) and the Committee on Innovation and Technology and Re-industrialisation (CITR) to co-ordinate cross-departmental implementations and to steer strategies on innovation and technology development respectively. The Innovation and Technology Bureau (ITB) is actively engaged with both committees with its Secretary serving as a member.

However, innovation and technology do not happen in the vacuum. Instead, they are integral parts of the general economic and societal developments. CITR needs to be tasked to create an overall blueprint for these developments and more importantly, to detail roadmaps of how innovation and technology can facilitate and accelerate these developments. Such overall blueprint needs substantial inputs related to the global trends in science and corresponding industrial development.

Referring to economies such as the United States and Singapore which established a separate organisation to advise governments from scientific perspectives, this report proposes to establish a Science and Development Office (SDO) in Hong Kong. Led by a Chief Science and Development Officer and comprised of academics and scientists, the SDO is in place to serve as a scientific advisor via providing forward-looking vision and highlighting emerging global trends in science and corresponding industrial development to the Chief Executive and the Cabinet.

In addition, as discussed in our previous report, the SDO needs to provide strategic directions for the overall public R&D funding, so that these public R&D fundings are less fragmented, and share common standards and goals. Finally, taking 5G as an example, the Government needs to be supportive in piloting some of the use cases to help create the innovative and sustainable ecosystem, and to materialise its investment of public R&D funding.

RECOMMENDATION 7.

Develop the Kowloon Bay Action Area into a world-class innovation district

In Hong Kong, major science and technology innovation infrastructures, namely the Hong Kong Science and Technology Parks (HKSTP), Cyberport, and the upcoming Lok Ma Chau Loop, are all far away from the central business districts. Nevertheless, many cities around the world have recognised the remarkable shift in the spatial geography of innovation and have developed urban innovation districts to drive knowledge transfer and commercialisation. Prominent examples include Boston's Innovation District and 22@Barcelona.

Given Kowloon East's pilot role in exploring the feasibility of developing a smart city, it is an ideal location to be developed into such a world-class innovation district, along with its convenient transportation, its pilot role to test proof of concept trials as well as its proximity to university and R&D centres. As a sizable and undeveloped plot of land in Kowloon East, Kowloon Bay Action Area would be the most suitable spot. By taking reference from overseas innovation districts, we propose that one-third to one-half of the Kowloon Bay Action Area should be earmarked for expansion of HKSTP and Cyberport, office space for AI and fintech firms, the TTA, mega research institutes, and innovation-related government departments. As the planning of the Kowloon Bay Action Area is in full swing, it is a timely opportunity to unleash its full potential via fitting our recommendations into the Government's current development schedule.

CONCLUSION

This report has proposed seven broad recommendations to drive knowledge transfer, so as to enable Hong Kong's world-class basic research to transform into viable businesses that could exert influential social and economic benefits. By strengthening knowledge transfer, we believe Hong Kong can foster a vibrant innovation ecosystem and position itself as an international innovation powerhouse.

Summary of Recommendations

RECOMMENDATION 1.

Foster a culture conducive to knowledge transfer in universities by enhancing the assessment framework and funding allocation linkage

1A: Create a comprehensive and comparable database of universities' knowledge transfer activities
1B: Enhance the assessment framework for universities' knowledge transfer activities
1C: Increase knowledge transfer funding and link universities' knowledge transfer performance to funding allocation

RECOMMENDATION 2.

Enhance IP mobilisation by offering more flexibilities and options for researchers to commercialise their research

2A: Provide clear guidelines and flexible policies on patent ownership
2B: Increase incentives in licensing terms and revenue-sharing policies
2C: Support spin-off companies with more flexible financial terms
2D: Relax outside practice regulations and expand hours for knowledge transfer activities

RECOMMENDATION 3.

Improve university research commercialisation through Technology Transfer Offices and a Technology Transfer Alliance

3A: Recruit external talent for technology transfer management
3B: Establish an alliance of technology transfer offices

RECOMMENDATION 4.

Strengthen the Technology Start-up Support Scheme for Universities

4A: Strengthen entrepreneurship education and training for TSSSU applicants

4B: Foster stronger integration with private incubators and accelerators

4C: Establish two phases of funding to encourage start-ups to seek private investment and foster collaboration with industries

4D: Offer tax incentives to encourage private investment in TSSSU start-ups

RECOMMENDATION 5.

Utilise the Future Fund to provide patient capital and deep-technology investment strategy to nurture local spin-offs

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Establish a high-level Science and Development Office to advise the Chief Executive and the Cabinet, provide strategic directions for overall public R&D funding, and identify use cases to be piloted by public bodies

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RECOMMENDATION 7.

Develop the Kowloon Bay Action Area into a world-class innovation district