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Downstream R&D emphasis ignores educational purpose

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By Simon Ho(HK Edition)

Much pressure on universities to produce market-ready results devalues basic science research and development, writes Simon Ho

In recent years, the Hong Kong Special Administrative Region Government and the information technology sector have spared no effort in promoting the development of innovation and technology. A few months ago, the government announced a HK\$50 billion commitment to upgrade the ecosystem of the innovation and technology industry, and significantly increase subsidies for higher education institutions to conduct downstream research and development. It also rolled out the Technology Talent Admission Scheme.

In addition to these local actions, the central government has positioned Hong Kong as an "international innovation and technology hub" in the Guangdong-Hong Kong-Macao Greater Bay Area, allowing Hong Kong research institutions to apply for national funds. These policy measures have been encouraging to many leaders and scholars of the city's HEIs.

But behind the government's moves, many Hong Kong people have not reflected on the educational meaning of research in HEIs and what the overall strategies should be. In this connection, I will specifically discuss the roles and challenges universities face in innovation and technology development.

Technology must involve research, which can be divided into two categories: basic research and applied research. The latter can be focused on downstream R&D and the commercialization of the results.

"Science" is basic academic theory, and "technology" is application and production. Their goals are fundamentally different and yet interrelated. The establishment of academic theory should precede the application and production of technology (the former normally takes longer), and the market demand for technology also drives the exploration of basic scientific discoveries. The two can have healthy interactions and a push-pull relationship.



Simon Ho

The author is president of Hang Seng Management College.

The policy of the HKSAR Government in recent years has been to encourage collaboration among the government, industry, academia and research sectors. Conducive to this are Hong Kong's free and open international academic environment and trade system, and its strong intellectual property rights protection. However, given the limitations of local research funding and the academic personnel promotion and retention system, coupled with a lack of product market size and personal economic incentives, university professors have traditionally been more focused on basic academic research and publishing academic papers.

Research and publications produced by Hong Kong universities have always been ranked very high internationally, but attach low importance to connecting research findings with market commercialization. The capabilities of downstream R&D are also far lower. The Policy Address stated that the government would encourage and fund universities to conduct more midstream and downstream R&D through the University Grants Committee. A small number of companies would also foster commercialization of technology through conducting R&D in cooperation with universities, or providing R&D sponsorship to these universities.

A development characteristic around the globe in recent years is the excessive integration of scientific research with free-market operations. University scholars and governments/enterprises are unable to maintain the needed independence. The market demands have gradually dominated research direction and input. In many cases, the phenomenon of pursuing instant product success and market results while

neglecting the educational functions of research arises. As Professor Hsu Cho-yun, a renowned historian once pointed out, research was originally a horse-drawn carriage, but in recent years, the carriage has been driving the horse. These are all worrying changes in direction which society leaders and higher education personnel must constantly reflect on and ensure a good balance.

Hong Kong should have different types of HEIs and scholars. Basic academic research should not be considered less worthy, not in line with the mega trend of innovation and technology, or lacking social impact. In the trend of innovation and technology, the top-notch California Institute of Technology insists on only funding its professors to conduct basic academic research. Despite the relatively high risks and long payback period, basic research often brings about the most significant breakthroughs in inventions and educational effects. In fact, one of the conditions for a society that advocates innovation is the establishment of suitable infrastructures fostering basic, midstream and downstream applied research, rather than just championing the latter.

University is not a major base for applied research or another technology park. In the US, the industry itself, but not universities, has been the main source of R&D or the biggest driver of technological development. Unfortunately, due to the aforementioned factors, Hong Kong's enterprises are still investing sparingly in this area. In future, there is a need to attract more multinational companies to set up R&D centers in Hong Kong.

Universities should bear the dual responsibilities of undergraduate teaching and research. University research has the function of educating students to seek truth and advance the frontiers of knowledge, think critically, and persevere. It should focus on the research process rather than just the outcomes or short-term market results. When a research project fails, we must strive to learn from the failures and continue to innovate for breakthroughs to achieve ultimate success.

In universities, we applaud success, but also appreciate the failures that lead to success. Outstanding scholars will continuously pursue innovations and research outcomes with significant social impacts. They will not publish papers just for personal career advancement or under the pressure of short-term indicators. As role models for students, science and technology scholars should keep in mind their fundamental responsibilities in teaching and research.

In addition, many institutions have strengthened an entrepreneurial culture and ambience to support potential students seizing opportunities for R&D or to start their own business. Although some scholars or graduate students have very good ideas that can be developed into new marketable products, they might not be interested in or suitable for downstream R&D or even startups. Most of the professors are not interested in applying for patents because of lack of incentives and the lengthy and cumbersome procedures. They rarely have the intention to transfer research results into market products. After all, the strength of most scholars is doing research and publishing papers, and most students choose to seek employment first at least for several years after graduation.

The few research-led universities in Hong Kong do not have to follow the footsteps of Stanford University or Massachusetts Institute of Technology, and in fact none of them could provide the similar culture and support for their teachers and students. A more effective way is to export the outcomes of their basic research and business opportunities to science parks or enterprises for further R&D; or they can even cooperate with enterprises and technology parks in the Bay Area.

In any case, it is most important for universities to provide opportunities for students to cultivate their creativity, humanity qualities and entrepreneurial spirit, regardless of whether these students want to start their own businesses. And scholars should ensure research independence and its educational functions.