

**For discussion
on 18 January 2005**

Legislative Council Panel on Commerce and Industry

**New Strategic Framework for Innovation and Technology
Development and Review of the Applied Research Fund**

Purpose

At the meeting on 13 April 2004, Members were informed of the Administration's new strategic framework for innovation and technology development. In the process of formulating the implementation plan for the new strategic framework, the Administration has also reviewed the mode of operation of the Innovation and Technology Fund and the Applied Research Fund. This paper informs Members of -

- (a) the outcome of the public consultation on the new strategic framework for innovation and technology development;
- (b) the implementation plan for the new strategic framework and the new three-tier structure of the Innovation and Technology Fund; and
- (c) the result of the review of the ARF.

New Strategic Framework

2. The new strategy emphasizes on five key elements, namely focus, market relevance, industry participation, leverage on the Mainland, and better coordination among different elements of the innovation and technology programme. The key initiatives of the new strategy are: (a) to identify technology focus areas where Hong Kong has competitive edge and has the potential for meeting market needs; and (b) to set up research and development (R&D) centres to drive and coordinate R&D efforts in the selected areas and facilitate technology transfer to the relevant industries.

3. On 30 June 2004, the Innovation and Technology Commission (ITC) issued a consultation paper to invite the public's views on the new strategy, particularly on the 13 proposed technology focus areas¹ and the proposal of setting up R&D centres. Concurrently, ITC also invited expressions of interest from universities and technology support organizations in hosting R&D centres. Between July and September 2004, ITC received a total of 167 written submissions, including 15 submissions from universities and technology support institutions, 50 from industry associations and professional organizations, 66 from companies and 36 from individuals.

4. The vast majority of respondents supported the general direction and key initiatives of the new strategy. In particular, most respondents agreed that Hong Kong should focus its resources on technology focus areas where it has competitive edge. They also agreed that setting up R&D centres in selected focus areas would help improve the relevance of applied R&D to the needs of industry and enhance the coordination among different R&D institutions and the industry. On the other hand, some respondents expressed that setting up too many R&D centres would dilute the resources and defeat the purpose of creating a critical mass for maximum impact. There was however no overwhelming view on which specific technology area should be deleted.

5. A few respondents noted that concentrating the resources of the Innovation and Technology Fund (ITF) on a few technology focus areas would diminish the support being rendered to R&D work in other areas. Under the market-driven, demand-led approach of the new strategy, one of the major considerations in selecting the focus areas would be the degree of support and commitment of the industry for the development of the respective technology areas. As such, some respondents were concerned that the likelihood of novel technologies, some of which might have good potential for future development, being identified as a focus area would not be high since industry support for these technologies is unlikely to be substantial.

6. As regards the mode of operation of the R&D Centres, some respondents suggested that it should be decided on a case-by-case basis, having regard to the

¹ The 13 proposed focus areas are: (1) Advanced Manufacturing Technologies; (2) Automotive Parts and Accessory Systems; (3) Chinese Medicine; (4) Communications Technologies; (5) Consumer Electronics; (6) Digital Entertainment; (7) Display Technologies; (8) Integrated Circuit Design; (9) Logistics/Supply Chain Management Enabling Technologies; (10) Medical Diagnostics and Devices; (11) Nanotechnology and Advanced Materials; (12) Opto-electronics; and (13) Textile and Clothing.

specific needs of the industry and the existing R&D infrastructure of the technology area in question. Many respondents expressed strong views that the R&D Centre should play an independent and impartial role in coordinating the existing R&D efforts of local institutions and in promoting the technology upgrading and development of the industry. To fulfill such a role, there should be a balanced representation of Government, stakeholders, industry and host institutions in the R&D Centre. A mechanism should also be put in place to monitor the effectiveness of the Centre.

Implementation of the New Strategy

Selection of Focus Areas

7. In line with the market-driven, demand-led approach of the new strategy, we have adopted the following criteria in selecting technology focus areas for priority development –

- (a) Existing research capability - The R&D Centres are expected to work closely with local universities and R&D institutions. It is imperative that universities and R&D institutions possess considerable research strengths in the technology focus area such that the R&D Centre could leverage on their resources and competitive edge.
- (b) Competitive advantage - It would be advantageous if the technology focus area is backed up by a strong industry base in Hong Kong or PRD such that a platform for commercializing the deliverables of the future R&D Centre could be provided.
- (c) Industry needs and market potential - There should be clear industry needs and market potential for the R&D deliverables under the technology focus area so as to ensure relevance of our investments in the R&D Centre to industry and support for the continued operation of the Centre.
- (d) Industry commitment and support - Priority should be accorded to technology areas where industry players are committed to R&D activities and indicate substantive support for the operation of the R&D Centres.

- (e) Clearly defined objectives for R&D Centres - To ensure effective use of resources, the R&D Centres should have clearly defined objectives and a roadmap for the technology development of the focus area.

8. Based on the above criteria, we plan to set up, as the first step, R&D Centres under the following four technology focus areas:

- (a) **Automotive Parts and Accessory Systems** – Various industry sectors are of the view that the rapid growth of the Mainland automotive industry has presented enormous opportunities for the Hong Kong industry. Given Hong Kong’s strong base of foundation industries, local manufacturers could provide the necessary technologies and components to support the development of the Mainland automotive industry. Taking into account the experience of the Hong Kong Productivity Council (HKPC) in this area and the strong industry support, we plan to invite the HKPC to make an application for hosting this R&D Centre in line with the requirement to have close collaboration with the industry and other R&D institutions.
- (b) **Logistics and Supply Chain Management (SCM) Enabling Technologies** - To consolidate its role as a major logistics hub and SCM base, Hong Kong should continue to develop the necessary knowledge base in logistics and SCM enabling technologies to support the growth of the logistics/SCM industry. In particular, radio frequency identification (RFID) technology presents immense opportunities for revolutionizing the industry by providing an unprecedented level of data collection and networking capability to logistics/SCM solution providers. Over the years, Hong Kong has developed a solid R&D base in logistics/SCM enabling technologies. Several institutions have expressed interest in hosting an R&D Centre in this area and we plan to invite publicly competitive bids for hosting the centre.
- (c) **Textile and Clothing** – The textile and clothing industry is one of the major foundation industries in Hong Kong, which requires new and innovative technologies to sharpen its competitiveness. Hong Kong possesses a strong R&D base in textile and clothing technologies and there is overwhelming industry support for establishing an R&D Centre in this area. Most organizations and companies in the textile and

clothing industry have pledged support for the Hong Kong Polytechnic University (PolyU) to host the Centre, with some industry players committing substantial financial support for R&D projects by the Centre. We plan to invite the PolyU to make an application for the hosting of this Centre in line with the requirement to have close collaboration with the industry and other R&D institutions.

- (d) **Nanotechnology and Advanced Materials** - Nanotechnology and advanced materials technology offer a powerful enabling technology platform that could lead to a wide spectrum of innovative products. They present immense opportunities for Hong Kong industries to upgrade their products as well as improve their manufacturing processes and productivity. Recognizing the importance and potential of this area, the ITF has already supported the establishment of the Institute of NanoMaterials and NanoTechnology at the Hong Kong University of Science and Technology (HKUST). To build on the existing infrastructure, we plan to invite the HKUST to expand the scope of the Institute to become an R&D Centre on Nanotechnology and Advanced Materials. In line with the operation model of other R&D Centres, the Centre hosted by the HKUST would be required to develop closer ties with industry and other R&D institutions.

ASTRI's Five-year Plan

9. The mission of ASTRI is to perform R&D activities to enhance Hong Kong's competitiveness in technology-based industries. ASTRI has identified four of the proposed focus areas, namely, **Communications Technologies, Consumer Electronics, Integrated Circuit Design** and **Opto-electronics** as its research priority areas in its new five-year plan. These four areas are relatively new and emerging technology areas with good market potential. During the public consultation, there is strong support from industry for establishing R&D Centres in each of these technology areas. In addition, the Hong Kong Jockey Club Institute of Chinese Medicine (HKJCICM), a subsidiary of ASTRI, has already been set up to promote R&D in **Chinese medicine** in Hong Kong.

10. As such, ASTRI is well-positioned to subsume R&D Centres in the above five technology areas under its existing operation infrastructure. In line with the operation model of the R&D Centres, ASTRI should develop closer ties with industry and other R&D institutions through collaboration in undertaking

R&D projects and other modes of cooperation. We plan to invite ASTRI to make a proposal on how it intends to take forward the implementation of R&D Centres in these five focus areas.

Other Focus Areas

11. During the public consultation, R&D in other technology areas were also supported by some industry sectors and the academia. While some of these areas possess considerable market potential, ITC does not recommend setting up R&D Centres in these areas in the initial stage due to the following reasons –

- (a) **Advanced Manufacturing Technologies (AMT)** - Although many industry players have indicated support for setting up an R&D Centre in AMT, there is concern that this area is too broad and it may be difficult to lay out a focused and cohesive objective for an R&D centre. Based on consultation feedback, industry's interest in AMT is mainly related to R&D of watch movements and materials processing. Instead of establishing a new R&D Centre in AMT at this point in time, we intend to support the former topic through individual project funding under the ITF and the latter to be supported initially in the proposed R&D Centre in automotive parts and accessory systems.
- (b) **Digital Entertainment** - This is a relatively new and evolving industry with huge market potential. The digital entertainment industry in Hong Kong comprises mostly new and small companies which are in need of infrastructure and advisory support as well as supply of local talents. Unlike foundation industries which require technological upgrade to maintain their competitiveness, it would be more efficient to support the local digital entertainment industry through the provision of incubation services and training opportunities. As such, instead of establishing an R&D centre in digital entertainment, we will enhance support for the digital entertainment industry through incubation programmes and the provision of facilities and training opportunities. The Cyberport would be a suitable location to take forward these initiatives. We therefore plan to invite the Cyberport to submit a proposal on the establishment of an incubation cum training centre.
- (c) **Display Technologies** – In the consultation exercise there were suggestions to develop OLED as a platform technology for the industry

in Hong Kong and the PRD to deploy. However, as the development of OLED is already quite advanced in many other places and there are already a number of key players emerging in the PRD developing this technology, it would be necessary for the industry to coordinate a bit more on the exact focus area for further development before we could come to a conclusion. In the meantime, we would not set up an R&D Centre in this area but would consider supporting meaningful projects on a case-by-case basis.

- (d) **Medical Diagnostics and Devices** - While it is generally agreed that this technology area possesses good development potential and is backed up by strong local R&D strength, the related industry is still in its infancy. Therefore, instead of establishing a dedicated R&D Centre in medical diagnostics and devices at this juncture, we consider that it would be more efficient to support the development of this sector on a project basis.

12. Several respondents have proposed to include biotechnology (or bioscience or bioinformatics) as an additional focus area. While biotechnology is generally regarded as an important technology area in the coming decades, the local industry base is still maturing. In the absence of a strong industry base to commercialize R&D deliverables, it is not appropriate to establish a dedicated R&D Centre in biotechnology at this stage. Given the broad nature of biotechnology, this technology area could be better supported by the existing “bottom-up” approach, with individual projects being funded on merit basis.

13. Other new technology areas proposed by respondents include environmental protection/recycling technologies, new energy sources, building and construction technologies, software development and application, and food manufacturing/food technology. These areas could either be considered under Tier II or Tier III schemes of the new ITF funding model as detailed below.

New Funding Model for ITF

14. Under the new strategic framework, ITF would in future deploy substantial resources to support the established focus areas. However, to encourage innovation and to ensure that other novel technologies with good market potential in the longer term will not be missed out, R&D projects not covered in the selected focus areas will still be considered and funded if they can

demonstrate exceptional merits. We will adopt a three-tier funding structure.

Tier 1 – R&D Centres

15. ITF will provide comprehensive and continuous support to R&D efforts by the R&D Centres and ASTRI in the nine technology areas as set out in paragraphs 8 - 10 above. ITF would be deployed to cover the cost of the initial operation of the R&D Centres and sponsor individual projects undertaken by the Centres. The R&D Centres are expected to solicit industry commitment and participation in individual research projects through different modes of cooperation such as sponsorship, collaboration, contract research and forming consortia.

Tier 2 – Focus Themes

16. For the other focus areas identified in the consultation paper, although we do not plan to set up R&D centres at this juncture we consider them to be relevant focus areas to be supported. Substantial industry support has also been identified in these technology areas. We plan to support individual projects through an annual call for proposals in these focus areas using the current Innovation and Technology Support Program (ITSP) of the ITF. However, we would encourage universities to coordinate and collaborate with each other and also work with the relevant industries to come up with consolidated proposals. Priority will be given to projects that are strongly supported by industry and with a strong team of coordinated researchers. Examples of such themes include mechanical watch movements and certain advanced manufacturing technologies, display technologies, and medical diagnostics and devices.

17. With the highly focused approach and close industry involvement in defining R&D problems under Tier I and Tier II of the scheme, we expect that the funded projects would be relevant to the needs of the industry and would be more effective in supporting industry upgrading.

Tier 3 – Innovative Projects

18. New technologies with good market potential may emerge from time to time. Since these technologies tend to be more forward-looking in nature and may not have immediate application, strong industry support may not be available at the initial stage. Therefore, it would be more appropriate to support

R&D efforts in these technology areas based on the present “bottom-up” approach by funding projects through the ITSP.

19. To encourage innovation and to ensure maximum flexibility, there would be no pre-identified themes under this tier to restrict the scope of R&D projects that could apply for funding support. Applications for funding support would be invited once a year, with proposals being assessed on a competitive basis. Projects to be funded will have to demonstrate significant merits and good potential for developing valuable IP rights. R&D projects in biotechnology and other novel technologies would be good candidates to be supported under this tier.

20. Meanwhile, the ITF will continue to support projects that contribute to fostering an innovation and technology culture and provide matching grants to technology entrepreneur for starting up through the existing General Support Programme and Small Entrepreneur Research Assistance Programme respectively under the ITF.

Mode of Operation of R&D Centres

21. Taking into account the views of research institutions and other relevant stakeholders, we plan to adopt two different operating models -

- (a) For the five technology areas to be led by ASTRI, it would not be necessary to set up R&D Centres as separate legal entities. The overall management of R&D projects would be overseen by the existing management structure of ASTRI.
- (b) For the four R&D Centres to be hosted by universities or other R&D institutions, it would be necessary to set up the Centres as separate legal entities such that the Centres could play an independent and impartial role in fostering coordination among R&D institutions and cooperation with industry partners. They can be in the form of subsidiary companies similar to the subsidiaries formed by universities in commercializing R&D results. Under this model, a Centre Director would be appointed to direct the actual operation of the R&D Centre.

22. The Centre Director will be responsible for managing and overseeing the operation of the R&D Centre. With the support of research and administrative

staff, he would play a key role in directing the work of the R&D Centre including proposing, coordinating and supervising R&D projects; drawing up collaboration plan with universities and R&D institutions as well as seeking collaboration opportunities with Mainland and overseas institutions; and encouraging industry participation in the activities of the Centre.

23. In addition, each R&D Centre would have the following setup -
- (a) a Management Committee to steer the research direction and ensure that the Centre follow the agreed research direction, to monitor the performance of the Centre and review the need to maintain the Centre at regular intervals; and
 - (b) a Technical Committee to review and advise on the individual projects to be undertaken.

Both Committees should comprise representatives from various stakeholders in industry and other R&D institutions to ensure the independent and impartial role of the Centre.

24. Each R&D Centre would have an initial term of operation of 5 years. The Management Committee would review the need to maintain the Centre at regular intervals. The term of the Centre could be extended subject to the result of the reviews. An exit strategy would be put in place to wind down the Centre if its operation is deemed to be unsatisfactory or if its mission is completed.

Review of the Applied Research Fund

25. In the context of formulating the new strategic framework for innovation and technology development, we have reviewed² the Applied Research Fund (ARF), taking into account an audit review of March 2004 and subsequent

² Member were kept posted of past reviews vide a paper of the Panel on Trade and Industry of the Provisional Legislative Council [serial no. CB(1)756(04)] on "Review of the Applied Research & Development Scheme and Co-operative Applied Research & Development Scheme: Findings and Recommendations" submitted for the meeting on 12 January 1998; and a paper of the LegCo Panel on Commerce and Industry [serial no. CB(1) 844/02-03(04)] on "Review of the Role and Future of the Applied Research Fund" submitted for the meeting on 10 February 2003.

deliberations of the Public Accounts Committee.³ The Applied Research Council (ARC) has taken an active part in the review and supported the conclusion.

26. The ARF first started in 1993 with an initial capital of \$250 million. Its objective was to foster the development of technology based ventures and R&D projects with commercial potential in the form of investment from the ARF, taking into account a market gap then existing that US-style venture capital was not available locally. Its capital was increased to \$750 million in 1998, with the engagement of professional fund managers to identify and analyse technology ventures or R&D projects for investment, to make investment decisions that satisfy the public mission criteria, to support and participate in the management of the funded projects and to arrange for the exit of ARF investments.

27. The ARF is controlled and administered by the ARC, a company wholly owned by Government. With a Board of Directors comprising industrialists and relevant professionals, such as accountants and lawyers, the ARC assumes a supervisory role to ensure that the public mission of the ARF is met.

28. The performance of the ARF has been lacklustre since its inception in 1993. Up to 31 March 2004, the ARF had invested in 50 projects in the form of loan or equity injection at a total sum of \$452 million. Taking into account the recouped value of the 26 exited projects and the valuation of the remaining investments, the total residual value stood at some \$235 million (or a loss of 48%) at the end of March 2004. Operating costs had amounted to some \$103 million. On the other hand, as evidenced in its track record, the ARF has hardly been successful in terms of its public mission for supporting and spawning technology-based ventures. Members have been kept posted of the performance of the ARF since 2000⁴.

29. Apart from the performance of the ARF as highlighted above, we have taken into account the following considerations in our review -

³ The Administration has been asked to critically review the role of the ARF, and pay attention to (i) the heavy capital losses and the significant operating costs; (ii) the lack of worthwhile and commercially viable projects that meet the public mission test; and (iii) the availability of venture capital from other sources.

⁴ Latest one issued in December 2004 reporting the period of 1 September to 30 November 2004 [serial no. CB(1) 598/04-05(01)].

- (a) There seem to be some inevitable systemic conflicts in the ARF scheme. Investments decisions are always torn between its public mission and the pursuit for financial return. ARF projects, usually those which are not able to attract private investment on their own, are almost risky and arguably of a lower quality in the context of the relatively weak deal flow in Hong Kong. The transparency and public accountability requirements, as well as the financial returns expectations, also presented major constraints on the operation of the ARF and the fund managers. Furthermore, investments as led by fund managers with a limited fund size could only be dictated by the circumstances of the time (as exemplified by the dotcom bubble with all the known consequences) and have only resulted in a small and risky portfolio that have not been able to create a real impact on the technological development or the capital market of Hong Kong.
- (b) Over the last decade, the venture capital industry has grown significantly and become well developed in Hong Kong. It is estimated that the venture capital investment portfolio into “Hong Kong companies” in technology-related industries was about \$4,267 million as at the end of 2002, as compared with \$231 million provided by the ARF. Empirically and anecdotally, it is recognised that venture capital funding for good and promising projects with commercial potential is not actually lacking in Hong Kong.
- (c) As detailed in paragraphs 2 – 10 above, we are realigning our strategic framework for innovation and technology development to ensure that government and industrial investment would result in a more relevant, larger scale and higher quality critical mass of output that could be better able to attract follow on investment upon commercialization, either from industry or through the capital market. Our priority would be to create a better and more sustainable deal flow through focused investment at the R&D and early commercialization stage.

30. We have come to the conclusion that the original objective of the ARF, to foster the development of technology based ventures and R&D projects with commercial potential, could be better spearheaded under the new strategic framework for innovation and technology development, including the various

funding schemes under the ITF⁵, and there is little case to continue making new investments under the ARF model in parallel. Where possible, the residual balance of the ARF (some \$400 million) should be injected into the ITF to augment the pool of resources to support the industry.

Way Forward

31. To take forward the new strategic framework for innovation and technology development, ITC plans to invite formal applications for hosting the four R&D centres as identified in the foregoing paragraphs in early 2005.

32. As regard the ARF, the ARC would cease making new investments after the expiry of the contractual investment period in March 2005, while continuing to operate to monitor and oversee existing investments and the exit. ITC would explore the possibility of injecting the surplus funds of the ARF, subject to cash flow requirements for the winding-down process, into the ITF.

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⁵ For example start-up ventures will continue to be eligible for funding under the Small Entrepreneur Research Assistance Programme with a \$2 million matching grant from the ITF.