For discussion
on 19 June 2009

FCR(2009-10)27

ITEM FOR FINANCE COMMITTEE

INNOVATION AND TECHNOLOGY FUND
HEAD 111 – INNOVATION AND TECHNOLOGY
Subhead 104 Establishment of Research and Development Centre for Nanotechnology and Advanced Materials
Subhead 105 Establishment of Research and Development Centre for Textile and Clothing
Subhead 106 Establishment of Research and Development Centre for Automotive Parts and Accessory Systems
Subhead 107 Establishment of Research and Development Centre for Logistics and Supply Chain Management Enabling Technologies

Members are invited to approve an increase in the commitment of the following Subheads under Head 111 Innovation and Technology and the retitling of the Subheads –

(a) from $61.4 million by $128.4 million to $189.8 million for Subhead 104 and retitle this Subhead as the Nano and Advanced Materials Institute;

(b) from $60.3 million by $93.3 million to $153.6 million for Subhead 105 and retitle this Subhead as the Hong Kong Research Institute of Textiles and Apparel;

(c) from $100 million by $67.6 million to $167.6 million for Subhead 106 and retitle this Subhead as the Automotive Parts and Accessory Systems Research and Development Centre; and

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(d) from $52.2 million by $79.7 million to $131.9 million for Subhead 107 and retitle this Subhead as the Research and Development Centre for Logistics and Supply Chain Management Enabling Technologies.

PROBLEM

We need to provide further funding for the Research and Development (R&D) Centres established under the Innovation and Technology Fund (ITF) to continue to drive applied R&D work in Hong Kong.

PROPOSAL

2. The Commissioner for Innovation and Technology , with the support of the Secretary for Commerce and Economic Development, proposes to further allocate a total of $369 million from the ITF to support the continued operation of the following R&D Centres up to 2013-14 and to retitle the relevant commitments –

(a) $128.4 million for the Nano and Advanced Materials Institute (NAMI);

(b) $93.3 million for the Hong Kong Research Institute of Textiles and Apparel (HKRITA);

(c) $67.6 million for the Automotive Parts and Accessory Systems R&D Centre (APAS); and

(d) $79.7 million for the R&D Centre for Logistics and Supply Chain Management Enabling Technologies (LSCM).

3. The proposed allocation will be met from funding available under the ITF.

JUSTIFICATION

Mid-Term Review

4. The Government is committed to driving Hong Kong to become a world-class knowledge-based economy through innovation and technology development. Following funding approval by the Finance Committee (FC) in June 2005, the Government established five R&D Centres in five key technology areas. Apart from the four R&D Centres mentioned in paragraph 2 above which are funded under the ITF, the R&D Centre for Information and Communications Technologies (ICT) was also established in April 2006 under the Applied Science and Technology Research Institute (ASTRI) with operational funding met by the Government's annual subvention to ASTRI. In seeking funding approval for the establishment and operation of the four R&D Centres in 2005, the Administration undertook to report to the Legislative Council (LegCo) Panel on Commerce and Industry (C&I Panel) the operation and performance of the R&D Centres annually and to conduct two major reviews, one in the second year and the other in the fourth year of operation. We briefed the C&I Panel on the progress of the R&D Centres in November 2006, July 2007 and June 2008. Given the R&D Centres were only established in April 2006 and only started rolling out their R&D programme in 2007-08, we undertook to conduct a Mid-Term Review on their operation up to end-2008.

5. The Innovation and Technology Commission (ITC) has conducted the above Mid-Term Review on the operation of the five R&D Centres. Each of the R&D Centres has submitted a report to ITC. Copies of these reports have been deposited with the LegCo Secretariat. The outcome of the review was presented to the C&I Panel on 21 April 2009.

6. The key findings of the review on the operation of the five R&D Centres are as follows –

(a) By the end of 2008, the Centres have undertaken a total of 316 projects with an estimated cost of $1,344.6 million. A summary of the R&D projects undertaken by each Centre and the project cost estimates are at Enclosure 1.

Encl. 1

(b) The Centres have secured a total contribution of $140.9 million from the industry in support of 208 platform and collaborative projects funded under the ITF, representing about 11% of the total project cost estimate. Among the 208 ITF-funded projects, 94 have been completed with the remaining due to be completed in 2009 and 2010.

(c) The total operating expenditure incurred by the four Centres (except for ICT[1]) for the period April 2006 to December 2008 was $112.9 million. A breakdown of the operating and R&D expenditures incurred by the four Centres up to December 2008 is as follows –

April 2006 to December 2008 ($ million)		
	Operating expenditure	**R&D expenditure#** ***(no. of projects undertaken)***
NAMI	25.8	47.6 (*25)*
HKRITA	22.0	45.6 (*29*)
APAS	35.6*	53.5 (*27*)
LSCM	29.5	74.0 (*23*)
Total:	**112.9**	**220.7** ***(104)***

* This includes the expenditure of $6.2 million for procuring testing equipment for both APAS's R&D projects and wider industry uses.

\# The R&D expenditure incurred by ICT during the same period was $450.2 million involving 212 projects.

(d) From the 208 approved platform and collaborative projects, the Centres have filed a total of 178 patent applications. In addition, they are taking steps to pursue technology transfer under 49 projects. A list of these projects is at Enclosure 2.

Encl. 2

(e) The Centres conducted about 300 seminars and workshops on their technology focus areas and R&D programmes/results. They have established club membership or Technology Consortium arrangements with more than 1 500 members from the industry and higher education/research institutes.

/**Assessment** .....

[1] The operating expenditure of ICT was funded by the Government's annual subvention to ASTRI which amounted to $119.9 million in 2006-07 and 2007-08, and $124.1 million in 2008-09.

Assessment

The programme and operation of the R&D Centres

7. The R&D Centres were set up as a platform for driving applied R&D and facilitating the technology transfer to the industry. Our assessment on their initial performance is as follows –

(a) R&D programme: The Centres have launched over 300 applied R&D projects in accordance with their technology roadmap. More importantly, they are focusing on emerging technologies, collaborating with both industries and tertiary institutes. These R&D programmes are focused and market relevant. Similar to other ITF-funded projects, the size of the research teams varies greatly from two to three research personnel to more than ten in some larger, more sophisticated R&D projects. About 1 300 research positions in a wide range of technology areas are provided under these projects.

(b) R&D expenditure: The Centres' project expenditures lag behind their original estimates drawn up in 2005. Except for ICT under ASTRI, it had taken longer than originally envisaged for the Centres to set up their offices, recruit key staff and put in place the project planning and management system. As a result, the four ITF-funded Centres only started rolling out their R&D programme in the first half of 2007. They have put up a very robust R&D programme from 2009-10 onwards, and have revised their R&D project funding estimates for the first five years to a total of $1,066.7 million (viz. to be funded by ITF). This is more or less in line with the 2005 target.

(c) Industry feedback: We note that the Centres have been reaching out to the industry through project solicitation, seminars and various collaboration activities. We solicited feedback from the major industry support organisations as part of this review exercise, i.e. the Federation of Hong Kong Industries, the Chinese Manufacturers Association of Hong Kong, the Hong Kong General Chamber of Commerce and the Chinese General Chamber of Commerce. They have indicated general support for the Centres, but they hope the R&D Centres can be more proactive in promoting their research deliverables to local companies and building up a closer partnership with the local industry, including their operations in the Pearl River Delta (PRD).

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(d) Industry contributions: The Centres have solicited $171 million from the industry, or about 13% of their research budgets of about $1,345 million. More than 330 companies provided contributions, be it in cash and in kind, to these projects. This falls below the original target of achieving an industry contribution of 40% at the end of the first five-year period. Our detailed assessment on the level of industry contributions is set out in paragraphs 16 and 17 below.

(e) Collaboration with the Mainland: With the establishment of joint funding schemes with Guangdong and Shenzhen in 2004 and 2005 respectively, R&D Centres are now engaging more and more joint projects with their Mainland counterparts. We encourage this and expect such collaborations to continue to grow.

(f) Technology focus areas: We have reviewed the need to establish additional R&D centres for new technology areas and concluded that, for the time being, we should focus our resources on existing Centres so that they have time to consolidate their R&D efforts and make a major push for technology transfer and commercialisation. Applied research in new technology areas could either be absorbed by the existing Centres or be funded under a separate scheme under the ITF.

(g) Pace of commercialisation: Since the Centres are only about to complete the first batch of projects, it is pre-mature to judge their success in commercialisation at this early stage. On the other hand, the experience of ASTRI suggests that there is certainly the opportunity for the Centres to do more in this area. We are optimistic that they will be able to deliver more R&D results for the benefit of the local industry in the coming years. Indeed, we note that all Centres are putting in more resources and commitment to technology transfer in the years ahead.

(h) Benefits to the economy: In October 2006, we engaged a local university to conduct a consultancy study on ways to analyse the economic and social benefits generated from the work of the R&D Centres and possibly the R&D work funded by the ITF. Work on the consultancy study has been seriously delayed by the difficult nature of the study itself as there are no internationally accepted methodologies to quantify the economic and social impact of R&D work. Following lengthy consideration, the Consultant will now focus on the few variables that would have a significant impact on the economy and will aim to complete the study by the end of the year.

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8. Having regard to the above findings, we are of the view that the R&D Centres have made a significant start and are now making an important contribution towards strengthening our R&D infrastructure and culture. They are also expected to play an increasingly important role in support of Hong Kong enterprises in the PRD as they upgrade their industrial processes. This will complement the future development of the PRD in various strategic technology areas such as automotive, new materials, environmental protection, renewable energy and Integrated Circuit design. Under the current financial climate, it is imperative to re-affirm our strong policy commitment to promote innovation and technology as a means to encourage high value added economic activities that open up new sectors for sustainable economic growth. According to latest findings of the Organisation for Economic Cooperation and Development, many economies have increased public funding of R&D, despite persistent budget constraints, as a key driver to put the economies back on a path to sustainable growth.

Corporate Governance

9. We attach great importance to corporate governance in the R&D Centres' operation. We have provided the Centres with a "Guideline for Developing the Corporate Governance Manual for R&D Centres" to assist the Centres in setting up the various governance system and procedures, including procurement and recruitment, adopting a two-tier reporting system for declaration of conflict of interest, and establishing Finance and Administration Committee and Technology Committee under the Board of Directors. In respect of the Centres' operation, each R&D Centre is required to submit the following to the ITC each financial year –

(a) an annual plan comprising the R&D programme, performance indicators and the resources required;

(b) four quarterly operational reports covering the significant activities and the cashflow position; and

(c) annual audited accounts of the Centre's operation.

In respect of R&D projects, the prevailing ITF funding guidelines are also followed, which include submission of half-yearly progress reports on the R&D work and annual audited statements on the project expenditure.

/**Extending** .....

Extending the operation of the R&D Centres funded by the ITF to 2013-14

10. The present funding proposal focuses on the four ITF-funded Centres, namely NAMI, HKRITA, APAS and LSCM. As the operation of the remaining Centre, namely ICT, is funded under the annual Government subvention to ASTRI, its funding arrangement will be reviewed in the context of ASTRI's subvention to ensure cost effective use of public resources.

11. Summaries of the reports from the four ITF-funded Centres, including their revised business plans, are at Enclosures 3 to 6. For the sake of completeness, a brief report on ICT/ASTRI is at Enclosure 7.

Encls. 3-6
Encl. 7

12. A brief highlight of the focus areas and early successes of NAMI, HKRITA, APAS and LSCM is as follows –

(a) NAMI: Nanotechnology and new materials can help upgrade the wide range of products manufactured by the more traditional industries. One of the key successes of NAMI is the development of a nano-humidity technology platform that could either be used as a high performance device or in low cost applications. The platform is now being evaluated by local industry partners for incorporation into their new products. On thin film photovoltaic (PV) technology, NAMI will undertake several large-scale collaborative projects in the coming few years and position itself as a leading R&D centre in solar energy technologies in the region.

(b) HKRITA: It has leveraged on the capability of the Hong Kong Polytechnic University and developed close partnership with the industry. One of the successful R&D projects under HKRITA is to improve the existing spinning technology for mass production of finer Nu-Torque cotton yarn for weaving and knitting. The technology provides much thinner and lighter fabrics produced by finer yarns, with unique cashmere-like softness for the resulting fabric. The local industry has shown keen interest in this technology breakthrough and HKRITA is discussing with individual companies on further demonstration and system integration work required.

(c) APAS: Its R&D work cuts across several technology areas including electronics, materials science, battery management control, etc. In one of its collaborative projects, APAS has successfully developed an adaptive front-light system which allows the head-lamp to self-adjust

its movement to adapt to different driving environment e.g. uphill/downhill or on a curved road. Whilst similar systems are available from individual overseas suppliers, the new invention allows the local industry to produce a comparable product at a much lower cost. The product has attracted considerable interest both locally and overseas.

(d) LSCM: One major focus area of LSCM is Radio Frequency Identification Devices (RFID) technology which has wide application in both the logistics industry, especially those involving cross-boundary operations (e.g. inventory management, track-and-trace), and everyday life (e.g. retail, food safety and security). Its RFID Application Enablement middleware allows companies to integrate the new RFID systems with their existing systems at minimal cost and to connect to the global supply chain infrastructures in a speedy and cost-effective manner. There has been encouraging response to this from the market. The potential of RFID in daily life applications is huge, for example, passive tags used in university libraries and airport baggage check-in, and active RFID tags for automated tunnel toll payment. The Octopus is perhaps the best illustration of the wide range of applications that can be realised from RFID technologies.

13. In revising their operating expenditure estimates for the first five-year operating period, the four ITF-funded Centres have also drawn up their funding requirements for a further five-year period up to 2015-16. We consider it prudent at this stage to extend their operation for three years up to 2013-14, pending further reviews in 2010 and 2011 (paragraph 15 below). This will allow us to review and enhance the institutional framework of the Centres and put in place improvement measures to achieve greater savings and higher cost-effectiveness before April 2014. Although the ITF funding commitments for the operation of the four Centres have not yet been exhausted, we see a need to commit additional funding now for the period beyond March 2011, bearing in mind the longer lead time for planning R&D projects. This will also enable the Centres to continue with the R&D programmes, retain/recruit experienced R&D personnel and seek further collaboration with the industry. The revised estimates of the operating expenditure of the four R&D Centres funded by the ITF for the first five-year period from 2006-07 to 2010-11 and their funding requirements from 2011-12 to 2013-14 are summarised as follows –

Operating costs of the four R&D Centres funded by the ITF: 2006-07 to 2013-14 ($ million)			
	2006-07 to 2010-11*		**2011-12 to 2013-14**
	FC approved funding	**Revised estimates**	**Estimates**
NAMI	61.4	97.6	92.2
HKRITA	60.3	59.7	93.9
APAS#	100.0	89.5	78.1
LSCM	52.2	52.2	79.7
Total:	**273.9**	**299.0**	**343.9**

* As the R&D Centres were only set up in April 2006, the cash flow for the first five-year operation of the Centres spread from 2006-07 to 2010-11 instead of from 2005-06 to 2010-11 as originally estimated in the 2005 FC submission.

\# APAS has specifically included a sum of $35 million for procurement of testing equipment in the 2005 original budget. In its revised estimates for the first five-year period, APAS has adjusted the provision downward to $18 million. A provision of $18 million has been made in the estimates for the period 2011-12 to 2013-14.

14. It is estimated that NAMI would require an additional funding of $36.2 million in the first five-year period from 2006-07 to 2010-11 to cope with a number of large scale projects on thin film PV technology whereas other Centres together are expected to achieve a small savings of about $11.1 million. Regarding the period from 2011-12 to 2013-14, the estimated increase in operating expenditure is due partly to the increase in the Centres' staff establishments and partly to their enlarged commercialisation programme, including setting up new business development teams, intellectual property (IP) registration and management, marketing and promotion (e.g. organising seminars and workshops, overseas roadshows and visits (including factories in the Mainland), setting up prototype displays or technology demonstrations, customisation of R&D deliverables to suit the needs of specific industry or business applications, post-licensing or post-transfer follow-up support. It is worthy to note that some of the Centres' staff are also engaged in R&D work. Besides, the costs for acquiring testing equipment for projects are also absorbed within the operating budgets of the Centres. In essence, the operational expenditures of the Centres are essential to drive the R&D programme and to carry out technology transfer with the industry subsequently.

15. The estimated operating costs of $642.9 million for the four R&D Centres from 2006-07 to 2013-14 represent an average of about 26% of their estimated R&D expenditures of $2,431.7 million for the same period. Individual Members of the C&I Panel have expressed concern about the high level of operating cost of the R&D Centres compared to their research expenditure. This is not unexpected during their early stage of operation as the Centres have only just rolled out their R&D programmes. There is scope for improvements to the overall cost-effectiveness and operating efficiency of the Centres. However, it would be counter-productive to introduce major changes at this stage as this may disrupt the R&D and technology transfer programmes being taken forward by the R&D Centres. We plan to conduct an overall review in 2010 to look into the modus operandi of the Centres to see if there is any room for achieving greater savings and higher cost-effectiveness. The feasibility of merging all the R&D Centres under one umbrella or to move towards shared support facilities to cut costs will also be considered. Besides, we will conduct a full review of the Centres' operation and overall performance for the first five-year period in 2011, taking full account of their experience in technology transfer and commercialisation. We will report our findings to the Panel. As the four R&D Centres have already been established and commenced full swing operation, we consider it appropriate to retitle the four commitments for the Centres under ITF as proposed.

Industry Contributions

16. Given the current financial climate, we consider that the Centres will have genuine difficulty to increase the proportion of industry contribution substantially in the near future. On the other hand, we consider it imperative to maintain the existing 10% industry contribution requirement as an indication of market potential and relevance for platform R&D projects. Having regard to the feedback from the Centres and the industry, we decide to adjust the Centres' target of soliciting industry contributions from 40% to 15% pending future review.

17. Notwithstanding this, we will encourage the R&D Centres to solicit more contributions from industry, be it in cash or in kind (e.g. research equipment) for collaborative R&D projects[2]. We will also ask the Centres to organise joint industry forum to update local industry on the Centres' R&D programme, including

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[2] Collaborative R&D projects normally involve one industry partner which makes a contribution no less than 50% of the total project cost and hence the IP generated from the R&D projects will be owned by the industry partner. To provide some flexibility for industry to undertake collaborative R&D work with the R&D Centres, the current funding guidelines allow the industry partner to make an initial contribution of no less than 30% of the project cost and increase the amount of contribution at a later stage. The industry partner will enjoy some form of exclusive licensing arrangements or IP ownership depending on the ultimate level of contribution.

progress of on-going R&D projects, and to seek further opportunities of collaboration in both R&D work and technology transfer. Whilst self-financing should still remain our ultimate goal, this could only be achieved over a longer-term horizon as it is internationally accepted that R&D projects may not produce immediate or short-term financial results.

Interim Improvement Measures for ITF-funded Projects

18. In the course of the Mid-Term Review, we have identified a number of restrictions under the present ITF funding guidelines which may have hindered the development of R&D work by either the Centres, local universities or private companies. We therefore propose to relax some of the existing restrictions with a view to promoting and encouraging more organisations to seek funding support for R&D work under the ITF.

Intellectual property

19. Before the setting up of the R&D Centres, the IP generated from platform R&D projects undertaken by local universities including technology transfer were owned and managed by the universities themselves. In considering the operation of the Centres in 2005, we envisaged that the Centres would play a more active role in technology transfer and commercialisation and hence they should retain the ownership of the IP generated from such projects. We have received feedback indicating that this arrangement may be an inhibitive factor for local universities to apply for funding support. It has also been argued that where the R&D work is undertaken by local universities, it may be more advantageous for the universities to own the IP and researchers themselves to take the lead in promoting technology transfer, possibly together with other IPs and R&D deliverables from projects which are not funded by ITF.

20. Our primary concern is to ensure that the R&D results will be put into best use in a timely manner for industry and technology upgrading. We will provide greater flexibility for the Centres to decide on the best IP arrangement to facilitate technology transfer and commercialisation so as to optimise the potential benefits to the industry. We will map out an appropriate collaboration model between the Centres and the universities in this regard. One important principle is to ensure that the Centres retain the royalty-free right to use and commercialise the results of R&D work regardless of who owns the IPs.

R&D work conducted outside Hong Kong

21. In 2007, we formulated a proposal to relax the geographical restriction under the University-Industry Collaboration Programme (UICP). The

purpose was to allow an overseas university to take part in an UICP project, thereby enabling our industry to capitalise on the R&D expertise and strengths not available locally. Following further consultation with local universities, we have refined the proposal to allow, as a general rule, no more than 50% of the R&D work to be conducted by non-local universities or outside Hong Kong, provided that under the same UICP project, a local university –

(a) plays the role of Project Coordinator who is responsible for the overall co-ordination of the project and the management of the project account and the funds disbursed; and

(b) undertakes some R&D work of the project.

We consider this an appropriate balance between local participation on the one hand and the need to provide new impetus to promote university-industry collaboration on the other, whilst providing reasonable safeguards against abuse.

22. We have received feedback from time to time on the need and advantages for the research work under other ITF-funded projects to be conducted in the Mainland, be it in the form of collaboration partners or outsourcing part of the R&D work to research institutes in the Mainland. Given the close ties between Hong Kong and the PRD region, we consider it sensible to adopt similar rules by allowing up to 50% of the R&D work to be conducted in the Mainland under ITF-funded projects. In the case of overseas universities or research institutes outside the UICP, we will provide the same treatment under the aegis of international or regional technology collaboration agreements reached between the Hong Kong Special Administrative Region Government and the overseas R&D institutes/centres or universities (e.g. memorandum of understanding on technology research cooperation).

Increasing Private Sector Investment in R&D

23. Our total public and private R&D expenditure remained low at 0.77% of our Gross Domestic Product (GDP) in 2007, when compared to our neighbouring economies (e.g. Taiwan: 2.6% of GDP in 2006 and Singapore: 2.4% of GDP in 2005). Whilst we would continue to provide funding support for R&D projects, our policy objective should also seek to encourage and stimulate private sector investment in R&D. Our recent experience on PV technology project indicates that there are substantial benefits to be gained by bringing in overseas investment and expertise. We therefore intend to explore new models to provide direct funding support for private sector companies with good research capabilities, say, in the form of matching grant, to undertake major R&D work in strategic and new technology areas that will bring long-term benefits to the economy as a whole.

/We .....

We will in conjunction with the Centres work out the detailed funding and collaborative arrangements. Separate approval from the FC will be sought if the new initiative to be funded by ITF exceeds the ceiling of authority delegated to the Administration for approving individual R&D project, currently at $21 million.

FINANCIAL IMPLICATIONS

Operating Expenditure of the R&D Centres

24. To sustain the operation of the R&D Centres, we propose to increase the commitments for the four R&D Centres funded under the ITF. It is estimated that an additional grant of $369 million, over and above the $273.9 million already approved, is required from the ITF. The indicative breakdown of the proposed additional allocation is as follows –

($ million)						
	2009-10	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**Total**
NAMI	5.7	30.5	29.5	30.7	32.0	128.4
HKRITA	—	—	32.0	29.5	31.8	93.3
APAS	—	—	13.6	26.0	28.0	67.6
LSCM	—	—	25.6	26.5	27.6	79.7
Total:	**5.7**	**30.5**	**100.7**	**112.7**	**119.4**	**369.0**

25. Subject to Members' approval of the proposed increases in commitment as mentioned in paragraph 24 above and taking into account the operating expenditure incurred by the four R&D Centres up to 2008-09, the estimated cash flow for the respective commitments are as follows –

($ million)					
	2009-10	**2010-11**	**2011-12**	**2012-13**	**2013-14**
NAMI	33.2	30.5	29.5	30.7	32.0
HKRITA	15.3	19.3	32.6	29.5	31.8
APAS	22.6	24.6	24.1	26.0	28.0
LSCM	12.0	10.8	25.6	26.5	27.6
Total:	**83.1**	**85.2**	**111.8**	**112.7**	**119.4**

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26. For 2009-10, the estimated cash flow for NAMI and HKRITA will exceed their original estimates under the ITF. We will meet the additional cash flow requirements on top of the original estimates of these two R&D Centres by offsetting an equivalent amount under Subhead 101 Innovation and Technology (block vote). We will include the necessary provisions in the Estimates for the ITF for future years. The budgets of the four R&D Centres which have reflected the proposed additional operational funding are indicated in Enclosures 3 to 6.

R&D Project Funding

27. The ITF will continue to fund the R&D work of the Centres on a project basis. Having regard to the updated R&D programme of the R&D Centres, the indicative R&D project funding required under the ITF after netting off the estimated income from industry contributions and other income is as follows –

Indicative net R&D expenditure up to 2013-14* ($million)				
	2006-07 to 2010-11 (2005 Estimates) (a)	**2006-07 to 2010-11 Revised Estimates# (b)**	**2011-12 to 2013-14 Estimates@ (c)**	**Total (b)+(c)**
NAMI	209.0	310.7	312.4	623.1
HKRITA	215.0	209.4	204.9	414.3
APAS	250.0	250.7	180.0	430.7
LSCM	255.0	295.9	205.0	500.9
Total	**929.0**	**1,066.7**	**902.3**	**1,969.0**

* This refers to the project funding to be funded under the ITF for the R&D projects undertaken by NAMI, HKRITA, APAS and LSCM. Taking into account the estimated income from industry contributions and other income, the total R&D expenditure estimates for the first 5-year period is $1,322 million, and $1,109.7 million for the period 2011-12 to 2013-14. This does not include the project funding requirement of ICT which will be dealt with separately in light of ASTRI's overall strategy and operation.

This includes the actual R&D expenditure incurred by the Centres from 2006-07 to 2008-09.

@ The Centres have put forth a robust R&D programme vis-à-vis the experience in the initial years of operation and industry feedback.

/28. .....

28. If the amount of funding required for implementing individual R&D projects exceeds the ceiling of authority delegated to the Administration to approve other R&D projects under the ITF, currently at $21 million, we will seek Members' approval for these projects. As at end-April 2009, the uncommitted balance of ITF[3] was about $3.5 billion. This is more than sufficient for meeting the estimated funding requirements of the four ITF-funded Centres set out in this paper.

PUBLIC CONSULTATION

29. We consulted the Steering Committee on Innovation and Technology, the Federation of Hong Kong Industries, the Chinese Manufacturers Association of Hong Kong, the Hong Kong General Chamber of Commerce and the Chinese General Chamber of Commerce. They have expressed general support for the Centres.

30. We consulted the LegCo C&I Panel on the outcome of the Mid-Term Review and the funding proposal on 21 April and 19 May 2009 respectively. The Panel supported the continued operation of R&D Centres and commented that the R&D Centres should strengthen its commercialisation efforts to ensure the R&D deliverables meet the needs of the industry for moving up the value chain. Some Members also suggested that the Centres should explore means to reduce the level of operating expenditure where practicable and to enhance their corporate governance.

BACKGROUND

31. The $5-billion ITF was established in 1999 to fund projects that contribute to innovation and technology upgrading in manufacturing and service industries vide FCR(1999-2000)36. Members also approved the delegation of authority to the Financial Secretary to approve individual projects not exceeding the prevailing funding ceiling of a Category D project in the Public Works Programme (currently at $21 million). Projects exceeding the $21 million funding ceiling will require Members' approval under a separate individual subhead under Head 111. As at the end of April 2009, the ITF has supported about 1 400 projects at an approved funding of about $4 billion.

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[3] This has taken into account the residual expenditure for projects undertaken by the former Industry Department and the income (including investment income) accumulated between 2000 and 2008.

32. Following public consultation in 2004, the Government decided to adopt a new strategic framework for innovation and technology development. One of the new measures under the framework was to set up R&D Centres in the following technology focus areas to provide a focal point for driving applied R&D –

(a) nanotechnology and advanced materials;

(b) textile and clothing;

(c) automotive parts and accessory systems;

(d) logistics and supply chain management enabling technologies; and

(e) information and communications technologies.

33. On 24 June 2005, Members approved vide FCR(2005-06)21 the creation of six commitments, involving a total grant of $358.7 million, under the ITF for the establishment of NAMI, HKRITA, APAS and LSCM as well as the development of two focus theme projects on Digital Entertainment and Mechanical Watch Movements. On 12 December 2008, Members approved vide FCR(2008-09)51 an increase in funding commitment under Subhead 108 Cyberport Digital Entertainment Incubation-cum-Training Programme from $30.8 million by $25.2 million to $56 million. The Mechanical Watch Movements is being undertaken by the Chinese University of Hong Kong at an estimated cost of $60 million (comprising $54 million from the ITF and $6 million of sponsorship from the watch industry).

Commerce and Economic Development Bureau
June 2009

R&D projects undertaken by the R&D Centres

(April 2006 to December 2008)

	Types of projects	No. of projects	Total Project Cost Estimate ($ million)	ITF Funding ($ million)	Industry Contributions ($ million) *(% of project cost)*
	Platform	25	99.5	86.7	12.8 (*13%*)
APAS	Collaborative	2	10.9	5.4	5.5 (*50%*)
	Contract	-	-	-	-
	Sub-total	27	110.4	92.1	18.3 *(17%)*
	Platform	26	98.0	86.6	11.4 (*12%*)
HKRITA	Collaborative	1	3.2	1.6	1.6 (*50%*)
	Contract	2	0.1	-	0.1 (*100%*)
	Sub-total	29	101.3	88.2	13.1 *(13%)*
	Platform	105	749.0	699.0	50.0 (*7%*)
ICT	Collaborative	7	32.7	14.1	18.6 (*57%*)
	Contract	100	26.9	-	26.9 (*100%*)
	Sub-total	212	808.6	713.1	95.5 *(12%)*
	Platform	23	184.2	161.8	22.4 (*12%*)
LSCM	Collaborative	-	-	-	-
	Contract	-	-	-	-
	Sub-total	23	184.2	161.8	22.4 (*12%*)
	Platform	12	122.6	109.7	12.9 (*11%*)
NAMI	Collaborative	7	14.5	8.8	5.7 (*39%*)
	Contract	6	3.0	-	3.0 (*100%*)
	Sub-total	25	140.1	118.5	21.6 *(15%)*
	Total	**316**	**1,344.6**	**1,173.7**	**170.9 (*13%*)**

Notes -

(1) Under platform projects, R&D Centres are generally required to secure a contribution of at least 10% of the project cost from the industry, as an indicator of market relevance and needs.

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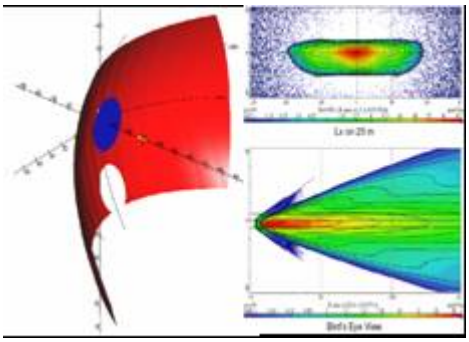
(2) Collaborative R&D projects normally involve one industry partner which makes a contribution no less than 50% of the total project cost and hence the intellectual property (IP) generated from the R&D projects will be owned by the industry partner. To provide some flexibility for industry to undertake collaborative R&D work with the R&D Centres, the current funding guidelines allow the industry partner to make an initial contribution of no less than 30% of the project cost and increase the amount of contribution at a later stage. The industry partner will enjoy some form of exclusive licensing arrangements or IP ownership where the ultimate level of contribution exceeds 50%. The R&D Centres will have royalty-free right to use the IPs generated from the ITF-funded projects for further research purposes.

(3) Contract projects refer to contract research and services that are requested and wholly funded by the industry.

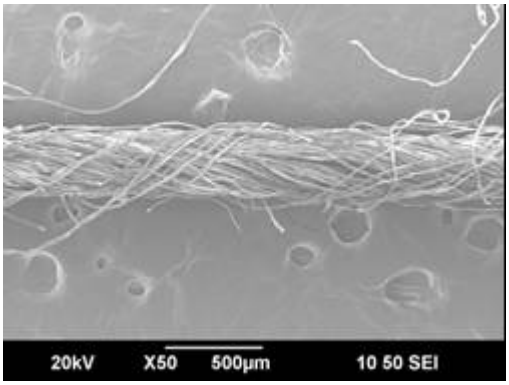
(4) The above figures have included 34 projects in the relevant technology areas in which the R&D Centres assisted in the project monitoring.

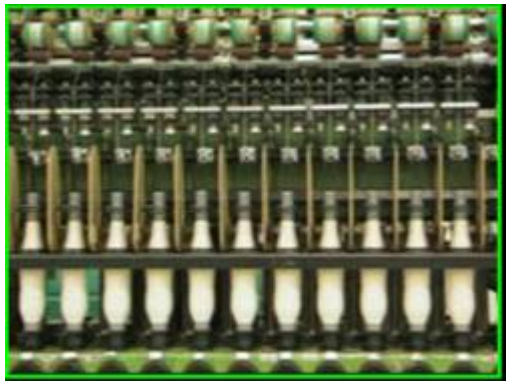
Examples of R&D projects undergoing/to undergo technology transfer and commercialisation

	Project Title	Project Cost ($ million)
APAS		
1.	Development of Automobile Advanced Frontlight System*	7.1



2.	Powder Metal Forming Technology for High Temperature Light Weight Aluminum-Titanium Alloys	3.3
3.	Development of Microcellular Foam Injection Moulding Technology Incorporated with Co-injection Technology for Producing High Quality and Value-added Plastic Automotive Parts	3.7
4.	Low Cost Direct Drive for Electric Vehicles	4.6
HKRITA		
5.	Finer Nu-Torque Cotton Yarn Production	2.4





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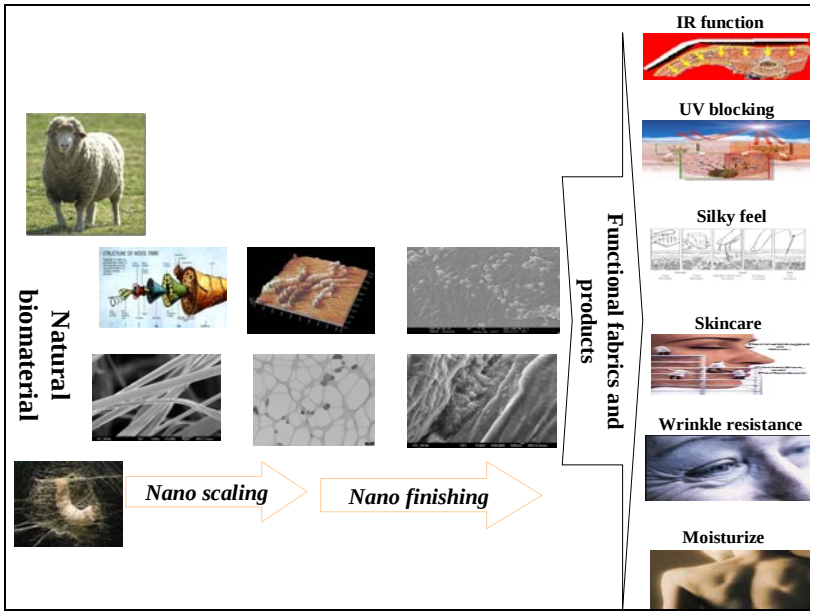
6. Biofunctional Materials and Applications 4.5



7. Development of an Innovative Finishing System for Wet Processing of Garments and Accessories 1.7

8. Advanced Clothing Functional Design Computer-Aided Design Technologies 4.1

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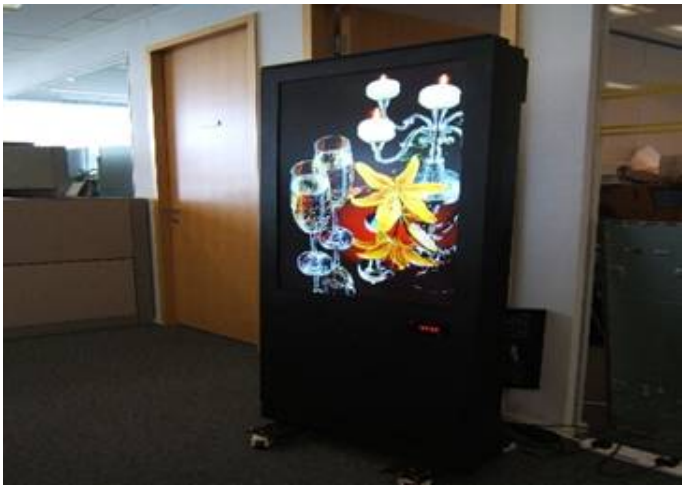
9.	Development of a Laboratory-scale Electrochemical Mercerization and Bleaching System for Technologies Evaluation	1.0
10.	Development of Fabric Structure Analysis and Appearance Evaluation System	2.9
ICT		
11.	Flexible and Adaptive – Active Dynamic Light-Emitting Diode (LED) Backlight Control Application-Specific Integrated Circuit (ASIC) Development (FA-ADBC)	11.0



12.	Advanced & Affordable Magnetic Resonance Imaging (MRI)*	4.6

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13.	Application Specific AMS IC Design Platform for Integrated CCD Image Sensor Processing	11.9
14.	Digital Terrestrial Multimedia Broadcast (DTMB) SFN Technology Adaptors and Systems	4.0
15.	Advanced Wireless Super-Physical Layer for Wireless Personal Area Networking Core Technology Platform (Advanced WiSPHY for WPAN CTP)	14.6
16.	Dualmode CWPAN/ZigBee RFIC Transceiver	10.9
17.	Mobile WiMAX Basestation Technology Platform	16.6
18.	Next Generation Anode Material for Lithium Ion Batteries (NALI)	10.0
19.	Next Generation Antenna Sub-Assemblies	8.5
20.	OFDM Core for Digital TV Applications	16.3
21.	Practical MIMO for WiMAX/LTE Device	17.0
22.	Thermal Energy Management with Advanced Materials and Structures	13.0
23.	WiMAX Access Service Network Gateway (ASN-GW) Platform	14.7
24.	iShare Media Sharing Platform	8.9
25.	Interactive TV Technologies Platform	9.2
26.	Mobile Peer Group Service Platform	6.7
27.	Social Networking Internet Tablet	6.9
28.	Integrated Driver Solution for LED Solid State Lighting (SSL)	9.2
29.	Mixed Signal System-on-Chip (AMS SoC) Design Platform	9.2
30.	A Novel Method of Removing Sapphire for Solid-state Lighting Power GaN LEDs	14.5
31.	Advanced Compact Camera Module (ACCM) for Cellular Phone Applications	13.3
32.	LED Based Intelligent Outdoor Lighting System	10.6
33.	Low-Cost Solution for High-Performance and High-Density Packaging	12.0
34.	Reliability Engineering for 3D Packaging (REF3D)	15.3

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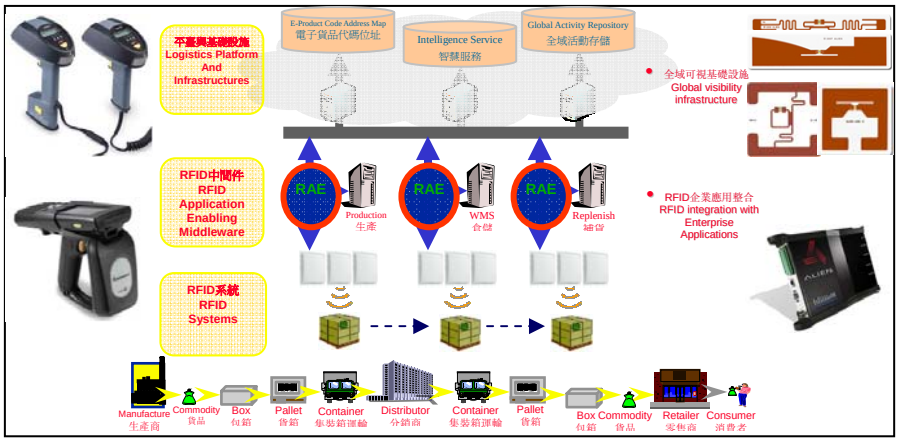
35.	DTMB Instrumentation and Testing Platform	3.1
36.	MMP AVS/H.264 Si-Proven Test Chip Development (MMP-SiP)	13.1
37.	Development and Commercialization of Key IC Packaging Technologies for Tire Pressure Monitoring System*	9.3
38.	Multi-Mode Mobile TV Baseband Demodulator	14.8
39.	Near-Field Antenna Sub-Assemblies	8.7
40.	Optek Multimedia SoC Development (OMM-SoC)*	4.2
41.	Recordable Electrical Memory (REME)*	7.5
42.	High Definition Single/4 Channels Streaming Player*	2.3
43.	Thermal Therapy Apparatus & Devices (TTAD) for Surgical Applications*	1.7
LSCM		
44.	Radio Frequency Identification (RFID) Enablement Middleware for Enterprise Applications	11.8



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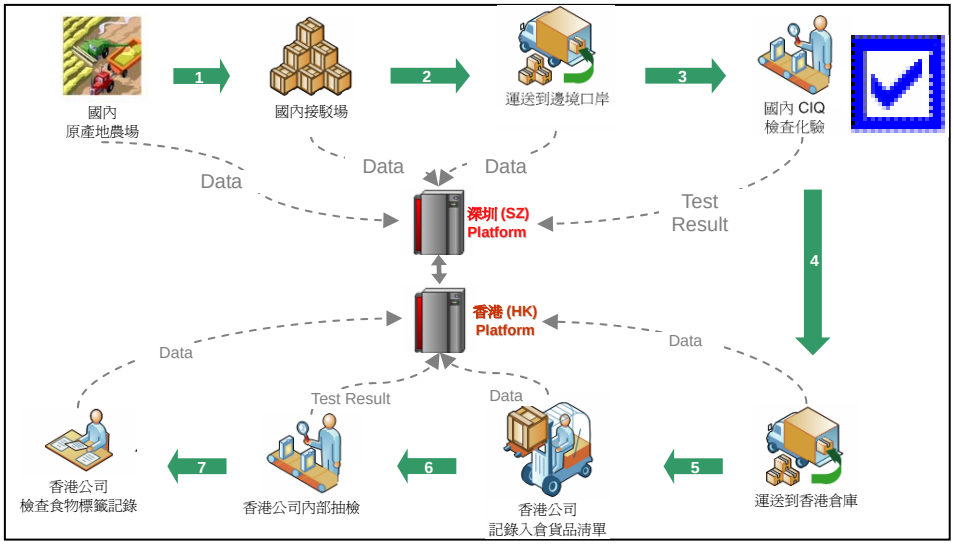
45.	RFID-enabling Platform Technology for the Integrated Shenzhen-Hong Kong Food Safety and Supply Chain Management Public Information Platform	10.0



46.	Establishing an Electronic Product Code Network Infrastructure to Enable End-to-End Supply Chain Visibility	17.2
47.	Development of RFID Reader	5.1

NAMI

48.	Demonstration Line for the Production of Low-cost Humidity Sensor*	0.6

49.	Development and Production of Novel Passive Negative Air Ion Materials and Products	1.0
50.	Thin Film Photovoltaic Technology [#]	-

Note: * - *Collaborative project*
[#] - *A series of collaborative projects under planning in this area*

Nano and Advanced Materials Institute (NAMI)

Summary Review Report and Revised Business Plan

1. Mission and vision

The mission of NAMI is to serve as the platform for the technology development of Hong Kong in the areas of nanotechnology and advanced materials. In particular, NAMI will -

(a) identify and perform innovative, market-driven R&D projects in partnership with local industry and research communities in a concerted manner; and

(b) drive the commercialisation of R&D project outputs.

2. Institutional Setup

The Centre is established as a non-profit-making limited company wholly owned by the Hong Kong University of Science and Technology (HKUST). As the host institute, HKUST provides NAMI with support in various areas such as human resources, procurement, finance, technology transfer, etc.

The Board of Directors oversees the operation of NAMI, including submission of annual plan, and quarterly and annual operational reports to ITC.

Under the Board, a Technology Committee consisting of members with technology background and government representatives is set up to assess R&D project proposals and to review/monitor project progress. Project monitoring is conducted from both the business and technical perspectives to ensure that technical development is carried out according to the research plan, and that commercial opportunities can be realised as soon as possible.

A Finance and Administration Committee is set up under the Board to oversee the administration procedures and policies as well as all aspects of NAMI's financial matters.

An Audit Committee is formed to monitor all aspects of NAMI operations. An International Advisory Committee will be formed to provide advice in terms of scientific and technology directions to the Centre.

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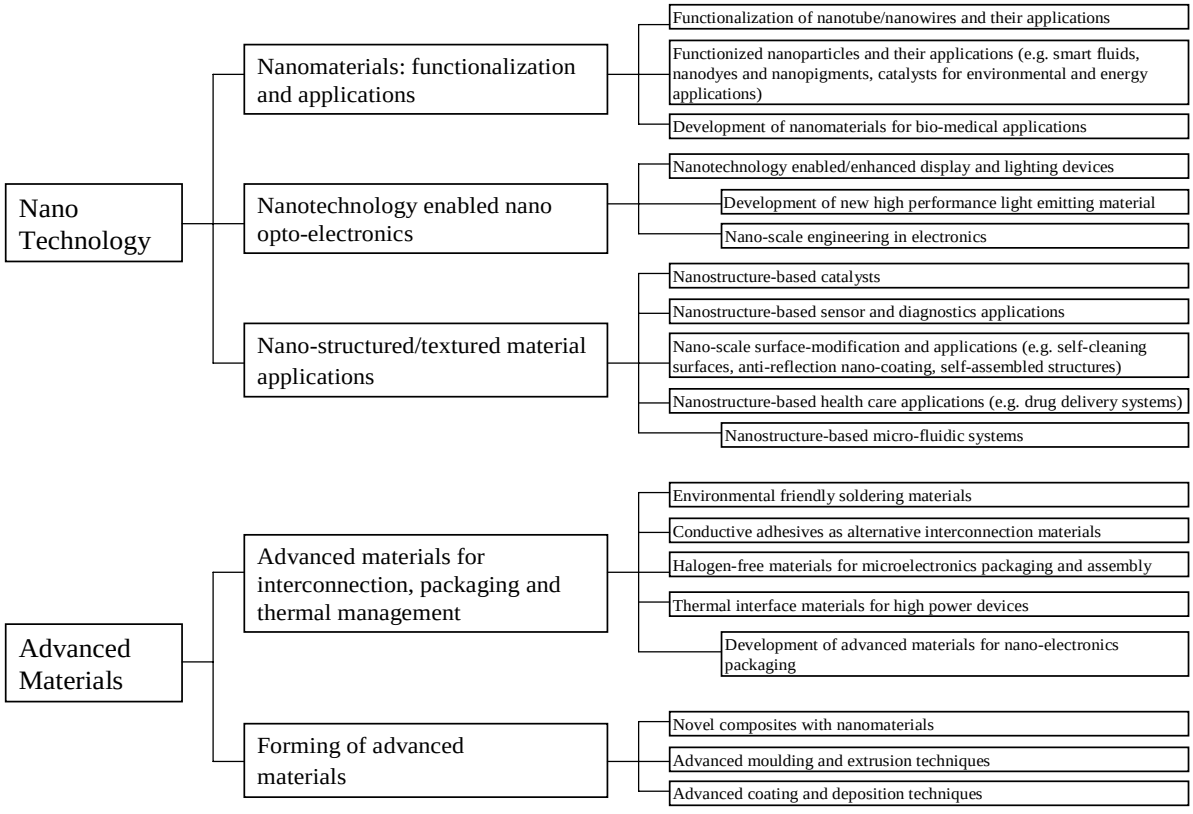
3. Organisation

As at 1 April 2009, the staff establishment of NAMI comprises 26 posts including the Chief Executive Officer (the planned establishment in 2005 is 16 posts). The senior management comprises the Chief Executive Officer, three Chief Technology Officers and the Senior Business Development Officer. The staff establishment is expected to increase to over 140 (including about 90 project staff) in 2013-14 due to a series of large-scale R&D projects on thin film photovoltaic (PV) technology starting from 2009.

The operations of NAMI are executed by six teams: Technical Team; Project Administration Team; Business Team; Administration and Human Resources Team; Accounting Team; and Project Support Team. The organisation chart showing the existing posts and the new posts to be created up to 2013-14 is at Annex 1.

4. Technology roadmap and R&D programme

NAMI has been pursuing five core areas of nanotechnology and advanced materials as its technology roadmap in the past three years -



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Following working with the local industry, it has become clear that a combination of technologies can be applied to different market segments. These include sustainable energy, solid state lighting, environmental technology, metals and metal finishing, lifestyle and healthcare products, advanced materials for consumer and industry, among others. A market segment perspective shows the application of multiple technologies in an individual market segment. It also makes it easier to communicate the values of a research project in terms of market requirements. Thus, the technology roadmap can be viewed from core technology and market segment perspectives as follows -

Market segment / **Technology area**	Advanced materials for consumer and industrial applications	Environmental technology	Lifestyle and healthcare	Metals and metal finishing	Solid state lighting	Sustainable energy
Nanomaterials: functionalisation and applications	S	P	P	S	S	P
Nanotechnology enabled nano opto-electronics	S				P	S
Nano-structured/ textured material applications		S	S	S		
Advanced materials for interconnection, packaging and thermal management	S	S			S	S
Forming of advanced materials	P	S		P		S

Note : P - Primary area; S - Secondary area

In the coming years, NAMI plans to continue to focus its programme on the following technology areas –

(a) <u>nanomaterials and nanotechnology enabled products</u> - nanomaterials, nanoparticles and nanostructures with desired properties will be developed in a safe, environmental-friendly manner and at a low cost for a series of nanotechnology enabled products such as sensors, healthcare products, energy storage devices and a variety of consumer appliances;

/(b) .....

(b) nanoelectronics: display and lighting - it aims to apply nanotechnology to highly demanded nanoelectronics, displays and lighting applications by enhancing their performance and lowering their material and manufacturing cost;

(c) advanced materials: electronic packaging and assembly - new and advanced electronic packaging materials and manufacturing technologies will be developed to enable the technology advancement of microelectronic packaging industry to meet the demanding package schemes and environmental requirements; and

(d) advanced manufacturing: technologies for advanced forming, surface treatment and environmental sustainability - this will lead to upgrading of the production technologies for advanced materials, coatings, composities and catalysts related processes in the manufacturing sector. It emphasises the improvement in process flexibility, productivity, product performance and reduction of manufacturing cost.

From the market perspective, NAMI plans to carry out a number of large-scale R&D projects in collaboration with industry. These market segments with significant growth potential include –

(a) Sustainable energy and related products - solar energy is clean and inexhaustible. Nanotechnology and advanced materials can help improve the conversion efficiency, lower the cost, prolong solar cell life and create innovative solar energy-based products. An example is thin-film photovoltaic (PV) technologies;

(b) Solid state lighting - it aims to apply nanotechnology to invent new materials for use in solid state lighting, enhance product performance and lower the manufacturing cost -

(i) miniaturised Light-Emitting Diodes (LEDs) in order to improve its resolution;

(ii) improved manufacturing process to minimise the difference in lamp color of LED devices from the same production batch; and

(iii) Organic Light-Emitting Devices (OLED) materials for better photo-electric conversion efficiency;

(c) Environmental technology - nanotechnology and advanced materials can play a major role in the monitoring, remediating and improving the quality of air, water and land, and contribute to the invention of environmental-friendly products and manufacturing processes;

(d) Metals and metal finishing - NAMI has worked with industrial sponsors on various projects to improve the mechanical strength, the anti-corrosion properties, etc. of steel materials. Another initiative is to work on metal composite materials;

(e) Lifestyle and healthcare products - There are a number of NAMI projects in this area, which include healthcare products such as nano forms of dietary supplements, consumer electronic products, personal-care products such as nano creams, etc. NAMI will redouble its effort in creating innovative products for this market segment; and

(f) Advanced materials for consumer and industrial applications - NAMI is currently working on a number of research ideas on developing new composite materials for both indoor and outdoor applications. They either are low cost replacements to existing products or offer performance and physical properties that exceed current capabilities.

Against the original target of 75 R&D projects in the first five years, NAMI undertook 25 R&D projects (including contract research) in the various major technology areas by the end of 2008.

Between April 2006 and December 2008, NAMI conducted five rounds of project proposal solicitation, and received a total of 62 project proposals. Of these applications, 15 projects (including three undertaken in-house by NAMI) were approved. NAMI also assisted in monitoring four platform projects on advanced materials and nanotechnology. The total estimated project funding from ITF for these 19 platform and collaborative projects (full list at Annex 2) is $118.5 million. About $18.6 million of industry sponsorship was secured for these projects, representing about 14% of contribution from the industry towards the project costs of $137.1 million.

In addition, NAMI has accepted six contract research projects with a total project cost of about $3 million funded solely by industry.

Commercialisation of NAMI products and production technologies is in progress. A nano-catalyst was licensed and used in a commercial air purifier manufactured by a local company. A low temperature polycrystalline silicon and active matrix organic light emitting diode manufacturing technology, a color vertically aligned liquid crystal display (LCD), a photoalignment technology, and a manufacturing process for separating fullerenes C60 and C70 have been licensed to industry.

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In addition, NAMI technical team has developed a nanomaterial-based humidity sensor, a coating of high light reflectivity, and a material which can generate a substantial amount of negative ions without power supply. Up to now, six patents are in different stages of filing and examination. In the coming two years, over 10 products generated from existing R&D projects are expected to be available for commercialisation.

5. Collaboration parties

NAMI has engaged the following local research institutes to work with industry -

- City University of Hong Kong
- Hong Kong Baptist University
- Hong Kong Productivity Council
- The Chinese University of Hong Kong
- The Hong Kong Polytechnic University
- The Hong Kong University of Science and Technology
- The University of Hong Kong

Some of the R&D projects have engaged research institutions based in the Mainland such as the South China University of Technology.

In addition, NAMI has formed a network of overseas research institutions as technology providers. This is crucial if expertise is not available locally and in the Mainland. NAMI is part of the Asia Nano Forum which comprises 13 Asian economies. Also, NAMI has been aligned itself with various local trade associations such as The Chinese Manufacturers' Association and the Federation of Hong Kong Industries.

6. Industry feedback and liaison

NAMI has been promoting the development of nanotechnology and advanced materials in Hong Kong through different channels – NAMI's corporate website, seminars, symposia, international conferences and workshops. A total of seven workshops were held between 2007 and 2008, five of which were co-organised with the Hong Kong Trade Development Council, to promote the development and commercialisation of products and manufacturing processes for various market segments. The average number of attendees per event in NAMI organised meetings has been over 100.

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NAMI has recruited NAMI Consortium members as a way to maintain and enhance communication with individuals interested in nanotechnology and advanced materials. To further strengthen the NAMI business and technical network, two major initiatives will be carried out.

Firstly, a network of leading researchers will be invited to become "affiliates" of NAMI. The NAMI affiliates can be strong in either fundamental or applied research in the market segments that NAMI has targeted. NAMI might involve our affiliates in R&D projects, workshops, brainstorming sessions, reviews, consultancy, etc. The aim is to organise people to serve as technology providers for the target market segments.

Secondly, marketing focus groups made up of business and technical people will be organised. The main purpose of these meetings is to provide a platform for -

- updating on market situations and requirements;

- presenting new ideas, research results, case studies of technology applications;

- widening the network and deepening the collaboration between local industry and research institutions; and

- identifying new opportunities for R&D projects and technology commercialisation and applications.

The following strategies will be adopted to ensure a research programme that would meet real market needs in the window of opportunity afforded by the market -

- NAMI should focus on a number of market segments to benefit from synergism and scale.

- The project approval process should be streamlined in order to speed up the time to market.

- In addition to industrial sponsorship, more effort should be made to get end-user commitment to try out the technology and to include these trials as part of the research programme.

- Project monitoring should be done from both the business and technical perspectives in order to ensure that technical development is carried out according to the research plan, and that commercial opportunities can be identified as soon as possible and where necessary to re-align the technical development if there is any change in market requirements.

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7. Budget and cashflow

Operating Costs

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
Staff [(1)]	6,930	7,265	9,480	21,324	22,391	21,305	22,370	23,489	134,554
Equipment and other capital cost	311	99	410	5,122	700	700	700	700	8,742
Other direct costs	3,196	3,234	3,472	7,119	7,715	7,774	7,916	8,156	48,582
- *Publicity/ promotion*	32	41	190	374	393	412	433	455	2,330
- *Marketing/ commercialisation*	-	-	60	252	265	278	292	306	1,453
- *Administrative support and others* [(2)]	3,164	3,193	3,222	6,493	7,057	7,084	7,191	7,395	44,799
Total expenditure:	10,437	10,598	13,362	33,565	30,806	29,779	30,986	32,345	191,878
Less: Income [(3)]	70	45	443	300	300	300	300	300	2,058
Total operating cost from ITF [(4)]:	**10,367**	**10,553**	**12,919**	**33,265**	**30,506**	**29,479**	**30,686**	**32,045**	**189,820**

Explanatory Notes –

(1) The staff cost covers basic salary, Mandatory Provident Fund contributions, contract-end gratuity and medical insurance.

(2) Expenditure on "Administrative support and others" covers human resources related items, information technology, legal and audit fees, office expenses, utilities, etc.

(3) The income includes fees collected from testing services. The administrative overheads provided under in-house projects conducted by NAMI would also be booked as income to offset the resources employed to undertake the R&D work. From 2009 and thereafter, an annual income of $300,000 is expected from contract research work.

(4) The increase in the funding requirements for the first five-year period from 2006-07 to 2010-11 against the commitment approved by the Finance Committee in 2005 is mainly due to the large-scale collaborative projects on thin film PV technology. The revised estimates for the period from 2009-10 to 2013-14 includes $11 million per annum for additional staff, $4 million for one-off capital expenditures for laboratory and office facilities at the Hong Kong Science and Technology Parks (HKSTP), $3 million for rental and utilities at HKSTP per annum, and $1 million of contingency funds and $0.6 million for public relations and commercialisation expenses per annum.

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(5) The figures for 2006-07 to 2008-09 represent the actual operating expenditures incurred by the R&D Centre.

Indicative R&D Expenditure

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
R&D expenditure	-	5,500	48,400	155,800	242,500	150,800	121,800	147,400	872,200
Less									
Industry contributions and other income	-	2,400	9,400	49,700	80,000	47,000	28,500	32,100	249,100
Total project funding from ITF	**-**	**3,100**	**39,000**	**106,100**	**162,500**	**103,800**	**93,300**	**115,300**	**623,100**

Explanatory Notes –

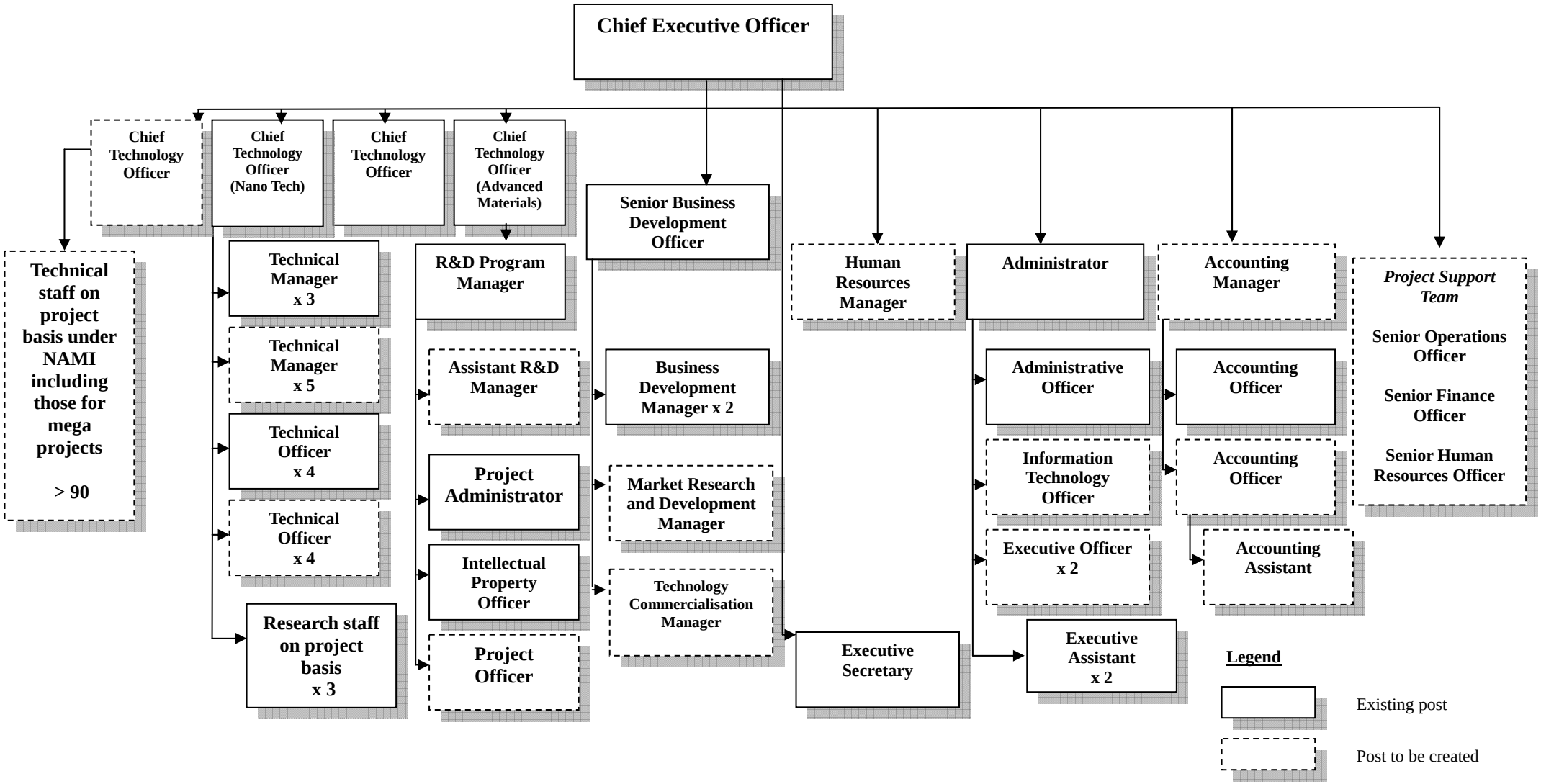
(1) The total number of R&D projects carried out in the first five years of operation is estimated to be 98 (platform research: 60; collaborative research: 30; and contract research: 8). The original target drawn up in 2005 was 75.

(2) It is estimated that about 70 projects will be undertaken for the period 2011-12 to 2013-14.

(3) The figures from 2006-07 to 2008-09 represent the actual R&D expenditures incurred by the R&D Centre.

Annex 1 to Enclosure 3

Organisation Chart of NAMI



Annex 2 to Enclosure 3

Summary of R&D Projects undertaken by NAMI

(April 2006 to December 2008)

	Project Title	Project Cost ($ million)
1.	Advance Materials, Devices and Processing Technologies for Organic Light-Emitting Devices (OLED)	8.5
2.	Robust OLED Materials and Their Purification Technology	4.3
3.	New OLED Materials Technologies for Displays, Illumination and Backlighting	6.1
4.	Institute of NanoMaterials and NanoTechnology: Development of Functional Nanomaterials and Technologies	63.3
5.	LED Arrays on Silicon Substrates by Flip-chip Technology	4.0
6.	Development and Production of Novel Negative Air Ion Materials and Products	1.0
7.	Development of the Layered Nanostructured Metallic Sheet/Plate for Structural Applications	5.3
8.	Precision Polishing Method for Complex-curved-profile Parts and Polishing Slurry Used for the Method	2.3
9.	Development of Advanced Composite Pellets and a Novel Supercritical Fluid Extraction Process for Micro-powder Injection Moulding Technology	3.2
10.	Nanotechnology-enabled Organic Light Emitting Devices for Decorative and Special-effect Lighting Purposes	3.5
11.	Next Generation Display Technology	8.5
12.	Research & Development of New Materials for Printable Electronics	12.5
13.	Industrialization of Liquid TiO_2 Hydrosol Production and Extensive Applications for Indoor Air Purification*	2.0
14.	Demonstration Line for the Production of Low-cost Humidity Sensor*	0.6
15.	Industrial Scale Sonochemical Fabrication of Mesoporous Photocatalysts*	1.0
16.	Nano-enhanced Hot-dip Galvanizing Process*	2.5
17.	High Performance Polymer Nanocomposite Fibers for Electronic Applications*	5.4

	Project Title	Project Cost ($ million)
18.	Development of Blue OLED Materials and Device*	0.6
19.	To Enhance the Attachment of Cells, Proteins and Peptides on Microplates by Surface Treatment for Enzyme-linked Immunosorbent Assay Applications*	2.4

*Note: * - collaborative project*

Hong Kong Research Institute of Textiles and Apparel (HKRITA)

Summary Review Report and Revised Business Plan

1. Mission and vision

The mission of HKRITA is to be a leading centre of excellence in research, development and technology transfer in fashion and textiles technologies. It is a Hong Kong-wide R&D Centre with the remit to support the continual development of technologies to enhance the competitiveness of the fashion and textiles industry and, thereby, continue to contribute to Hong Kong's economic development.

2. Institutional set up

HKRITA was established in April 2006 as a government-funded organisation and is a non-profit making company wholly-owned by the Hong Kong Polytechnic University (PolyU).

The Board determines policy and spearheads the direction of HKRITA. It is underpinned by -

(a) an Executive Committee which is responsible for advising on and overseeing all administrative matters; and

(b) a Technology Committee which is responsible for advising on project proposals and related issues.

HKRITA has also put in place internal audit (IA) mechanisms. The findings of the compliance checks and IA reports will be reported to the Executive Committee.

HKRITA is required to seek formal approval for funding of individual projects from the Commissioner for Innovation and Technology (CIT) and also submit quarterly reports and annual plans on its operating budget.

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3. Organisation

As at 1 April 2009, the staff establishment of HKRITA comprises 18 posts including the Chief Executive Officer (the planned establishment in 2005 is 20 posts by the fifth year of operation). The Centre is headed by the Chief Executive Officer who reports directly to the Board of Directors. He is responsible for policy formulation and overall management of the Centre.

At present, he is supported by three key officers -

(a) The Director, Research and Development who is in charge of the vetting application for project funding and monitoring on-going projects;

(b) the Manager, Corporate Services who is responsible for human resources, finance and accounts, general administration, procurement and committee work; and

(c) the Marketing Manager who is responsible for promoting HKRITA and providing publicity-cum-marketing support for R&D projects.

The staff establishment of HKRITA is expected to grow to 23 by 2010-11 and 29 by 2013-14. The additional staff will mainly be in the R&D team given increased project workload and also include a senior officer to handle commercialisation for completed projects.

For the research work, HKRITA will continue to rely on the research capability of PolyU and other research insititutes. This reflects the most cost-effective use of resources.

The organisation chart showing the existing posts and the proposed new posts to be created up to 2013-14 is at Annex 1.

4. Technology roadmap and R&D programme

The textiles industry in Hong Kong dates back to the early 1950s and has contributed significantly to Hong Kong's economic development over the decades. Over the years our textiles industry has grown from strength to strength from mass production of inexpensive garments to quality, high fashion apparel wear. To-day Hong Kong remains a leading player in this field. The significance of the textiles industry to Hong Kong's economic development is underlined by the fact that for the period ending December 2007 the gross value of domestic export for the Hong Kong Textiles and Clothing Industry stood at $42.5 billion which equated to 39% of total domestic export.

/Feedback .....

Feedback from industry partners as well as from PolyU and other research institutes which have been involved in HKRITA projects over the past three years has confirmed that the focus areas for research which HKRITA have adopted so far remain valid. This has also been borne out in HKRITA's field trip and observations as well as through discussion with its contacts in the Pearl River Delta and Yangtze River Delta. HKRITA will therefore continue to identify and invite project applications in these fields.

In the coming years, HKRITA therefore plans to continue to focus on the following technology areas:

(a)	New Materials, Textiles and Apparel Products
	- thermal and moisture management fabrics and garments - nano materials - shape memory polymers, fabrics and garments - smart garments for healthcare applications - functional fibers

(b)	Advanced Textiles and Production Technologies
	- multiple functional treatments for fabrics and garment - new coloration technolgies - new finishing technolgies - new spinning technolgies - 3D pattern computer-aided design (CAD)

(c)	Innovation Design and Evaluation Technologies
	- new mannequin for product development and evaluation - quality evaluation systems - product specification - garment fit

(d)	Enhanced Industrial Systems and Infrastructure
	- knowledge portal - yarn and fabric database - fashion design database - industrial consortium - training and consultancy

The following are examples of promising projects under these focus areas which have attracted considerable industry interest -

(a) <u>New Materials and Textiles and Apparel Products</u>

- Biofunctional Materials and Application - Nano biofunctional protein materials extracted from wool and silk fibres can turn common textiles and clothing to higher value added products, i.e. functional apparel with anti-bacteria, infra-red, moisture management function, etc.

/Development .....

- Development of an Innovative Finishing System for Wet Processing of Garments and Accessories - An innovative rotary type wet finishing machine that meets industry expectation for washing cashmere.

- Advanced Functional Surface Treatment Technology for Textile Materials - Advanced functional treatments, i.e. nanotechnology based multi-functional treatment, advanced self-cleaning treatment, and nanoparticle-based flame retardant treatment that provide added value to the textiles and clothing products.

(b) Advanced Textiles and Clothing Production Technologies

- Finer Nu-Torque Cotton Yarn Production - A novel spinning technology for the production of torque free single ring yarn which enhances the hand feel and other qualities of cotton fabrics.

- Advanced Textiles and Garment Manufacturing Process Technology - A radio frequency identification (RFID)-based system that can support the automation in the textile and garment manufacturing process and facilitate the capturing of data through different production points so as to reduce bottlenecks.

(c) Innovative Design and Evaluation Technologies

- Development of Fabric Structure Analysis and Appearance Evaluation System - A fabric structure analysis and appearance evaluation system for weave structure identification. This will facilitate the quick prototyping of woven fabric and knit fabric evaluation.

- Imaging Colour Measurement System for Textiles and Garment Industry - An imaging colour measurement system is able to measure the accurate spectral colour of textiles samples with single- and multi-colour patterns, yarn dyed fabric, printings, etc.

- Fabric Sensors for Three Dimensional Surface Pressure Mapping - Innovative fabric pressure sensors that can measure pressure on three dimensional surface, which is promising for applications in functional wear and building maintenance.

/(d) .....

(d) Enhanced Industrial Systems and Infrastructure

- Development of a Fashion Sales Forecasting Decision Support System using Artificial Intelligence Techniques - A scientific sales forecasting decision support system that can provide a state-of-art and user-friendly platform for conducting scientific forecasting for both aggregate yearly fashion demands and seasonal sales pattern of various fashion product categories.

Applications for projects can either be in response to call circulars or submitted at any time. Between April 2006 and December 2008, HKRITA has had six rounds of submissions to its Technology Committee. A total of 55 applications have been received. Of these applications, 27 platform and collaborative projects have been approved at a total estimated project funding of $88.2 million from ITF. About $13 million of industry sponsorship was secured from these projects, repersenting about 13% of the contribution from the industry towards the project cost of $101.2 million.

Applications for projects are first vetted by the HKRITA R&D team. In-put is then obtained from a panel of experts (both local and overseas) as well as from Innovation and Technology Commission. Submissions are then put to the Technology Committee for endorsement.

A full list of the approved projects (excluding contract research) is at Annex 2. Up to end-2008, four projects have been completed and the remaining 23 are scheduled to be completed in 2009 and 2010.

HKRITA will also adopt the following initiatives in its roadmap -

Extension Services

HKRITA shall explore how it can leverage on the capabilities of universities and research institutes on R&D projects.

Its Extension Services programme will continue to reach out to industry partners to identify problems areas and where appropriate initiate projects for research.

Commercialisation

With projects coming to fruition, a new and important priority will be to push for the commercialisation of research deliverables. HKRITA shall, inter alia, adopt the following approaches -

(a) promotion of projects' results;

/(b) .....

(b) conversion of lab-scale prototype to scalable, commercial product;

(c) intellectual property management including the filing of patents; and

(d) licensing arrangement and technology transfer to interested industry users.

With this in mind, a "Standing Committee on Commercialisation" will be set up to study business plans, assess market interest, and advise on practical approaches to capture market interest.

Publicity and Marketing

HKRITA's marketing priority will be to complement the R&D efforts to generate industry interest in the deliverables from completed projects. HKRITA will also continue to organise seminars and workshops to benefit industry partners as well as take part in roadshows and exhibitions.

Operational

In consultation with CIT, HKRITA shall streamline procedures with a view to speeding up project related work. The Administrative team will also constantly review staffing, procurement and other arrangements to ensure value for money and good governance.

5. Collaboration parties

Many organisations express interest to participate in the Centre's operation. PolyU, the Hong Kong Productivity Council and the Clothing Industry Training Authority are HKRITA's main research partners. There are also over 120 industry partners, 15 industrial supporting organisations and trade associations and seven overseas organisations.

6. Industy feedback and liason

Membership Scheme

HKRITA has a membership scheme and have 252 registered members. Companies which have not joined as members may still have access to HKRITA through their affiliation with trade organisations (such as the Textile Council).

/The .....

The major communication channels are -

(a) HKRITA website (www.hkrita.com) in English and Chinese. To-date there have been over 200 000 hits;

(b) E-Newsletter issued on a quarterly basis which, inter alia, provides articles on projects as well news on current industry matters; and

(c) Electronic direct mailing which enables a fast and efficient way to reach industry partners.

Exhibitions and Roadshows

HKRITA has participated in 23 exhibitions in Hong Kong, the Mainland and overseas over the past three years. This included involvement in government-initiated events (e.g. the Innovation Expo), international conventions (e.g. Fashion Week), and HKRITA's own activities (e.g. the Technology Symposium and the roadshows at four local universities).

7. Budget and cashflow

Operating Costs

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
Staff [1]	4,500	6,050	7,720	11,400	13,400	14,800	16,100	17,800	91,770
Equipment and other capital cost [2]	710	1,470	220	80	180	5,000	200	200	8,060
Other direct costs	490	1,920	2,270	3,900	5,680	12,900	13,300	13,900	54,360
- *Publicity/ promotion* [3]	170	540	740	800	2,140	2,600	2,700	2,800	12,490
- *Marketing/ Commercialisation*	-	-	-	1,000	1,000	5,000	5,200	5,300	17,500
- *Administrative support and others* [4]	320	1,380	1,530	2,100	2,540	5,300	5,400	5,800	24,370
Total expenditure	5,700	9,440	10,210	15,380	19,260	32,700	29,600	31,900	154,190
Less: Income [5]	40	120	80	40	40	100	100	100	620
Total operating cost from ITF [6]	**5,660**	**9,320**	**10,130**	**15,340**	**19,220**	**32,600**	**29,500**	**31,800**	**153,570**

/Explanatory .....

Explanatory Notes -

(1) The staff cost covers basic salary, Mandatory Provident Fund contributions, contract-end gratuity and medical insurance. It is expected that in 2011-12 to 2013-14, the number of staff will increase from 23 to 29 to meet increasing R&D workload.

(2) Equipment and other capital costs include expenditure on (a) office renovation and (b) IT infrastructure including IT servers. The Centre has budgeted about $5 million in 2011-12 for acquiring a larger premises to accommodate the additional staff including the commercialisation team. The new office premises will also provide new facilities like laboratory, technology demonstration corner and IT upgrading.

(3) Publicity/promotion expenditure includes website, publicity, publication and promotion expenses.

(4) Expenditure on "Administrative support and others" covers human resources related items, information technology (hardware and software licences), legal and audit fees, office expenses, utilities, etc.

(5) The sources of income for the period 2011-12 to 2013-14 will come from licensing/royalties and contract research.

(6) The increase in the budget for the period 2011-12 to 2013-14 reflects mainly increased expenditure for commercialisation of R&D projects (including inflation adjustment). This includes further development work like setting up prototype or pilot manufacturing demonstration, factory visits and customisation of the R&D deliverables for individual end-users, licensing and royalty management.

There was no significant expenditure on commercialisation expense in the first three years as the R&D projects were still in their early stage.

(7) The figures from 2006-07 to 2008-09 represent the actual operating expenditures incurred by the R&D Centre.

Indicative R&D Expenditure

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
R&D expenditure	40,500	23,500	51,300	48,700	80,300	79,200	81,600	84,000	489,100
Less									
Industry contributions and other income	4,900	2,600	7,000	7,300	13,100	12,900	13,300	13,700	74,800
Total project funding from ITF	**35,600**	**20,900**	**44,300**	**41,400**	**67,200**	**66,300**	**68,300**	**70,300**	**414,300**

/Explanatory .....

Explanatory Notes -

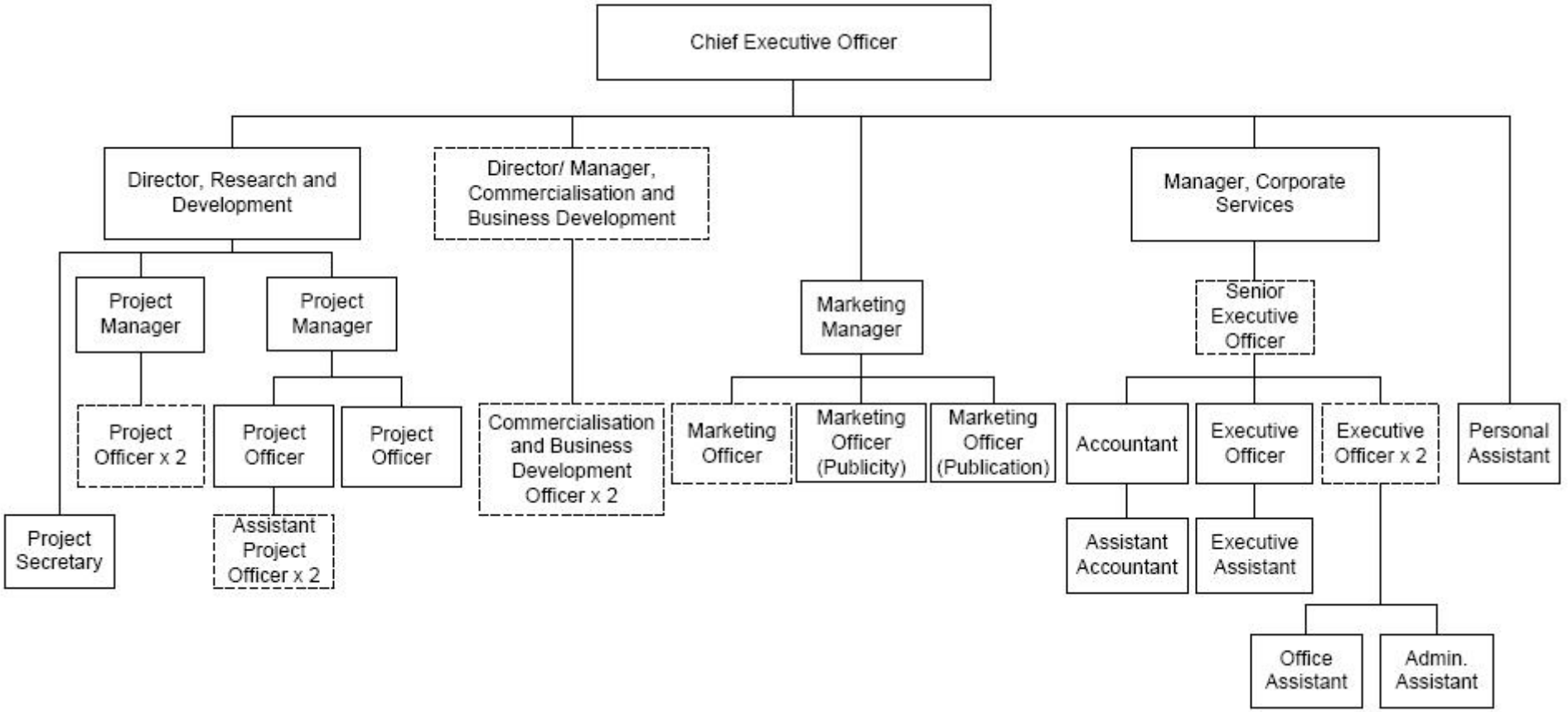
(1) The total number of R&D projects to be carried out in the first five years of operation from 2006-07 to 2010-11 is estimated to be 78 (platform research: 67; collaborative research: 5; and contract research: 6). The original target drawn up in 2005 was 105.

(2) It is estimated that about 70 projects will be undertaken for the period 2011-12 to 2013-14.

(3) The figures from 2006-07 to 2008-09 represent the actual R&D expenditures incurred by the R&D Centre.

Annex 1 to Enclosure 4

Organisation Chart of HKRITA



Legend

Existing post

Post to be created

Summary of R&D Projects undertaken by HKRITA

(April 2006 to December 2008)

	Project Title	**Project Cost** ($ million)
1.	Biofunctional Materials and Applications	4.5
2.	Advanced Clothing Functional Design Computer-aided Design (CAD) Technologies	4.1
3.	Development of an Innovative Finishing System for Wet Processing of Garments and Accessories	1.7
4.	Advanced Textile and Garment Manufacturing Process Technology	3.9
5.	Development of a Laboratory-scale Electrochemical Mercerization and Bleaching System for Technological Evaluation	1.0
6.	Finer Nu-Torque Cotton Yarn Production	2.4
7.	Development of Fabric Structure Analysis and Appearance Evaluation System	2.9
8.	Advanced Functional Surface Treatment Technology for Textile Materials	4.8
9.	Imaging Colour Measurement System for Textile and Garment Industry	4.4
10.	Development of Shape Memory Knitted Fabrics/Garments	11.0
11.	Development of a Problem Solving Model for the Hong Kong Textiles and Clothing Industries	3.0
12.	Development of an Integrated Solution for Minimizing Pilling Problem of Cashmere Knitwear	2.8
13.	Fabric Sensors for Three Dimensional Surface Pressure Mapping	8.0
14.	Development of Smart Interactive Functional Clothing	3.1
15.	High-Performance Sportswear and Devices	5.4
16.	Development of a Fashion Sales Forecasting Decision Support System Using Artificial Intelligence Techniques	2.8
17.	Functional and Decorative Textile Products through Sputtering Technology	0.8

	Project Title	Project Cost ($ million)
18.	Novel Finishing Treatment for Knitwear Using Low Temperature Rapid Evaporation	2.9
19.	Small Sized Fiber Sensors	6.0
20.	Development of an Innovative Manufacturing Solution for Energy-saving and Environmental-friendly Production of Brassiere Cup	2.7
21.	Novel Quick Testing Sensors of Formaldehyde in Textile Fabrics and Clothing Products	4.3
22.	Biofunctional Materials and Applications (II)	5.2
23.	Advanced Clothing Functional Design CAD Technologies (II)	6.8
24.	Remote Assessment System for Physical Prototypes under an e-clustering Environment (EPAS – e-clustered Prototype Assessment System)	1.6
25.	An Intelligent Fabric Sample Resources Management System for Fashion Product Development	1.0
26.	Application of Foam Dyeing Technology for Developing Colour Wash-out Effect on Cotton Knitted Fabric	1.0
27.	Development of 100% Cotton Super Comfort & Easy Care Fabrics and Garments*	3.2

*Note: * - Collaborative project*

Automotive Parts and Accessory Systems R&D Centre (APAS)

Summary Review Report and Revised Business Plan

1. Mission and vision

Vision

To become a world-class automotive parts and accessory systems R&D centre and assist Hong Kong foundation enterprises to enter into or expand in the automotive industry.

Mission

- Develop R&D competencies in selected core technical areas
- Establish related networks in the Mainland and overseas
- Collaborate with the Mainland and overseas R&D partners
- Promote R&D services and expand user base

2. Institutional set up

APAS was incorporated on 31 March 2006 as a subsidiary of the hosting institution, the Hong Kong Productivity Council (HKPC). APAS leverages on HKPC to provide finance, human resources, administration, secretariat and publicity support. The operation of APAS is overseen by a Board of Directors and two standing committees: the Technology Committee (TC) and Finance and Administration Committee (FAC). TC is responsible for assessing/vetting the R&D proposals and making recommendations to the Innovation and Technology Commission (ITC). FAC monitors the financial performance of APAS and provides advisory support on administration matters. APAS has also put in place internal audit (IA) mechanisms. The findings of the compliance checks and IA reports are reported to the FAC.

For each financial year, APAS will prepare and submit an annual plan to ITC for approval. The annual plan sets out the R&D programme, operational issues and financial estimates.

APAS prepares and submits on a quarterly basis an operational report to ITC. The report comprises a quarterly financial statement of income and expenditure for APAS' operations, as well as cashflow requirement for the next 6 months.

/3. .....

3. Organisation

As at 1 April 2009, the staff establishment of APAS comprises 29 posts including the Chief Executive Officer (the planned establishment in 2005 is 13 posts). No change in the Centre's existing establishment is expected by 2013-14. The organisation chart showing the existing posts is at Annex 1.

4. Technology roadmap and R&D programme

Manufacturers in the Mainland and Hong Kong lag behind foreign suppliers in advanced technologies. They are less competitive in the higher-end segments of automotive parts and accessories. Automakers mostly source imported parts and accessories from foreign suppliers. Now that the Mainland government calls for autonomous innovation in the industry and increase in market share of local brands, opportunities arise for Hong Kong manufacturers to collaborate with the local automakers and develop their own products.

In the coming years, APAS plans to continue to focus their programme on the following technology areas -

(a) Electronics and software

Electronics and software are essential parts of virtually every vehicle system. From sensing, information processing, to actuation, they are the brain of many components and systems. The value of electronics and software in modern vehicles is projected to increase to over 30% of the cost of each car in the near future.

(b) Safety

The applications of safety and security related components are not only limited to protective and preventive systems for driver and passengers. Those dealing with restrain systems are highly regulated requiring high level of reliability and assurance. There are a number of systems that are less critical but yet provide comfort and convenience that allow the driver to operate the vehicle more safely, such as illumination and prognostic systems for preventive maintenance, and many of the interior systems which support the driver and passengers. These components represent good starting point for manufacturers with less experience to enter the industry.

/(c) .....

(c) Hybrid electric drive and environment

Technologies which provide fuel economy and emission control are in high demand. On the other hand, crude oil price had gone up to US$140 per barrel in 2008, and more stringent emission regulations and environmental concerns are driving and adding more pressure on the development of innovative technologies. Hybrid drives and eventually electric drives are part of the answer. Equally challenging is the need to make the internal combustion engine more efficient and less polluting. The critical areas leading to success in hybrid/electric vehicles applications are: low-weight structural components, higher energy density and long life battery packs, more efficient internal combustion engines, and more efficient power control.

Up to end-2008, APAS has undertaken six Electric Vehicles (EV) - related projects in co-operation with R&D teams in Hong Kong and the Mainland. These six projects cover key component technologies such as battery management control strategy, functional EV power pack demonstration and EV charging station. Six new proposals related to EV are in the pipeline. They cover key technologies on regenerative braking control systems and EV power management.

(d) New materials and processes

For the auto parts industry, two focus areas in materials are composites and light weight alloys. The performance needs are light weight and strength at acceptable cost. Any gram reduction leads to better fuel economy and value for the consumer. Composites can potentially replace heavier metal parts for many structural and some functional parts. For body parts, steel has many desirable qualities in manufacturing, design flexibility and reparability. However, low cost replacements are needed to reduce the weight of parts. Improvements in steel applications such as galvanization and high strength steel have led to weight reduction, but further reduction is needed. For light weight alloys in engine, transmission, gears, seats, and intake manifolds, aluminium alloys have been used quite extensively.

Limitations of materials and capabilities of processes are what engineers and manufacturing people deal with on a daily basis. Better materials and processes are fundamental enablers for developing new and improved products which deliver fuel economy, safety, emission and process cost benefits. This focus area is certainly an important part of the R&D programme.

/Against .....

Against the original target of 110 R&D projects and $191.1 million income in the first five years, APAS has undertaken 27 projects and secured $18.4 million from industry contributions in four major technology areas by the end of 2008 (full list at Annex 2). The lower number of approved projects and industry sponsorship are due mainly to the longer time required to do the set up arrangement, recruit suitable project staff and initial difficulties in finding industry partners. As a new R&D organisation, APAS is still in the process of building up a track record to strengthen the industry's confidence in the Centre's R&D capability. Industry investment in R&D has also been hard hit by the global economic downturn.

Between April 2006 and December 2008, APAS conducted seven rounds of project proposal solicitation, and received a total of 42 applications. Of these applications, 12 projects were approved. APAS also initiated nine R&D projects and assisted in monitoring six platform projects in automotive and related areas. Out of the total estimated project cost of $110.5 million for the 27 projects undertaken by APAS, $92.1 million is funded by ITF while $18.4 million of industry sponsorship was secured under these projects, representing about 17% of the total project cost.

APAS has engaged external experts to render advice on all project proposals received by the Centre.

Up to end-2008, nine of these 27 approved projects were completed, with another 15 projects to be completed in 2009. The Centre has set up a R&D project commercialisation support group led by its Commercialisation and Development Director to establish a network with industry end users with a view to encouraging them to use the R&D results, participate in product commercialisation and assist in production pilot run. The support group is also responsible for handling intellectual property, licensing and royalty matters.

5. Collaboration parties

The R&D Centre will continue to implement projects in collaboration with local universities and research institutes, Hong Kong industry associations (including those in the fields of auto parts, foundry, metal finishing, plastic machinery, optoelectronics & screw and fastener) and Mainland technology partners.

6. Industry feedback and liason

APAS has established a wide business network and maintained a close contact with the industry through networking with industry partners and overseas experts.

/In .....

In the last three years, APAS organised and took part in 143 public events comprising workshops, exhibitions and seminars.

APAS has set up a members club to promote the latest events and facilitate club member's access to industry information, reports, standards and engineering specifications of major global auto makers. Up to December 2008, the club has more than 600 members.

7. Budget and cashflow

Operating Costs

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
Staff [(1)]	1,900	7,400	8,260	12,340	13,540	14,250	14,950	15,700	88,340
Equipment and other capital cost [(2)]	300	4,700	3,850	5,000	5,500	5,500	6,000	6,500	37,350
Other direct costs	7,300	4,000	5,230	5,500	5,800	6,400	7,050	7,750	49,030
- *Publicity/ promotion*	142	693	800	950	1,000	1,100	1,300	1,500	7,485
- *Marketing/ commercialisation*	-	-	300	350	400	500	600	700	2,850
- *Administrative support and others* [(3)]	7,158	3,307	4,130	4,200	4,400	4,800	5,150	5,550	38,695
Total expenditure	9,500	16,100	17,340	22,840	24,840	26,150	28,000	29,950	174,720
Less: Income [(4)]	-	-	600	240	240	2,000	2,000	2,000	7,080
Total operating cost from ITF [(5)]	**9,500**	**16,100**	**16,740**	**22,600**	**24,600**	**24,150**	**26,000**	**27,950**	**167,640**

Explanatory Notes -

(1) The staff cost covers basic salary, non-accountable cash allowance, Mandatory Provident Fund contributions and medical insurance.

(2) The revised cost estimate for procuring testing equipment for wider industry uses (i.e. they are made available for individual industrialists/researchers to test their products or auto parts outside APAS's R&D projects) is $18 million for the first 5-year period. The Centre has also budgeted $18 million for the same purpose for the period 2011-12 to 2013-14.

(3) Expenditure on "Administrative support and others" covers human resources related items, information technology (hardware and software licences), legal and audit fees, office expenses, utilities, etc.

/(4) .....

(4) The sources of income for the period 2011-12 to 2013-14 will come from licensing/royalties. The administrative overheads provided under in-house projects conducted by APAS would also be booked as income to offset the resources employed to undertake the R&D work.

(5) The estimated increase of about $2 million of expenditure for each year between 2011-12 and 2013-14 is based on the following three considerations:

(a) increased automotive parts testing service which requires more equipment update;
(b) adjustment on the staff cost and other expenses like rental and support services; and
(c) increase in the expenditure on marketing and commercialisation.

(6) The figures from 2006-07 to 2008-09 represent the actual operating expenditures incurred by the R&D Centre.

Indicative R&D Expenditure

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
R&D expenditure	27,500	39,800	78,800	75,200	69,800	69,800	69,800	69,800	500,500
Less									
Industry contributions and other income	3,700	7,200	4,500	15,200	9,800	9,800	9,800	9,800	69,800
Total project funding from ITF	**23,800**	**32,600**	**74,300**	**60,000**	**60,000**	**60,000**	**60,000**	**60,000**	**430,700**

Explanatory Notes -

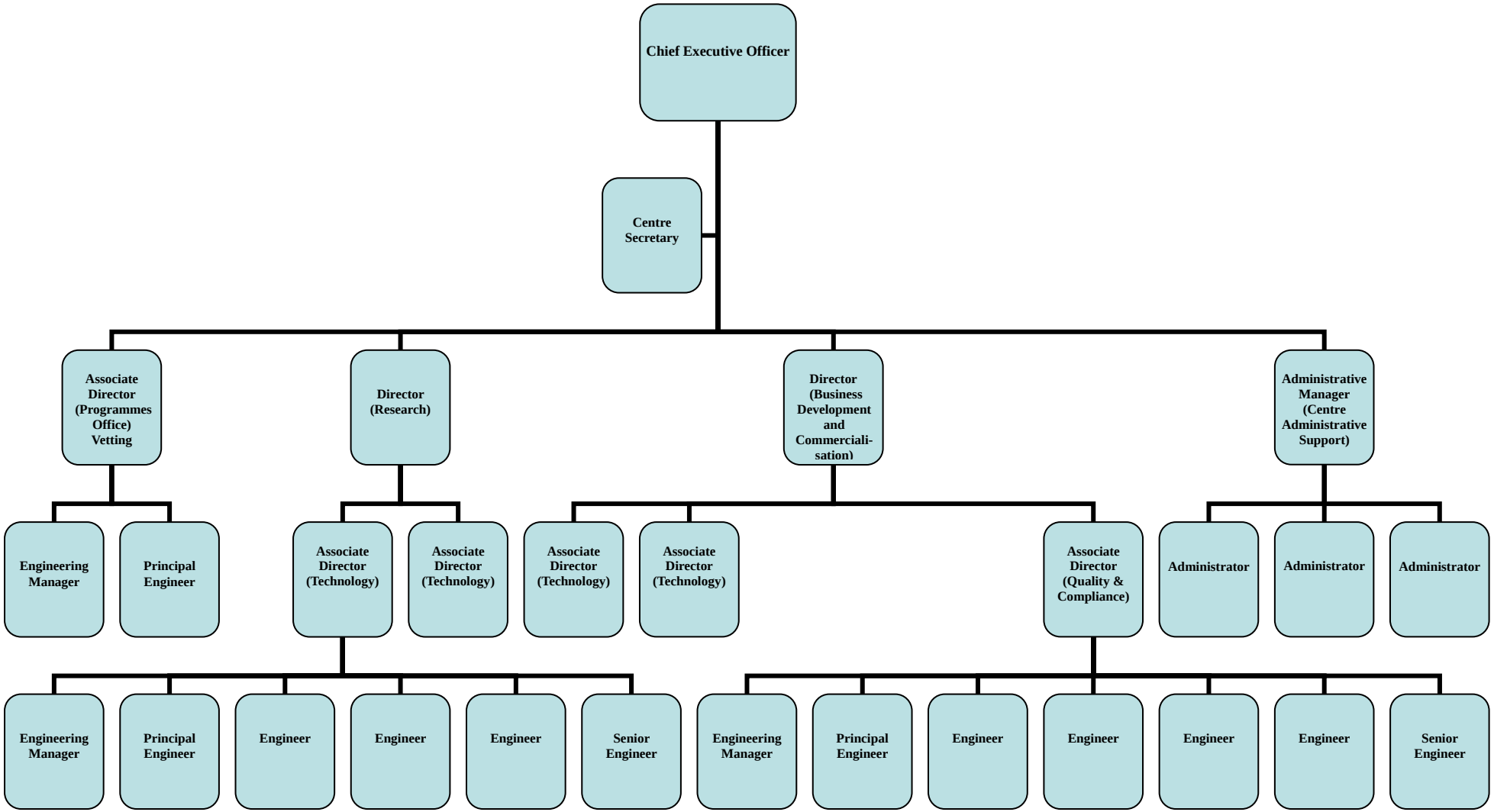
(1) The total number of R&D projects to be carried out in the first five years of operation from 2006-07 to 2010-11 is estimated to be 87 (platform research: 81; collaborative research: 5; and contract research: 1). The original target drawn up in 2005 was 110.

(2) It is estimated that about 50 projects will be undertaken for the period 2011-12 to 2013-14.

(3) The figures from 2006-07 to 2008-09 represent the actual R&D expenditures incurred by the R&D Centre.

Annex 1 to Enclosure 5

Organisation Chart of APAS



Annex 2 to Enclosure 5

Summary of R&D Projects undertaken by APAS

(April 2006 to December 2008)

	Project Title	Project Cost ($ million)
1.	Intelligent Omni-directional Hybrid Electric Vehicle	14.3
2.	To Develop a Mg Semi-solid Slurry Maker for Rheo-diecasting in Production of High Strength Low Weight Mg Automotive Part	3.1
3.	Optical Computer Aided Engineering Technology for Automotive Lighting and Illumination Parts Development	2.1
4.	A Total Solution for Manufacturing of High Strength Mg Automotive Parts – Mg Thixoforming, Scraps Recycling and Billet (Feedstock) Production	9.1
5.	To Establish Automotive Components Quality Management Support Services for Enhancing the Capabilities and Reputation of Auto Parts Suppliers	2.4
6.	Design and Fabrication of High-Intensity Discharge and Light-Emitting Diode (LED) Lighting System for Automotive Illumination	8.8
7.	Development of Software and Hardware Platform and Methodology for Integrated Configurable Dashboard Design	8.0
8.	Development of the 14V Idling Stop/Start System	3.4
9.	To Develop a Versatile Hydraulic Control Unit for an Integrated Chassis Electronic Stability Control (ESC) System	4.0
10.	Development of Electronic Control Unit for Vehicle Anti-lock Braking System and ESC System	5.6
11.	Development of Automotive Headlamp System for LED Light Source	4.2
12.	Battery-less Tire Pressure Monitoring System	1.8
13.	Low Cost Direct Drive for Electric Vehicles	4.6
14.	Integrated Battery Charger and Motor Drive Systems	4.4
15.	A New Generation of Electric Vehicle Power Pack Platform	4.5
16.	Development of an Automotive Hybrid Air Conditioning System Technology	2.8

	Project Title	**Project Cost** ($ million)
17.	Powder Metal Forming Technology for High Temperature Light Weight Aluminum-Titanium Alloys	3.3
18.	Development of Advanced Tube Hydroforming Technology for Making Complicate-Shaped Metallic Tubular Automotive Parts	3.7
19.	Development of Microcellular Foam Injection Moulding Technology Incorporated with Co-injection Technology for Producing High Quality and Value-added Plastic Automotive Parts	3.7
20.	Development of Immobilizer System	0.9
21.	Development of Automatic / Manual Transmission Controls and Systems	1.0
22.	Battery Management Control Strategy	1.0
23.	Development of I.C. Engine Control Strategies	1.0
24.	Automotive Electronic Sub-system Design Guideline	1.0
25.	Long Vehicle Wireless Backup Monitor System	1.0
26.	Development of an Integrated Map Matching Based Automotive Navigation System*	3.8
27.	Development of Automobile Advanced Frontlight System*	7.1

*Note: * - Collaborative project*

Hong Kong R&D Centre for Logistics and Supply Chain Management Enabling Technologies (LSCM)

Summary Review Report and Revised Business Plan

1. Mission and vision

The mission of LSCM is to foster the development of core competencies in applied R&D in logistics and supply chain related technologies, with focus on radio frequency identification (RFID), and to facilitate adoption of these technologies by industries in Hong Kong and the Mainland to enhance their competitiveness.

2. Institutional set up

LSCM is set up as a non-profit-making limited company jointly owned by the hosting institutions: University of Hong Kong, the Chinese University of Hong Kong and the Hong Kong University of Science and Technology.

The operation of the R&D Centre is overseen by the Board of Directors which is supported by the Finance and Administration Committee and the Technology Committee.

The Board of Directors oversees the operation of the R&D Centre, including submission of annual plans and quarterly operational reports to ITC.

The Finance and Administration Committee oversees all matters relating to the finance and administration, including capital expenditure, financial management, budgeting, project control, intellectual property, staffing, human resource management, procurement, and commercialisation framework. It also oversees the Internal Audit (IA) matters of the R&D Centre.

The Technology Committee assesses project proposals and monitors and reviews the progress of R&D programmes and all projects.

/3. .....

3. Organisation

As at 1 April 2009, the staff establishment of LSCM comprises 31 posts including the Chief Executive Officer (the planned establishment in 2005 is 14 posts by the fourth year of operation). As the Centre approaches the end of the first five-year period, LSCM anticipates an increase in business and technology transfer activities, and a moderate increase in the overall research activities by working closely with university and other R&D partners. The Centre is expected to be built up to full strength by 2012 and the headcount is expected to increase to 47. The Centre's organisational structure and mode of operation will remain largely unchanged. The organisation chart showing the existing posts and the new posts to be created up to 2013-14 is at Annex 1.

Under its current mode of operation, the Centre will maintain its current level of administrative staff while relying on the hosting institutions' support for finance, IT and HR functions. Additional staff will be hired in the following areas -

(a) Intellectual property (IP) and contract management
(b) Technology Transfer and commercialisation
(c) Business and industry development
(d) Project monitoring

The Centre will continue to maintain two R&D Directors in the establishment. The Directors will be responsible for (a) developing R&D strategies for their respective areas, (b) liaising with industries on technical issues, and (c) monitoring research activities for their respective areas.

The Centre may also appoint selected Principal Investigator or outside experts as Centre Research Fellow(s) to represent the Centre in external activities as well as to advise the Centre on technology and research issues.

4. Technology roadmap and R&D programme

In 2008, LSCM conducted a market intelligence study with an objective to empower logistics and supply chain community with industry needs and technology capabilities to enhance production and adoption of relevant technologies in the industry. This extensive industry analyses and researches (including in-depth study of market trends and interviews with industry experts and leaders) have highlighted a number of gaps between present technology and industry's requirements.

Having regard to the study, LSCM plans to continue to focus on the following technology areas in the coming years:

/(a) .....

(a) RFID hardware and systems – to develop core design capabilities, system implementation and manufacturing processes of RFID tags and readers that are related to targeted logistics management applications. Key research areas include RFID Testing and Qualification, Low-cost RFID Tag Manufacturing Techniques, RFID Hardware Systems Development for Manufacturing and Packaging Industries, RFID Beyond Gen2, etc.

(b) Networking and infrastructure technologies – to develop advanced computer networking and information infrastructure technologies for industrial adoption of information technologies in their business processes and for enabling efficient and effective business integration among enterprises, in order to nurture the technology enabled environment for competitive advantage of the local industry. Key research areas include Enterprise e-Logistics Internetworking, On-demand technologies for Logistics Application Software Service Platforms.

(c) Applications and decision support technologies – to reinforce Hong Kong's position as a world-class logistics hub with advanced technologies and to assist manufacturers and suppliers in this region to fulfill RFID adoption requirements set by their global buyers. Key research areas include RFID-enabled warehouse management system, food safety, cross border, retailing, manufacturing and decision technologies.

Between April 2006 and December 2008, LSCM conducted six rounds of project proposal solicitation and received a total of 43 applications. LSCM also initiated 8 R&D projects of relevance to the industry.

Against the original target of 80 R&D projects in the first five years, LSCM has undertaken 23 projects by the end of 2008 at a total estimated project funding of $161.8 million from ITF (full list at Annex 2). About $22.4 million of industry sponsorship was secured under these projects, representing about 12% of contribution from the industry towards the project costs.

Project Vetting

In addition to assessments by Centre Staff, project proposals are also vetted by the Expert Review Panel, which consists of members from the logistics and supply chain management enabling technologies-related industries, trade and industry associations, research and academic institutions, public bodies, Government etc., and of the legal, accounting, financial and management professions.

/Technology .....

Technology Transfer

The Centre has started to build up R&D project pipeline since mid-2007. With an average project duration of about 18 to 24 months, some of our early projects are either completed or reaching their final development stages.

In late 2008, the Centre completed its first R&D project, "RFID Enabling technologies for Retail & Logistics Industry", and finalised the IP licensing arrangements in January 2009. Currently, both the Hong Kong International Airport has expressed interest in adopting the new technologies.

The Centre anticipates that commercialisation activities will gradually increase. Organising industry activities, such as LSCM Annual Conference, Industry & Technology Forums, Membership e-news, will be a key commercialisation strategy.

In order to provide an effective platform for the exchange of IP and technology with the industry, the Centre will form a new cross-functional team which consists of researchers, technical staff, marketing staff and business staff to capture the increasing technology transfer opportunities.

5. Collaboration parties

LSCM aims to act as the focal point of the coherent force that combines Government resources, industry support and university researchers to create the greatest value for the supply chain management and logistics industry. To empower the Centre with market feedback and intelligence, the Centre has engaged the following industry partners and research institutions, from local, mainland China and overseas for various forms of collaboration -

Organisations	**Details of Collaboration**
Hong Kong Productivity Council; Hong Kong Science & Technology Parks Corporation; Hong Kong Trade Development Council; Federation of Hong Kong Industries; Guangdong and Hong Kong Feeder Association; Hong Kong Association of Freight Forwarding And Logistics; Hong Kong CFS and Logistics Association; Hong Kong Logistics Association; Hong Kong Shippers' Council; The Chamber of Hong Kong Logistics Industry	➢ Co-organise and promote industry events, e.g. seminar, training, exhibition, study tour ➢ Solicit industry problems and requirements ➢ Disseminate project results

/**Organisations** .....

Organisations	Details of Collaboration
GS1 Hong Kong; Guangdong RFID Technology Service Center; Shanghai Base of National RFID Industrialisation; RFID China Alliance; EPCglobal, Inc.	➢ Promote RFID adoption and applications ➢ Closely monitor technology and stand development
The University of Hong Kong; The Chinese University of Hong Kong; The Hong Kong University of Science and Technology; The Hong Kong Polytechnic University; Sun Yat-sen University; Shanghai Research Center for IC Design; Shanghai Jiao Tong University; Beijing University of Posts and Telecommunications; Fudan University; Shenzhen Institute of Advanced Technology; RFID Research Center, Institute of Automation, Chinese Academy of Sciences; National ICT Australia; University College London; Center for Information Technology Research in the Interest of Society/University of California, Berkeley; University of California, Los Angeles	➢ Undertake research/ consulting project ➢ Establish research partnership

6. Industry feedback and liaison

Since the establishment of the Centre, we have participated in over 150 promotional events all over the world. These activities serve to promote the Centre's strong research capabilities and help foster the adoption of enabling technologies by the logistics and supply chain industries.

In addition, we have organised more than 50 forums/conferences/seminars in the last few years, expanding our reach into the logistics and supply chain industry. These activities also enable the research community in Hong Kong to interact directly with the industry players while searching for innovative solutions. The Centre also actively participates in networking activities. For instance, the Business Development Team participated in 52 events in 2007 and 2008.

Thirty delegations from different countries have visited the Centre since mid-2006. Nine overseas groups are now collaborating with us on several R&D initiatives.

/Membership .....

Membership Scheme

The Centre has recruited over 350 individual members, 110 company/ institutes members, and 70 technology/solution provider members, making a total of 540 members.

Apart from business matching and project collaboration activities, members also actively participated in the Centre's events like industry and technology forum, exhibitions, conferences, delegations as well as networking opportunities.

7. Budget and cashflow

Operating Costs

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
Staff [(1)]	5,139	9,602	6,709	8,000	8,000	14,436	14,997	15,609	82,492
Equipment and other capital cost	766	208	306	155	155	252	263	275	2,380
Other direct costs	2,214	3,063	7,185	7,341	7,341	14,656	15,184	15,760	72,744
- *Publicity/ promotion*	159	298	300	824	824	1,378	1,420	1,466	6,669
- *Marketing/ commercialisation*	159	298	300	824	824	1,583	1,625	1,671	7,284
- *Administrative support and others* [(2)]	1,896	2,467	6,585	5,693	5,693	11,695	12,139	12,623	58,791
Total expenditure	8,119	12,873	14,200	15,496	15,496	29,344	30,444	31,644	157,616
Less: Income [(3)]	81	2,974	2,717	3,500	4,740	3,700	3,900	4,100	25,712
Total operating cost from ITF [(4)]	**8,038**	**9,899**	**11,483**	**11,996**	**10,756**	**25,644**	**26,544**	**27,544**	**131,904**

Explanatory Notes –

(1) The staff cost covers basic salary, Mandatory Provident Fund contributions, contract-end gratuity and medical insurance. The revised estimates for staff costs in the first five-year period are higher than the 2005 estimates, due to the higher manpower requirements to conduct more Centre-initiated research projects.

(2) Expenditure on "Administrative support and others" covers human resources related items, information technology, legal and audit fees, office expenses, utilities, etc.

/(3) .....

(3) The major sources of income for the period 2011-12 to 2013-14 will be from license fee and contract research. The administrative overheads provided under in-house projects conducted by LSCM would also be booked as income to offset the resources employed to undertake the R&D work.

(4) The increase in operating expenditure for the period 2011-12 to 2013-14 is largely due to a substantial increase in technology transfer activities and additional staff to support the following:

(a) IP and contract management;
(b) Technology transfer and commercialisation;
(c) Business and industry development; and
(d) Project monitoring.

(5) The figures from 2006-07 to 2008-09 represent the actual operating expenditures incurred by the R&D Centre.

Indicative R&D Expenditure

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
R&D expenditure	52,500	48,168	82,230	81,799	69,653	73,136	76,792	85,592	569,870
Less									
Industry contributions and other income	6,893	4,777	9,832	8,573	8,425	8,847	9,289	12,384	69,020
Total project funding from ITF	**45,607**	**43,391**	**72,398**	**73,226**	**61,228**	**64,289**	**67,503**	**73,208**	**500,850**

Explanatory Notes –

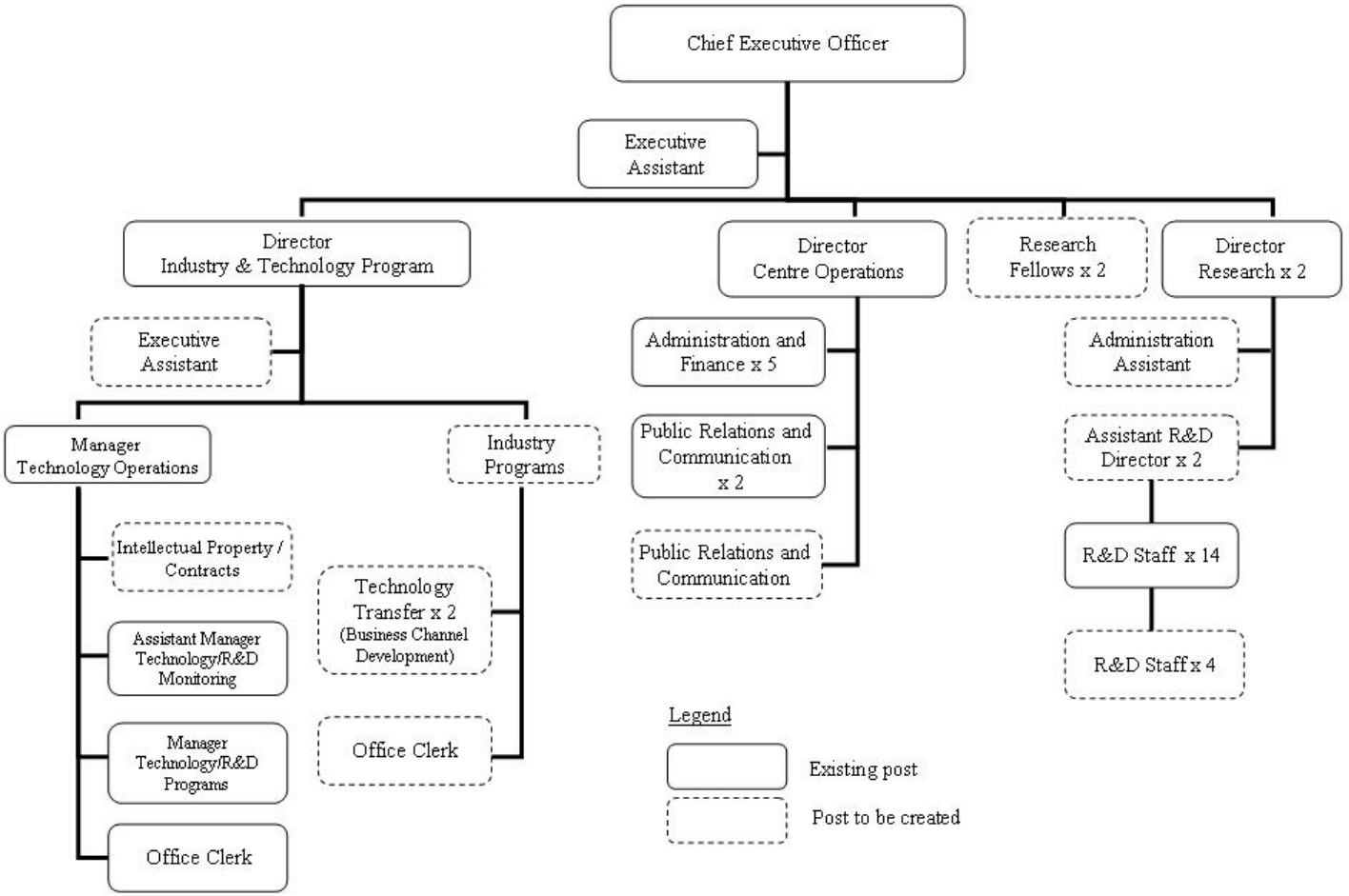
(1) The total number of R&D projects carried out in the first five years of operation is estimated to be 45 (platform research: 41; and collaborative research: 4). The original target drawn up in 2005 was 80.

(2) It is estimated that about 30 projects will be undertaken for the period 2011-12 to 2013-14.

(3) The figures from 2006-07 to 2008-09 represent the actual R&D expenditures incurred by the R&D Centre.

Annex 1 to Enclosure 6

Organisation Chart of LSCM



Summary of R&D Projects undertaken by LSCM
(April 2006 to December 2008)

	Project Title	Project Cost ($million)
1.	RFID Tag and Reader Technologies at Ultra High Frequency (UHF) Band for Logistics Management	5.9
2.	Development of RFID Reader	5.1
3.	RFID Enablement Middleware for Enterprise Applications	11.8
4.	Establishing an Electronic Product Code Network Infrastructure to Enable End-to-End Supply Chain Visibility	17.2
5.	Enabling Technologies for Single-Chip Passive UHF RFID Tags and Readers	7.1
6.	The Development of RFID-based Business Solutions for Counterfeit Prevention, Physical Asset Management and Commercial Applications	5.4
7.	Study the Design Challenges of 90nm Technology UHF RFID Tag IC	2.2
8.	An eLogistics Appliance with Data Exchange and Conversion Technologies for Infrastructure Connectivity	6.6
9.	Integrated Passive UHF RFID Tags and Readers	7.7
10.	RFID-based Interoperable Gateway for Logistics Service Platforms	11.3
11.	RFID Benchmarking: Methodology and Practice	2.2
12.	RFID Enabling Technologies for Retail & Logistics Industry	7.3
13.	Package-specific RFID Tagging and Embedding Technology	14.3
14.	RFID-Enabled Real-Time Manufacturing Shop-floor Information Infrastructure for PRD Processing Trade Enterprises	7.7
15.	Trustworthy RFID Technologies: Methodology and Practice	4.4
16.	RF-based Technologies for Asset/Personnel Tracking	6.5
17.	RFID Benchmarking Methodology, Report and Tool Support	10.7
18.	Enhancing the Competitiveness of the Hong Kong Air Freight Forwarding Industry Using RFID and Software Agent Technologies	4.5

	Project Title	**Project Cost** ($million)
19.	Lightweight RFID Reader Chip for Near Field Communication and Mobile Applications	14.6
20.	Interoperability Technology and applications for Container RFID and e-seal	9.6
21.	RFID-enabling Platform Technology for the Integrated Shenzhen-Hong Kong Food Safety and Supply Chain Management Public Information Platform	10.0
22.	Privacy Protection and Communication Security in RFID Systems	2.0
23.	A Market Intelligence Study on Enabling Technologies for Industries related to Logistics & Supply Chain Management	10.0

R&D Centre for Information and Communications Technologies (ICT) / Applied Science and Technology Research Institute (ASTRI)

Summary Review Report

ICT was subsumed under ASTRI which started operation in 2001 with the mission of performing high quality R&D for technology transfer to industry, developing the much needed technical human resources and bringing together industry and university R&D assets to enhance Hong Kong's technological competitiveness.

2. Under ICT/ASTRI, there are four technology areas, namely, Communications Technologies, Enterprise and Consumer Electronics, Integrated Circuit (IC) Designs, and Material and Packaging Technologies. As of end-2008, ASTRI has 469 staff of which 401 are research personnel. The annual Government recurrent subvention to support the operation of ASTRI in the past three years was about $120 million.

3. ICT has been able to leverage on ASTRI's established infrastructure and hence has made more progress than the other R&D Centres. Between April 2006 and end-2008, ICT undertook a total of 212 projects, including 105 platform projects, 100 contract researches and seven collaborative projects. Excluding contract researches, the total project cost estimate of the 112 projects is $781.7 million, under which a total of $68.6 million in industry contributions was secured.

4. The number of patents filed by ICT/ASTRI has been growing fast since 2006. For the period 2006 to 2008, more than 170 patents (53 in 2006, 58 in 2007 and 63 in 2008) were filed. The number of technology transfers has also grown significantly during the period. While the figure was only nine in 2005, a total of 144 technology transfers (32 in 2006, 42 in 2007 and 70 in 2008) were conducted between 2006 and 2008.

/5. .....

5. In the area of Communications Technologies, antenna designs developed by ASTRI were applied in advanced cell phone and WiFi systems. The technology is also used in the creation and rendering of high resolution images in locally designed magnetic resonance imaging medical imaging machines. In the area of Enterprise and Consumer Electronics, the peer-to-peer technologies developed by ASTRI allowed local cable users to watch the 2008 Olympic Games from their laptops and mobile handheld devices. The set-top box digital television technologies have also been licensed to manufacturers, with their set-top boxes sold in Hong Kong and the Mainland. In the area of IC Designs, an IC for the analog front end of a Charge-Coupled Device camera module was designed to integrate the functions of three ICs, and has been licensed to local industry partners. In the area of Material and Packaging Technologies for Light-emitting Diodes (LED), enhanced thermal management designs were licensed to two manufacturers for high-power general lighting applications such as street lights. LED technology is also employed successfully in providing backlight for Liquid Crystal Display televisions with savings in energy whilst providing better display contrast. The R&D results have so far been licensed to four companies. A list of major R&D results and the latest progress in technology transfer under ICT/ASTRI's projects is at Annex.

6. ASTRI organised four Industry and University Consultation Forums in 2007 and 2008 (two in Hong Kong and the other two in Shenzhen) to bring industry and the academia together on technology programmes and R&D endeavours. With the recent establishment of a new office in Shenzhen, ASTRI plans to reinforce its networking in Shenzhen as well as other strategic locations in the Pearl River Delta.

Annex to Enclosure 7

List of major R&D results and progress of technology transfer under ASTRI/ICT's projects

Project Title	R&D results	Progress in technology transfer
(A) Communication Technologies		
EMS for Wireless Networks	• Element Management System for WiFi and WiMAX network base stations • Rapidly and cost-effectively customizable.	• Licensed to local WiFi operator and telecom company
Multimode Mobile TV Handset	• Baseband IC for DVB-T/H (Europe), T-DMB (Korea) and CMMB (China) • RF IC for multi-band tuner. • Single chip solution reduces power consumption and cost.	• Designs ready for licensing in 2009 for China and international market.
Practical MIMO for WiMAX/LTE Device	• Reference designs and core IP modules for an MIMO-OFDM platform (WiMAX/LTE) • Digital hardware platform for a TD-LTE emulator	• Ready for technology transfer in 2010
Advanced Indoor MIMO Platform	• Enhanced 802.11g/n platform with ASTRI's Innovations in antenna selection and rate/mode selection • Wireless Home AV distribution system	• Licensed to world leading 802.11 chip vendor

/***(B)*** *.....*

(B) Enterprise & Consumer Electronics

Video Encoder and Decoder	• HD H.264 decoder FPGA and IC	• Licensed to Chinese TV manufacturer.
	• Chinese AVS Compression Standards	• IP accepted into AVS pool in China standards.
Client-based Wireless Hotspot Access	• Handheld WiFi devices with access to multiple hotspots	• ASTRI had signed marketing agreement with main provider of hotspots worldwide.
	• Voice over IP with roaming	• Turnkey WiFi VoIP phone reference design available to be licensed.
Portable Dual Mode Wireless and Broadcast Multimedia Platform	• A mobile digital TV platform leveraging the convergence of wireless networks (cellular and Wi-Fi) and broadcast networks (DVB-H and T-DMB).	• Reference design licensed to local and overseas partners
	• 3 hours viewing time with 1200mAh battery, quick service discovery and channel switch, and DSP multimedia engine	
Triple Player IP Set Top Box (STB) Platform	• “Triple Play”: video, data and voice services provided by a single operator delivered via the broadband network.	• Reference design licensed to local and overseas partners
	• Personal Video Recording (PVR) with streaming application.	
	• Robust IP TV streaming modules with ASTRI proprietary error resilient algorithms	

/***(C)*** .....

(C) IC Designs

Power Management IC	• Low Drop Out (LDO) voltage regulator • DC/DC Converter for mobile phones	• LDO IC in mass production since 2007 • IP transferred to local partners
Nanometer IC Design	• 90nm and 65 nm design methodology • Library of popular components • Upgrade local IC design capability	• Low cost nanometer IP library components available in 2010 for HK IC designers to provide advanced products
ASIC for Integrated CCD Image Sensor Processing	• Integration of analog mixed signal IP with digital circuitry • High speed-low power data converters (ADC, DAC), • Precision oscillators and high voltage CCD clock drivers in BiCMOS and CMOS processes.	• Licensed to local partners for volume production

(D) Materials & Packaging Technologies

Advanced Technologies System-in-Package (SiP)	• Integration for wireless front-end module • Applications in automobile electronics	• Award winning design in Consumer Electronics Show • Specific product IPs retained by the industry partner (collaborative research project).
Opto-electronics Modules	• Small size personal micro-projector: 20mm/30mm/13mm • Optical HDMI cable transceivers	• 3.4Gb/s per channel for 100m long cable design licensed to two industry partners.

/LED .....

LED for General Lighting - Area Light Source	• Chip electrode design for LEDs • High brightness and low energy consumption LED driving module • High failure tolerant circuit design for LED light source • Remote and feedback control technology	• High power LED based MR16 lamp design licensed to local partner who is receiving orders for volume production
Large-Sized (>32”) Back-Light Unit using LED	• A backlight unit using Red, Green, and Blue Light Emitting Diodes (RGB-LEDs) • Special package design for heat dissipation • Pulse LED system design for energy saving	• Licensed to Chinese TV manufacturers

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