

For discussion
on 17 June 2014

**Legislative Council
Panel on Commerce and Industry**

**Progress Report on
Research and Development (R&D) Centres
for 2013-14**

PURPOSE

This paper is an annual update on the 2013-14 operation of the R&D Centres set up under the Innovation and Technology Fund (ITF).

BACKGROUND

2. In April 2006, the Administration set up five R&D Centres to drive and co-ordinate applied R&D in selected focus areas and to promote commercialisation –

- (a) Automotive Parts and Accessory Systems R&D Centre (APAS);
- (b) R&D Centre for Information and Communications Technologies under the Hong Kong Applied Science and Technology Research Institute (ASTRI);
- (c) Hong Kong Research Institute of Textiles and Apparel (HKRITA);
- (d) R&D Centre for Logistics and Supply Chain Management Enabling Technologies (LSCM); and
- (e) Nano and Advanced Materials Institute (NAMI).

3. In 2011, we conducted a comprehensive review on the operation and performance of the five R&D Centres in their initial five years of operation up to 31 March 2011. With the support of the Panel, the Legislative Council Finance Committee (FC) approved vide FCR(2012-13)21 in May 2012 an additional commitment of \$275.3 million to extend the operation of NAMI and APAS (which had met the interim industry contribution target of 15% in their first five-year period) up to 31 March 2017, and HKRITA and LSCM (which

had not achieved an industry contribution of 15% in the first five years) up to 31 March 2015.

4. Subsequently, having regard to the satisfactory performance of HKRITA and LSCM during the two-year observation period from April 2011 to March 2013 and with the support of the Panel, the FC approved vide FCR(2013-14)55 in January 2014 to extend the operation period of these two R&D Centres to align with that of the other R&D Centres up to 31 March 2017. The target level of industry contribution for all R&D Centres is 20% during the second five-year operation period.

5. Hence, since 2006, the FC has approved a total funding commitment of \$1,019 million to support the operation of the R&D Centres up to 31 March 2017 (except the operating expenditure of ASTRI which is met separately from Government's annual recurrent subvention).

6. In this report, we will set out the overall performance and operation of the five R&D Centres in 2013-14. Detailed statistics and progress of realisation/commercialisation of the R&D Centre's projects are at **Annex A** to **Annex E** respectively. At the coming Panel meeting on 17 June 2014, we will also show a short video on the work progress of the five R&D Centres. (Note: There is a more detailed version of the video which will be sent to Members before the meeting.)

OVERALL PERFORMANCE IN 2013-14

(A) Operating Expenditure

7. The operating expenditure of the R&D Centres in 2012-13 and 2013-14 and their staffing situation (as at end-March 2014) are summarised as follows –

Operating Expenditure^{Note} and Staff Strength
(in \$million)

	2012-13	2013-14	% change over 2012-13	Staffing Strength as at End-March 2014 [Establishment]
APAS	15.8	11.4	-28%	22 [33]
ASTRI	130.2	129.5	-1%	499 [563]
HKRITA	19.1	21.1	+10%	26 [29]
LSCM	20.9	20.4	-2%	49 [67]
NAMI	38.1	56.2	+48%	64 [69]

Note: After netting off administrative overhead for in-house R&D projects.

8. In 2013-14, the operating expenditure of APAS has decreased by 28% (from \$15.8 million to \$11.4 million). This is mainly attributed to savings in manpower and administration costs arising from its merger with the Hong Kong Productivity Council (HKPC) and several unfilled senior management posts in 2013-14. The operating expenditure of ASTRI and LSCM were basically similar to last year's. HKRITA registered a growth of \$2 million (or 10%) mainly due to recruitment of new staff and increased efforts in marketing.

9. The operating expenditure of NAMI has increased significantly by 48% (from \$38.1 million to \$56.2 million) in the year for the following reasons –

- (a) the deferral of (i) an one-off payment of \$5 million from 2012-13 to 2013-14, which includes the acquisition of equipment and completion of necessary acceptance tests that should have originally taken place in 2012-13; and (ii) a payment of \$1 million for laboratory renovation conducted in 2012-13 to 2013-14;
- (b) additional \$1 million in rental expenses for relocation of its office from the Hong Kong University of Science and Technology to the Hong Kong Science Park to meet operational needs;
- (c) filling of 11 vacancies; and costs for filing of 70 intellectual property (IP) applications; and
- (d) more public relations and marketing activities in 2013-14.

(B) Level of Industry Contribution Achieved

10. R&D Centres are platforms for co-ordinating applied research in designated technology areas and facilitating technology transfer to the industry, and as such the level of industry contribution remains a most important indicator to show the degree of support of the industry in their work.

11. The performance of the R&D Centres in 2012-13 and 2013-14 is summarised as follows –

<u>Level of Industry Contribution</u> (based on approved funding commitment) ^(Note 1)			
	2012-13	2013-14	Change in Percentage Point (pp) over 2012-13
APAS	30.5%	41.8%	+11.3pp
ASTRI ^(Note 2)	25.3%	19.3%	-6.0pp
HKRITA	26.8%	35.0%	+8.2pp
LSCM	18.7%	28.2%	+9.5pp
NAMI	39.0%	15.9%	-23.1pp

Note 1: The level of industry contribution is calculated as follows –

$$\frac{\text{Industry Contribution Pledged}}{\text{Approved Project Expenditure}} \times 100\%$$

Note 2: Starting from 2013-14, ASTRI has aligned its industry contribution calculation method with that of other R&D Centres

12. As illustrated from the above table, APAS, HKRITA and LSCM have demonstrated considerable improvement in the level of industry contribution. The performance of APAS has improved by 11 percentage points from 30.5% in 2012-13 to 41.8% in 2013-14 as it has undertaken 7 new collaborative projects in 2013-14 compared to 1 in 2012-13. At the same time, HKRITA has improved its industry contribution by 8 percentage points (from 26.8% to 35.0%) as it further strengthened its connections with the textiles, apparel and fashion industry and raised awareness of its work. LSCM has also recorded an improvement of around 10 percentage points in the year, with its industry contribution increased from 18.7% to 28.2%.

13. ASTRI's level of industry contribution has dropped from 25.3% to 19.3% in the year, although it has commenced more collaborative projects in the 2013-14 compared to 2012-13. This is mainly due to an alignment of ASTRI's calculation method for industry contribution (ASTRI has previously adopted a slightly different method due to historical reasons, where it was calculated with the total cash received during the reporting period from the industry including licence fees and contract research income, instead of only pledged industry contribution) with that of other Centres starting from 2013-14. As we reported to Panel Members in last year's annual progress report, this will facilitate comparison of ASTRI's performance with that of other R&D Centres.

14. NAMI's level of industry contribution has dropped from 39.0% to 15.9% in the year. This is due to a number of factors –

- (a) 14 new projects incubated in 2013-14 were only approved in late March 2014, and hence could only be commenced in 2014-15. Among these 14 projects, 7 have already commenced as at early June 2014¹ and we anticipate the figures to pick up in the coming year;
- (b) withdrawal of two large scale collaborative projects on the photovoltaic (PV) technology with project cost of about \$29 million. This unfortunate event can be explained by the recently challenging market conditions of the industry; and
- (c) in 2013-14, NAMI has also gone through personnel change at senior level. Having served in NAMI on secondment from the Hong Kong University of Science and Technology for 7 years, the previous Chief Executive Officer (CEO) has returned to the university to resume professorship. The new CEO took office on 1 September 2013.

(C) R&D Projects and Expenditure

15. The numbers of R&D projects of the R&D Centres in 2012-13 and 2013-14 are summarised as follows –

¹ If these projects were able to be commenced in 2013-14 as originally planned, NAMI's level of industry contribution would be increased to around 19%.

No. of New Projects ^(Notes 1&2) which Commenced in 2013-14
and No. of On-going Projects as at end-March 2014

	No. of New Projects Commenced			No. of On-going Projects		
	2012-13	2013-14	% change over 2012-13	As at Mar 2013	As at Mar 2014	% change over Mar 2013
APAS	6(1)	14(7)	+133%	13(4)	23(10)	+77%
ASTRI	38(1)	32(3)	-16%	52(4)	44(4)	-15%
HKRITA	19(4)	25(11)	+32%	35(6)	43(15)	+23%
LSCM	13(2)	13(3)	0	20(3)	27(4)	+35%
NAMI	22(7)	16(4)	-27%	38(11)	37(11)	-3%

Note 1: Under the ITF, there are broadly two types of R&D projects:

- (i) *platform projects* which require industry contribution of at least 10% of the project cost. The industry sponsors (minimum of two) will not own the project intellectual property (IP). However, we have announced in February 2014 that the industry contribution requirement for projects initiated by Government bureaux/departments and statutory bodies with clear community benefits can be waived; and
- (ii) *collaborative projects* which require industry contribution of at least 30% (for R&D Centre projects only) or 50% (for non-R&D Centre projects) of the project cost. The industry sponsor(s) will be entitled to utilise the project IP exclusively for a defined period or own the project IP.

The ITF also supports *seed projects* for the R&D Centres which are capped at \$2.8 million per project. These are more forward-looking and exploratory projects and aim to provide foundation work for future platform/collaborative projects. No industry contribution is required.

Note 2: Figures in brackets denote the number of collaborative projects.

16. As regards R&D expenditure, the situation is as follows -

	R&D Expenditure (in \$million)		
	2012-13	2013-14	% change over 2012-13
APAS	16.3	23.9	+47%
ASTRI	267.4	230.5	-14%
HKRITA	28.0	51.4	+84%
LSCM	35.4	45.6	+29%
NAMI	47.8	46.8	-2%

17. In 2013-14, the number of new projects commenced and R&D expenditure of APAS have both increased significantly by 133% and 47% respectively. This is because APAS has proactively reached out to its industry partners and commenced more R&D projects (from only 6 in 2012-13 to 14 in 2013-14), and of the 14 newly commenced projects in 2013-14, half of them are collaborative projects.

18. The performance of HKRITA has also improved with the number of new projects increased from 19 to 25 (increased by 32%) and the R&D expenditure increased from \$28.0 million to \$51.4 million (increased by 84%). This is because HKRITA has broadened its technology focus and proactively collaborated with more local universities as well as other R&D Centres.

19. The number of new projects commenced and amount of R&D expenditure of ASTRI have slightly dropped by 16% and 14% respectively in the year because ASTRI has revamped its R&D strategy after a comprehensive review conducted in 2013 and consolidated resources for launching cross-domain projects and clustered-seed projects targeting at new technology areas in emerging markets (please refer to paragraphs 29 and 30 below).

20. The number of new projects commenced by NAMI has dropped from 22 to 16 for the reasons explained in paragraph 14 above. Its R&D expenditure has slightly reduced from \$47.8 million to \$46.8 million.

REPORT ON INDIVIDUAL CENTRES

21. In the ensuing paragraphs, we will highlight the key activities of each R&D Centre, as well as their progress in realisation and commercialisation of R&D results.

(A) APAS

22. In 2013-14, APAS has conducted 14 new projects comprising 2 platform projects, 7 collaborative projects, 1 seed project and 4 projects under the Public Sector Trial Scheme (PSTS). There is also a significant improvement in terms of the level of industry contribution and commencement of new projects (please refer to paragraphs 12 and 17 above).

23. During this year, APAS has capitalised on the wider network with the industry after its merger with HKPC and adopted a strategy of supporting

the industry through collaborative projects. This, in a way, has demonstrated the confidence of APAS's industry sponsors in its technical competence and the good market potential of its R&D results.

24. In 2013-14, APAS has undertaken 3 new platform or seed projects to build up its capability in electric vehicle technology. Of the 7 new collaborative projects, 4 are related to further development of technologies arising from its previously completed platform/seed projects, covering the areas of driver assistance system, charging stations, electric vehicle technologies and vehicle infotainment system. The other 3 collaborative projects are related to development of new technologies in areas such as electric bus, automotive part die-casting and ignition system for motorcycles.

25. APAS has also conducted more projects under the PSTS to facilitate real world application of its R&D outcomes. APAS has carried out two projects on trial of the 20kW electric vehicle fast charging station in collaboration with the Electrical and Mechanical Services Department, Environment Bureau and Hong Kong Police Force. The trials will capture valuable information of user experience and interface for future commercialisation and development of a faster (50kW) charging system. Another trial project on pedestrian warning & protection system is an innovative solution combining APAS's research results in image processing and wireless back-up system. This project will enhance work site safety by providing a reliable warning alert solution for vehicles in work sites to detect moving objects in close proximity.

26. In future, APAS will further strengthen industry connection through seminars and trade shows. It will review its R&D technology roadmap and increase efforts to explore new project ideas with universities and R&D institutions. APAS will also make better use of the promotional platforms of HKPC to increase commercialisation opportunities with industry partners to turn R&D results into marketable products and applications.

(B) ASTRI

27. In 2013-14, ASTRI has conducted 32 new projects comprising 20 platform projects, 3 collaborative projects and 9 seed projects. The amount of industry income received has increased from \$68 million in 2012-13 to \$87.5 million, demonstrating a continual progress in the commercialisation and licensing of technologies to the industry. Key examples of ASTRI working closely with the industry are –

- (a) Long-term strategic partnership with a listed leading consumer electronics company – the partnership focuses on joint R&D of 4G product applications and 5G wireless technologies. Apart from the assignment of ASTRI's patents to the company related to wireless communications technologies with a payment of over \$13 million, the company has also indicated interest in future collaboration opportunities with ASTRI;
- (b) Big Data Analytics Platform – ASTRI is currently conducting a collaborative project with a leading multinational technology company. The outcome of the project will be software modules which can support enterprise-scale big data analytics platform systems; and
- (c) Smart Consumer Electronics Operating System Framework - Android Plus – ASTRI is currently supporting customers on the mass production of Android based Internet TV box through licensing of technology and contract service which has led to over \$2.5 million of industry contribution. Furthermore, the applications developed for the industry partners have been launched in both Google Play and Apple App Store.

28. ASTRI has worked closely with various Government departments and non-governmental organisations to conduct trials in the public sector. For example, the 'iHome' built by the Hong Kong Housing Society has demonstrated ASTRI's R&D work on the healthcare and home safety technology system to enhance the quality of life of the elderly. In the 'Legends of the Giant Dinosaurs' exhibition organised by the Leisure and Cultural Services Department in early 2014, an interactive and virtual dinosaur show was made possible by utilising the state-of-the-art augmented reality technology developed by ASTRI.

29. In 2013, ITC conducted a comprehensive review on the performance and mode of operation of ASTRI and the recommendations are being implemented in phases. One of the recommendations of the review is to align ASTRI's calculation method of the level of industry contribution with that of other R&D Centres, and ASTRI has started to adopt this calculation method starting from this report (2013-14). While this technical adjustment has led to a drop to ASTRI's level of industry contribution, we noted that it has in fact received more industry sponsorship in 2013-14 (increased from \$46 million to \$55.4 million).

30. To further facilitate ASTRI to build up its research capabilities in new and emerging technologies that meet the demands of the industry, ITC introduced in 2014 a clustered-seed approach for projects conducted by ASTRI on a trial basis for two years. In 2014-15, ASTRI plans to conduct 10 seed projects in four clusters, namely Wireless Technologies, Internet of Things Endpoints, Security, and Image and Data Processing.

(C) HKRITA

31. In 2013-14, HKRITA has conducted 25 new projects comprising 10 platform projects, 11 collaborative projects and 4 projects under the PSTS. The level of industry contribution has reached a record high of 35%, involving \$28.3 million of industry sponsorship. This reflects not only the industry's support towards HKRITA's efforts to promote advance technology development, but also the industry's eagerness to improve its competitiveness via innovation and cutting-edge technologies.

32. For platform projects, HKRITA has pooled its R&D efforts to design and develop projects which would foster the sustainability of the industry, facilitate value-added production, reduce production cost and increase productivity. Highlights include projects on 'Fast Fabric Hand Measurement Technology', 'Development of a Smart Process Flow Management Expert System for Agile Manufacturing of Apparel Supply Chain', 'Development of Industry-scale Plasma Treatment System for Wool/Cashmere Knitwear to Minimize Pilling' and 'Artificial Muscle and Skin for Rehabilitation'

33. There are also projects developed for the good of the community. The project 'Development of Intelligent Impact Protectors Based on 3D Auxetic Fabrics' evaluates the effectiveness of the special protective pants for the elderly compared to the performance of commercially available products. Furthermore, the 'Development of Smart Interactive Functional Clothing' project aimed at designing functional rowing suits for the Hong Kong Rowing Team participating in the 2014 Asian Games.

34. At the 42nd International Exhibition of Inventions of Geneva, one of the world-acclaimed innovation events held in April 2014, HKRITA won three gold medals and one silver medal. The gold medals went to the projects on 'Development of Intelligent Impact Protectors Based on 3D Auxetic Fabrics', 'Artificial Muscle and Skin for Rehabilitation' and 'Intelligent Footwear System Embedded with Fabric Pressure Sensor', while the project on 'A Novel Approach in Thermal Functional Textile with Conductive Materials' won a silver award.

35. In terms of commercialisation, HKRITA has set up a dedicated business development team to promote its R&D deliverables through seminars, workshops and liaison with individual companies. Up to 2013-14, HKRITA has granted 25 non-exclusive licences. To foster technology advancement, HKRITA has built up and maintained strong connection with the academia, industry and research institutes. A successful example is the Innovation and Technology Symposium 2013 organised by HKRITA on 26 September 2013. The theme of the Symposium was 'The Future of Innovation' and it has received overwhelming responses with more than 300 participants from different industry sectors, including buying offices, garment and textiles manufacturers, trading companies, academia and non-government organisations.

36. To enhance international R&D collaboration, HKRITA has signed memoranda of understanding (MOUs) with various overseas research institutes such as the Fiber Innovation Incubator of Shinshu University of Japan, a well-known research institute in textiles and clothing in the world, to further enhance the cooperation between the academia and industry professionals.

(D) LSCM

37. In 2013-14, LSCM has conducted 13 new projects comprising 2 platform projects, 3 collaborative projects, 1 seed project and 7 projects under the PSTS. LSCM has performed satisfactorily in obtaining industry sponsorship, with the level of industry contribution increased from 18.7% in 2012-13 to 28.2% in 2013-14. The three-year average from 2011-12 to 2013-14 is 21.1%, surpassing the 20% target for the second five-year period.

38. LSCM has reduced its operating expenditures to \$20.4 million (a year-on-year reduction of 2%) while at the same time conducting more R&D and commercialisation activities. For instance, the actual R&D expenditure has increased from \$35.4 million in 2012-13 to \$45.6 million in 2013-14 and the number of registered IP including patents, designs, and trademarks, generated by LSCM has increased from 3 to 12.

39. LSCM initiates strategic commercialisation planning to facilitate effective transfer of LSCM's technologies to partners in both the private and public sectors. Having identified focused technologies which have potentials for commercialisation, LSCM 'pushes' them to potential adopters such as manufacturers, system integrators, etc. In parallel, LSCM exerts its greatest efforts to identify and develop the industrial potential and business opportunities by creating market awareness or 'market pull' for these focused technologies.

40. One notable example of this strategy is the development of a radio-frequency identification (RFID) Reader IC Chip design. In 2013-14, LSCM has developed this design by partnering with a local RFID company through a collaborative project to productise and commercialise the R&D outcome. In parallel, LSCM creates industry-driven applications for the RFID reader utilising LSCM chip as backbone, for instance, through two projects under PSTS: (i) an RFID reader capable of identifying and tagging trees by the Hong Kong Housing Authority; and (ii) an integrated RFID walking cane aiming to improve navigation assistance support for the visually impaired people.

41. LSCM also endeavors to promote its core research competencies by spearheading innovation and technology initiatives in collaboration with the public sector. LSCM has collaborated with various Government departments, public bodies and trade associations, including Hong Kong International Airport Carrier Liaison Group, Hong Kong Association of Freight Forwarding and Logistics, Hong Kong Construction Association, Hong Kong Institute of Construction Managers and the Hong Kong Society for the Blind. A local private hospital is also piloting LSCM's technology on baby monitoring.

42. In 2013-14, LSCM has continued to reach out to promote itself to various sectors and industries in Hong Kong. An increasing awareness of LSCM is demonstrated by feedbacks from a series of LSCM's events including the IoT Symposium (April 2013), LSCM Logistics Summit (September 2013) and the LSCM Logistics Roadshow (February 2014). As a result, LSCM was able to forge partnerships with many new industry partners. During the year, LSCM has also been appointed as an institutional member of the Hong Kong Logistics Development Council in recognition of LSCM's knowledge and expertise in the logistics industry.

43. In consultation with its Board of Directors, LSCM has drawn up a technology roadmap that is demand-driven, with an emphasis on providing innovative solutions to enable its clients, in particular small and medium sized enterprises (SMEs), to move up the value chain. LSCM will build upon its network of SMEs and strengthen its commercialisation programme to identify technology solutions to supply chain of various sectors and expand its potential clientele to the Mainland.

(E) NAMI

44. In 2013-14, NAMI has conducted 16 new projects comprising 2

platform projects, 4 collaborative projects, 8 seed projects and 2 projects under the PSTS. Overall, it has achieved a lower level of industry contribution in 2013-14 compared to last year due to a number of factors as explained in paragraph 14 above, but its overall average level of industry contribution in the second five-year operating period so far (from 2011 to 2014) is 34.7%, significantly exceeding the 20% target.

45. NAMI will continue to adopt industry engagement and business development strategies, with a view to proactively soliciting industry support for more market-driven collaborative research projects, and bringing about commercialisation of more R&D results. In 2013-14, NAMI has deployed its background IP in 5 collaborative projects and 1 platform projects. It has also received a total \$300,000 licensing fee from three projects, namely 'Development of a Light Weight Hydrophobic Cementitious Acoustic Board'; 'Development of Wearable Temperature Sensor for Tracking and Monitoring Body Temperature'; and 'Thermal, Optical, and Electrical Solutions for High Power Plasma Lighting'.

46. During the year, NAMI has worked actively in conducting trials to realise its R&D results in the public sector. NAMI has secured approval of 3 new PSTS projects, namely 'Development of Functional Mirror-like Nano-coating on Target Metals and the Technology Transfer Study from Laboratory to Production'; 'High Performance Cementitious Materials for the Construction of External Wall with Enhanced Thermal Insulation' and 'Advanced Thermal Insulation Coating Material'. (Note: Furthermore, another 2 PSTS projects have been approved in the first two months of 2014-15 and will soon commence in July 2014. They are 'Doped Nano-Lithium Titanate (LTO) for High Performance Lithium Ion Batteries' and 'Development of Advanced Composite Pellets and a Novel Supercritical Fluid Extraction Process for Micro-powder Injection Moulding Technology to Industries'.)

47. In the past, quite a number of NAMI's projects were related to PV technology. However, due to improvements in technology and drop in material cost of traditional PV technology, the PV market conditions have lately become rather unfavourable.

48. Looking ahead, NAMI will attach greater emphasis to other technology areas such as display and solid state lighting, environmental technologies, biotechnology and healthcare as well as construction and building materials, so as to develop a more diversified portfolio. Diversification would be conducive to a healthier development of NAMI. Besides, NAMI will utilise its core technologies to fit into different companies' product roadmaps in order

to establish long term technology partnership. Potential partners have been identified in different market sectors. For instance, it is co-operating with a Hong Kong based company on plasma lighting technologies, which are emerging technologies for high illumination applications offering potentially the most energy-efficient light source for outdoor, commercial and industrial lighting. It is expected that with these new strategies, the performance of NAMI will be able to catch up next year.

OVERALL AND WAY FORWARD

49. The R&D Centres have continued to progress and consolidate their position as the focal point to drive and co-ordinate applied R&D in selected focus areas and promote commercialisation of R&D results. We have set an average industry contribution target of 20% for their second five-year period from 2011-2016. We are glad to report that all R&D Centres have achieved this target in the first three years of this period (from 2011 to 2014).

50. As reported to this Panel in November 2013 when consulting Members on the proposal to extend the operation period of HKRITA and LSCM, we will critically evaluate the operation of the R&D Centres in around 2015 – by that time they have operated for nearly 10 years - and put forward our recommendations with regard to their future operation having regard to the outcome of the review.

ADVICE SOUGHT

51. Members are invited to note the latest progress of the R&D Centres as set out above.

Innovation and Technology Commission
June 2014

**Automotive Parts and Accessory Systems R&D Centre (APAS)
Highlight of Operation in 2013-14**

I. New R&D Projects and Industry Contribution (in \$million)

	<u>2012-13</u>			<u>2013-14</u>		
	No. of New Projects	Project Cost	Industry Contribution	No. of New Projects	Project Cost	Industry Contribution
Platform	2	7.3	1.4 (19.5%)	2	10.8	2.0 (18.5%)
Collaborative	1	5.5	3.1 (55.3%)	7	70.2	33.0 (47.0%)
Seed	1	1.9	n/a	1	2.7	n/a
Total:	4	14.7	4.5 (30.5%)	10	83.7	35.0 (41.8%)
Public Sector Trial Scheme Projects	2	1.6	n/a	4	3.3	n/a

Note: Figures in brackets denote the level of industry contribution.

II. Operating Expenditure (in \$million)



	2012-13	2013-14
Staffing	9.9	8.2
Accommodation	1.5	1.4
Equipment	0.3	0.1
Others	4.1	1.7
Total:	15.8	11.4

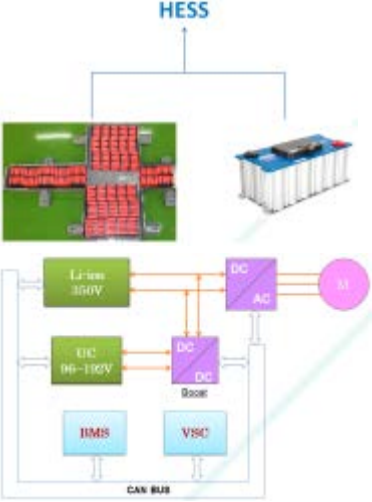

III. Industry Income Received (in \$million)

	2012-13	2013-14
Sponsorship for projects	1.42	8.24
Licensing/Royalty	0.01	0.01
Contract Services	0.03	0.16
Others	0.15	0.05
Total:	1.61	8.46

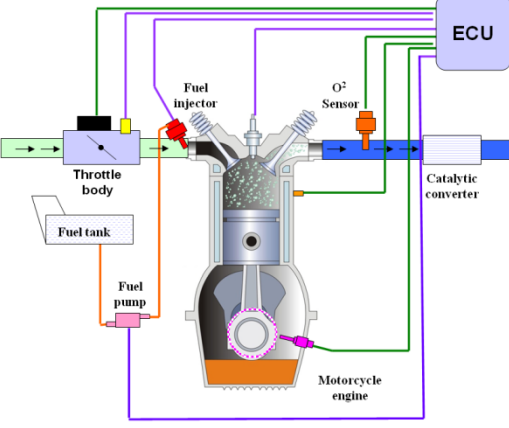

IV. Progress of R&D, Commercialisation and Use of R&D Deliverables in the Public Sector

A video featuring selected projects of APAS is available at the following link – <http://youtu.be/5wjW1cV-aWE>

Project / Technology	Status / Progress
<p>Development of Intelligent eBus with Light Body Structure and High Efficient Traction Motor System</p>  	<p>APAS kicked-off a pure electric bus (e-bus) project in August 2013. The bus carries four major characteristics: utilisation of light weight body structure, longer electric vehicle (EV) range, smart control and design with Hong Kong element. The e-bus also utilises high strength aluminium and direct motor system to increase vehicle efficiency, hence improving vehicle performance and extend travel range.</p> <p>APAS will conduct the first road test on the e-bus in early 2015 and the e-bus shall be available for commercial application by the end of 2015. The project also aligns with government green initiatives and helps reduce roadside emission.</p>

Project / Technology	Status / Progress
<p data-bbox="204 286 694 360">Efficient Hybrid Energy Storage System for Electric Vehicles</p> 	<p data-bbox="831 286 1398 797">Hybrid Energy Storage System (HESS) is an enhancement of EV powertrain. Compared with Li-ion pack alone, it boosts maximum output power for short bursts to enhance vehicle acceleration. It also extends the battery life by sharing repetitive high current loads. HESS combines the merits of Li-ion battery and ultra capacitor. APAS has set out to develop an intelligent control algorithm to maximize the system performance in all traffic conditions under a seed project.</p> <p data-bbox="831 857 1398 972">APAS has gained interest from the industry to further develop the technology under a platform project.</p>
<p data-bbox="204 1041 778 1077">Electric Vehicle Fast Charging Station</p> 	<p data-bbox="831 1041 1398 1429">APAS has carried out two projects on trial of the 20kW electric vehicle fast charging station in collaboration with the Electrical and Mechanical Services Department, Environment Bureau and Hong Kong Police Force. One of the stations will be installed at the New Territories North Regional Police Headquarters and another one at the Central Government Offices in Tamar.</p> <p data-bbox="831 1489 1398 1928">APAS is further strengthening its EV charging technology and developing a 50kW charger which can reduce the charging time from 45 minutes to 20 minutes. APAS has kicked off a new combo standard charger to support a wider range of EVs. APAS has also developed a mobile charger that is able to provide mobile charging capability to aid the proliferation of EVs in Hong Kong.</p>

Project / Technology	Status / Progress
<p data-bbox="204 286 805 443">Develop an Individual Tie-bar Control and Multi-stage Injection Two-platen Die Casting Machine for the Production of High Strength Auto Parts</p> 	<p data-bbox="831 286 1398 443">The project aims to develop an innovative metal die casting machine comprises of an individual tie-bar adjustment clamping mechanism.</p> <p data-bbox="831 501 1398 779">The project results can benefit the auto metal die casting industry by improving product quality at a higher yield rate, reducing production cost by reducing air entrapment defects and removing flashes, and saving energy by on-demand servomotor speed.</p>
<p data-bbox="204 846 805 1003">Worksite Safety Warning System based on Advanced Driver Assistant Systems (ADAS and consisting of pedestrian warning systems)</p> 	<p data-bbox="831 846 1398 1205">This is a project under the Public Sector Trial Scheme in which APAS cooperates with four Government departments (i.e. Architectural Services Department, Civil Engineering and Development Department, Drainage Services Department and Highways Department) to increase worksite safety by monitoring moving objects.</p> <p data-bbox="831 1256 1398 1451">ADAS-based prototypes, which can alert drivers when workers approach the blind spots of the vehicles in operation, will be installed on the vehicles of these departments.</p>

Project / Technology	Status / Progress
<p data-bbox="204 286 778 398">Development of Advanced and Integrated Motorcycle Electronic Fuel Injection System</p> 	<p data-bbox="831 286 1401 560">The project aims to develop an advanced and integrated motorcycle electronic fuel injection (EFI) system. The EFI system can provide accurate fuel injection and thus fuel consumption and emission that are much lower than conventional carburettor systems.</p> <p data-bbox="831 616 1401 817">Considering that the Euro IV emission standards for motorcycle will become effective from 1 January 2016, the market potential for EFI system is quite substantial.</p>
<p data-bbox="204 862 805 974">A Prototype of Vehicle Safety and Passenger Information Services: a Road Trial Run Programme</p> 	<p data-bbox="831 862 1401 1288">This system provides passenger with useful information, like points of interest, news, stops and distances. The trial of the system has generated a lot of media publicity and industry recognition, leading to a consultancy project namely 'Intelligent Transportation System Application' with Sun Yat Sen University and generated a service contract of \$126,000 for APAS.</p>

Hong Kong Applied Science and Technology Research Institute (ASTRI)
Highlight of Operation in 2013-14

I. R&D Projects and Industry Contribution (in \$million)^{Note 1}

	<u>2012-13</u>			<u>2013-14</u>		
	No. of Project	Project Cost	Industry Contribution ^{Note 2}	No. of Project	Project Cost	Industry Contribution
Platform	52	226.6	43.2 (18.8%)	20	226.9	37.5 (16.6%)
Collaborative	7	11.6	2.9 (29.9%)	3	35.3	16.4 (46.4%)
Seed	28	27.9	n/a	9	17.6	n/a
Contract Service/ Licensing, Royalty and Others	-	-	21.9	-	-	n/a
Total:	87	266.1	68.0 (25.3%)	32	279.8	53.9 (19.3%)
Public Sector Trial Scheme Projects	2	1.3	n/a	-	-	n/a

Note 1: Figures in brackets denote the level of industry contribution.

Note 2: Due to historical reason, ASTRI has adopted a different method of calculating industry contribution up to 2012-13. Starting from 2013-14, ASTRI has aligned its industry contribution calculation method with that of other R&D Centres. Therefore, figures in 2012-13 and earlier are not directly comparable with the figures in 2013-14.

II. Operating Expenditure (in \$million)


	<u>2012-13</u>	<u>2013-14</u>
Staffing	76.7	75.4
Accommodation	23.6	25.0
Equipment	2.9	3.6
Others	27.0	25.5
Total:	130.2	129.5


III. Industry Income Received (in \$million)

	2012-13	2013-14
Sponsorship for projects	46.07	55.38
Licensing/Royalty	9.12	8.21
Contract Services	12.22	9.42
Others	0.62	14.50
Total:	68.03	87.51




IV. Progress of R&D, Commercialisation and Use of R&D Deliverables in the Public Sector


A video featuring selected projects of ASTRI is available at the following link – <http://youtu.be/qgskgc8MW0U>

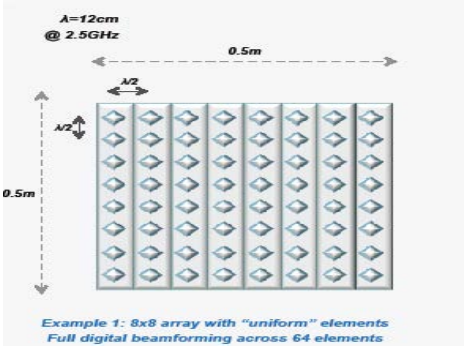
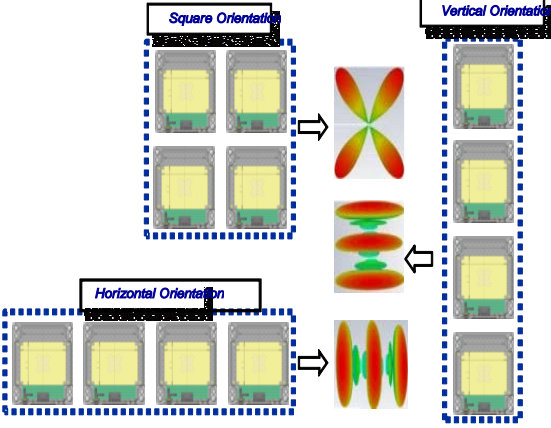
Project / Technology	Status / Progress
<p>Establishing the ASTRI-HP Information Research Centre with HP Hong Kong</p>  <p><i>ASTRI and HP jointly inaugurated the “ASTRI-HP Information Technology Research Centre” (December 2013)</i></p>	<p>ASTRI has commenced a collaborative project ‘Bamboo: A Big Data Analytics Platform’ with HP Hong Kong in November 2013.</p> <p>The project will develop software modules which can support enterprise-scale Big Data Analytics Platform Systems. Individual software modules in the platform include multi-tenant and dynamic job management component, advanced query engine, and interactive and rich content interface.</p> <p>This is the first collaboration project undertaken by the ‘ASTRI-HP Information Technology Research Centre’. The inauguration ceremony of the Centre was held in December 2013.</p>

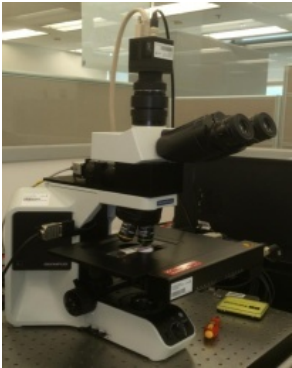



Project / Technology	Status / Progress
<p data-bbox="204 264 767 376">Long-term strategic partnership with TCL Communication on 4G and 5G wireless technology</p>  <p data-bbox="236 815 778 967"><i>Signing Ceremony of Strategic Partnership for Sustainable Wireless Technology and Product Development (October 2013)</i></p>	<p data-bbox="831 264 1401 416">ASTRI has established a long-term strategic partnership with TCL Communication Technology Holdings Limited.</p> <p data-bbox="831 479 1401 631">The partnership focuses on joint R&D of 4G product applications and next generation 5G wireless technologies to enhance Hong Kong's competitiveness.</p> <p data-bbox="831 694 1401 967">TCL has acquired 9 U.S. patents and 5 China patents from ASTRI related to wireless communications technologies, and has committed further contributions for mid-term (targeted research) and long-term (basic research) collaborations with ASTRI.</p> <p data-bbox="831 1025 1401 1137">Specifics of the collaboration projects are being finalised. Topics under consideration include but not limited to:</p> <ul data-bbox="831 1155 1401 1438" style="list-style-type: none">• Targeted Research: Internet of Things, Green RF, Broadband Wireless Innovation Platform, LTE/WiFi internetworking; and• Basic Research: 4G+/5G, Machine type communications and ad-hoc networks.

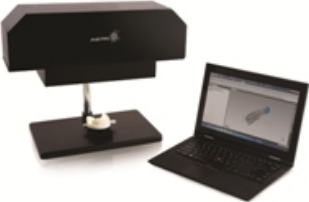

Project / Technology	Status / Progress
<p data-bbox="204 264 751 376">‘iHome’ in Collaboration with Hong Kong Housing Society and the Hong Kong Polytechnic University</p>  <p data-bbox="240 770 571 792">Single switch input for environmental control</p>	<p data-bbox="831 264 1398 577">ASTRI has collaborated with the Hong Kong Polytechnic University and Hong Kong Housing Society to implement this project which aims to promote the concept of safe, healthy and comfortable living for the elderly by making use of innovative and user-friendly technologies.</p> <p data-bbox="831 636 1398 792">A model ‘iHome’ flat, fully furnished with advanced healthcare and home automatic devices, was established in Prosperous Garden in Yau Ma Tei.</p> <p data-bbox="831 851 1398 1084">Technologies integrated into the model flat include (1) Telecare system, (2) Wireless reflective pulse oximeter, (3) Telehealth hub, (4) Environmental control system, and (5) Mobile and wearable sensors for healthcare.</p> <p data-bbox="831 1142 1398 1375">‘iHome’ also provides a technology demonstration platform for potential commercialisation partners to visualise upcoming technology advancement to enhance the quality of life of the elderly.</p>
<p data-bbox="204 1451 740 1525">Advanced Liquid Crystal on Silicon (LCoS) Display</p> 	<p data-bbox="831 1451 1398 1608">This is a collaborative project of ASTRI with its industry partner being a leading component supplier for advanced LCoS Display.</p> <p data-bbox="831 1666 1398 1899">This project is to address the technical challenges of the emerging head-mounted-display market. An LCoS panel with integrated video memory suitable for the wearable smart glass will be developed.</p>



Project / Technology	Status / Progress
<p data-bbox="204 264 740 376">Long Term Evolution (LTE) Access Network Management and Legacy 3GPP Interworking</p> <div data-bbox="240 481 767 952"><p data-bbox="352 667 400 701">3U</p><p data-bbox="647 667 695 701">5U</p><p data-bbox="475 920 539 954">12U</p></div> <p data-bbox="209 969 799 1043"><i>Advanced Telecom Computing Architecture (ATCA) Hardware Platforms</i></p>	<p data-bbox="831 264 1398 376">This project focuses on LTE network management software and LTE access network gateway software.</p> <p data-bbox="831 439 1398 790">Four companies in Hong Kong and Taiwan have already signed sponsorship or technology transfer agreements with ASTRI at a total income from industry of over \$2.5 million for this project. Their major businesses cover wireless equipment manufacturing/sales and system integration.</p>
<p data-bbox="204 1070 740 1104">Interactive Displays for E-classroom</p> <div data-bbox="331 1160 679 1413"></div>	<p data-bbox="831 1070 1398 1223">This project focuses on the core technologies of optical multi-touch sensing technology for pointing and gesture recognition.</p> <p data-bbox="831 1285 1398 1480">Large optical touch sensing technology, near distance 3D non-touch gesture recognition and object recognition methods will also be developed in this project.</p> <p data-bbox="831 1543 1398 1655">ASTRI has received a total of over \$2 million licensing income from the industry on this project.</p>

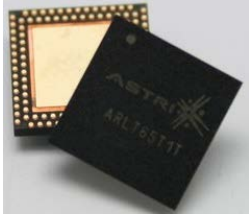


Project / Technology	Status / Progress
<p data-bbox="204 264 678 376">Cloud Facilitated Learning and Collaborative E-Learning for E-Schoolbag Pilot</p> 	<p data-bbox="831 264 1398 416">ASTRI has developed a Cloud-based learning management system (LMS) which involves cloud based resources such as bandwidth and storage.</p> <p data-bbox="831 477 1398 748">This Cloud-LMS has been deployed by a major service provider to a number of schools in Hong Kong as part of their E-Learning solution since August 2013. It is also being deployed in 14 primary schools in the ‘WaaSchool Partnership Project’.</p> <p data-bbox="831 808 1398 1240">ASTRI has also co-developed a classroom management system with a provider of in-class intelligent system, which has become an integral part of an E-Learning solution offered by a major service provider in Hong Kong. The classroom management solution consists of a rich set of learning activity applications and electronic contents as a means to enable in-class interactive and collaborative learning.</p> <p data-bbox="831 1301 1398 1496">Furthermore, an industry partner of ASTRI is actively promoting the classroom management system in the Mainland, including Shanghai and Guangzhou.</p>

Project / Technology	Status / Progress
<p data-bbox="204 264 759 338">Active Antenna System Development Platform</p>  <p data-bbox="312 707 663 741">Example 1: 8x8 array with "uniform" elements Full digital beamforming across 64 elements</p>  <p data-bbox="229 1279 783 1395"><i>Example Active Antenna System Configuration (top) and Example Beam Forming (bottom)</i></p>	<p data-bbox="831 264 1398 416">An Active Antenna System (AAS) is developed in this project to address the global demands in green communications.</p> <p data-bbox="831 477 1398 712">The AAS aims at providing high energy efficiency, low-cost and compact antenna system solution for 3G and 4G mobile networks, using high isolation antenna design and advanced control algorithms.</p> <p data-bbox="831 772 1398 1008">Sponsors of this project include four companies in Hong Kong and the Mainland, which include wireless network equipment vendors, component and reference design provider and development tool provider.</p> <p data-bbox="831 1068 1398 1462">A joint R&D initiative has been established among a China-based wireless network equipment provider, China Mobile Research Institute and ASTRI, leveraging the technologies developed from this project to develop a large scale active antenna system targeting at China Mobile's C-RAN applications, which serves a huge potential market.</p>

Project / Technology	Status / Progress
<p data-bbox="204 264 762 300">High Speed Digital Pathology System</p> 	<p data-bbox="831 264 1401 495">A contract was signed with a leading Hong Kong microscope manufacturer with manufacturing base in the Mainland. Two patents were filed in U.S. and the corresponding patents were filed in the Mainland.</p> <p data-bbox="831 555 1401 909">The outcome of the project is a slide digitisation platform with scan throughput higher than current mainstream systems. Individual functionality modules in the platform including imaging, focusing, and stitching have been developed. They can be licensed out separately to interested parties.</p>
<p data-bbox="204 981 762 1093">Development of Anti-counterfeit Identification Microsystem (AIM) by SiP technology)</p>   	<p data-bbox="831 981 1401 1133">ASTRI's RFID Dual Reader developed from this project won the 'Most Innovative Product Award' from the RFID Standards Alliance of Shenzhen.</p> <p data-bbox="831 1193 1401 1507">Requiring only a power supply and an external antenna for operation, this RFID dual reader comes in with a small and slim design for integration into mobile applications, including anti-counterfeit, membership card and other Near Field Communication applications.</p> <p data-bbox="831 1568 1401 1843">ASTRI has received a total income of over \$2 million from three companies for the licensing of UHF based RF-SiP design for AIM E-card and contract service related to the design and modelling/simulation of anti-counterfeit identification modules.</p>

Project / Technology	Status / Progress
<p data-bbox="204 264 738 338">Smart Compact 3D Machine Vision System</p> 	<p data-bbox="831 264 1396 421">A fast and highly accurate 3D machine vision system suitable for measuring small objects and re-constructing 3D surfaces was developed in this project.</p> <p data-bbox="831 477 1396 745">ASTRI has signed two agreements on this technology with two companies which have committed to sponsor the development of this project through technology licensing, contract service and in-kind sponsorship at a total amount of \$2 million.</p>
<p data-bbox="204 824 699 860">Secure Mobile Storage Processor</p> 	<p data-bbox="831 824 1396 981">This is a collaborative project with a company on making a processor System-on-chip (SoC) for security applications.</p> <p data-bbox="831 1037 1396 1507">With the rapid growth of internet applications and cloud computing business, information security has become one of the most important research topics in the industry. The secure mobile storage processor developed in this project utilises user authentication to conduct randomisation, split, and fast encryption and decryption operations to effectively protect user data files against security breach of cloud information.</p> <p data-bbox="831 1574 1396 1798">The results of this project can be applied to enterprises, government and consumer applications to provide data confidentiality, and a safer environment of the cloud computing and cloud storage industry.</p>

Project / Technology	Status / Progress
<p data-bbox="204 264 805 338">Smart Consumer Electronics Operating System Framework - Android Plus</p>  <p data-bbox="453 645 560 678"><i>TV Box</i></p>  <p data-bbox="368 1115 644 1149"><i>Android Game Box</i></p>	<p data-bbox="831 264 1398 853">In this project, ASTRI has developed an enhanced operating system framework to capture the fast-growing smart consumer electronics market. This framework is built on the open source Android platform with performance optimisation/tuning. It can run on platforms with less memory and lower end CPU than standard Google Android so as to provide a low cost solution to customers. The project also focuses on improving user experience for Smart TV and provides a reference design (both software and hardware) for customers.</p> <p data-bbox="831 913 1398 1227">ASTRI is also supporting customers on the mass production of Android-based Internet TV box based on the reference design (both software and hardware) of this project. The applications developed for industry partners have been launched in both Google Play and Apple's App Store.</p>

Project / Technology	Status / Progress
<p data-bbox="204 264 707 338">Cost-effective TDD/FDD LTE RF Transceiver</p> <div data-bbox="204 443 453 658"></div> <p data-bbox="220 667 435 703"><i>Transceiver IC</i></p> <div data-bbox="512 477 692 658"></div> <p data-bbox="491 667 767 703"><i>Transceiver Layout</i></p> <div data-bbox="204 757 544 1010"></div> <p data-bbox="204 1019 488 1055"><i>Development Board</i></p>	<p data-bbox="831 264 1401 456">A cost-effective dual-mode multi-band RF transceiver supporting global LTE (3GPP Release 9) and China 3G (TD-SCDMA) standards was developed in this project.</p> <p data-bbox="831 517 1401 987">SAW (Surface Acoustic Wave)-less architecture is adopted to reduce the cost and size of RF transceiver boards. To provide high flexibility for our customers, the transceiver was designed to support all the Frequency-division Duplex (FDD) bands and Time-division Duplex (TDD) bands used by major countries or regions, including Hong Kong, the Mainland, the U.S, Japan, Australia, the United Kingdom and Europe.</p> <p data-bbox="831 1048 1401 1361">ASTRI has signed technology licensing agreements or contract service agreements with two solution companies for transferring or leveraging the technologies developed from this project. A total amount of over \$4 million income from industry has been received.</p>

Hong Kong Research Institute of Textiles and Apparel (HKRITA)
Highlight of Operation in 2013-14

I. New R&D Projects and Industry Contribution (in \$million)

	<u>2012-13</u>			<u>2013-14</u>		
	No. of New Projects	Project Cost	Industry Contribution	No. of New Projects	Project Cost	Industry Contribution
Platform	9	33.9	5.6 (16.5%)	10	39.0	6.8 (17.6%)
Collaborative	4	14.0	7.2 (51.7%)	11	41.9	21.5 (51.3%)
Seed	-	-	n/a	-	-	n/a
Total:	13	47.9	12.8 (26.8%)	21	80.9	28.3 (35.0%)
Public Sector Trial Scheme Projects	6	4.8	n/a	4	3.3	n/a

Note: Figures in brackets denote the level of industry contribution.

II. Operating Expenditure (in \$million)

	2012-13	2013-14
Staffing	12.9	13.5
Accommodation	1.9	1.9
Equipment	1.2	0.2
Others	3.1	5.5
Total:	19.1	21.1



III. Industry Income Received (in \$million)


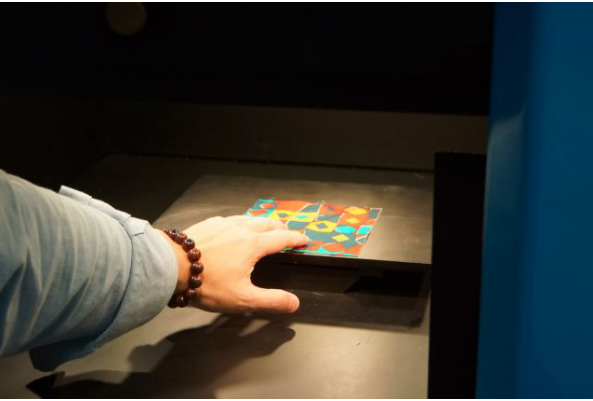
	2012-13	2013-14
Sponsorship for projects	7.52	18.23
Licensing/Royalty	1.02	0.51
Contract Services	-	-
Others	-	1.01*
Total:	8.54	19.75

*Income from sales of equipment and sponsorship for conference/seminar.



IV. Progress of R&D, Commercialisation and Use of R&D Deliverables in the Public Sector

A video featuring selected projects of HKRITA is available at the following link – <http://youtu.be/Iap4Jrv0rOk>

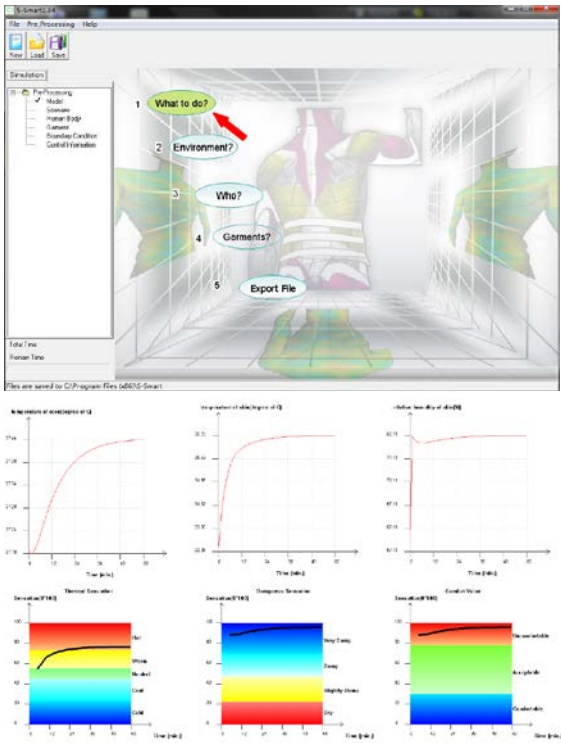

Project / Technology	Status / Progress
<p>Development of Smart Interactive Functional Clothing</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>T-shirt</p>  </div> <div style="text-align: center;"> <p>Unisuit</p>  </div> </div> <p><i>Preliminary concept of rowing suit</i></p>	<p>HKRITA is developing a new rowing suit which involves new design, production and evaluation systems for the Hong Kong Sport Institute rowing team.</p> <p>This project is aimed at designing functional high performance rowing suits for the Hong Kong Rowing Team to participate in the upcoming Asian Games held in Incheon, South Korea in September 2014.</p> <p>The rowing suits will include a set of unisuit and a t-shirt. The unisuits are designed for training enhancement and competition performance improvement.</p> <p>Tests on elasticity, friction and UV resistance are carried out on selected fabrics to ensure their functional performances. Then, 3D body scanning is conducted on athletes to collect their body measurements. Finally, the developed sportswear is put on Walter sweating manikin to evaluate its functions on thermal dissemination, moisture absorption and fluid transfer.</p>


Project / Technology	Status / Progress
<p data-bbox="215 275 743 311">Image Colour Measurement (ICM)</p>  	<p data-bbox="842 275 1414 472">The ICM system, developed by HKRITA, provides a solution for the textile and apparel industry for meeting rigorous standards of colour management.</p> <p data-bbox="842 533 1414 730">The system can quantify different colours found on the fabric, measure the fabric samples with different sizes and textures, providing colour information in an accurate and objective manner.</p>

Project / Technology	Status / Progress
<p data-bbox="215 275 699 349">Fast Fabric Hand Measurement Technology</p>  <p data-bbox="309 580 379 591">Fabric Touch Tester</p>   <p data-bbox="564 405 708 472">41st International Exhibition of Inventions of Geneva</p> <p data-bbox="564 479 687 517">The world's most important 10 > 14 April 2013 Geneva Palexpo Hall 7</p> <p data-bbox="533 651 719 734">inventions Geneva www.inventions-geneva.ch</p>	<p data-bbox="842 275 1410 904">The Fabric Touch Tester is a breakthrough in the area of fabric hand feel evaluation. While fabric hand-feel evaluation systems exist in the market today, they are not widely adopted by the industry due to their complexity in measurement and the lack of recognised testing standards. The Fabric Touch Tester provides an objective evaluation system with a user-friendly interface to measure fabric hand feel. HKRITA is drafting standardised testing protocols and will work to establish an international industry standard in the area of fabric hand feel evaluation.</p> <p data-bbox="842 965 1410 1397">Since project commencement, HKRITA has been working closely with one of the leading global testing equipment manufacturers from the US. A non-exclusive licence agreement has been signed in 2013. The licensee has since launched a working model. HKRITA will continue its effort in commercialising the technology with the support from the licensee and will receive royalty from machines sold.</p> <p data-bbox="842 1458 1410 1615">The innovation won a gold medal with the congratulations of jury at the 41st International Exhibition of Inventions of Geneva in April 2013.</p>

Project / Technology	Status / Progress
<p>Finer Nu-Torque Cotton Yarn Production</p> 	<p>Globally, Nu-torque has been one of the most significant advancements in spinning of singles ring yarns in the last decade. To date, this technology, which has received wide industry acceptance, has resulted in close to \$9 million licensing income. There are several more licensing discussions ongoing.</p> <p>The current licensees could produce Nu-Torque yarns at a total capacity up to 700,000 spindles and they are actively using this technology in their production lines in the Mainland, Thailand, Malaysia and India.</p> <p>Nu-torque has gone through five generations of development. More refinement and research are in progress. Nu-torque is now protected by a family of patents including 5 US, 4 PRC, and 3 PCT, in which 3 US and 1 PRC patents have been granted. The technologies have also won innovation awards from various associations/authorities from Hong Kong and the Mainland.</p>
<p>Innovative Energy and Utility Management System in Textile Processing</p> 	<p>Carbon footprint, including energy usage in production, is an important discussion topic in many industry sectors, especially those involving high energy consumption such as textile dyeing and finishing.</p> <p>HKRITA has worked with a Hong Kong-based supply chain solution provider to promote this system and provide one-stop service for the industry. The system has been successfully commercialised and royalty fee was received in February 2014.</p>

Project / Technology	Status / Progress
<p data-bbox="215 275 663 349">Artificial Muscle and Skin for Rehabilitation</p> 	<p data-bbox="842 275 1410 703">This project solves the technical problem of adhesive tapes currently in the market. HKRITA has developed a re-peelable elastic tape containing an elastic polymer micro-fabricated with the biomimetic nano- or micro- surface pattern. The pattern is inspired by climbing insects' attachment mechanism. The tape has achieved good adhesion and removal from the skin.</p> <p data-bbox="842 768 1410 958">One non-exclusive licence has been issued in October 2013 to transfer the knowhow to a local company to develop functional elastic tapes for rehabilitation.</p>
<p data-bbox="215 1030 815 1104">Development of Intelligent Impact Protectors Based on 3D Auxetic Fabrics</p>  <p data-bbox="328 1525 371 1543">Front</p> <p data-bbox="523 1525 563 1543">Back</p> <p data-bbox="691 1525 722 1543">Side</p>	<p data-bbox="842 1030 1410 1384">This is a new project of HKRITA in collaboration with the Tung Wah Group of Hospitals and Jockey Club Centre for Positive Ageing. The purpose of the project is to evaluate the effectiveness of the special protective pants in reducing the potential risk of injury to joints and bones from falling accidents of the elderly.</p> <p data-bbox="842 1444 1410 1637">The protective pants for elderly will be integrated with intelligent impact protectors. Each pant is consisted of two hip protectors and two knee protectors.</p>

Project / Technology	Status / Progress
<p data-bbox="215 275 753 349">Functional Design Optimization for Uniforms of Fireman in Hong Kong</p>  	<p data-bbox="842 275 1410 786">Most computer-aided design (CAD) systems in the textiles and apparel market are focused on the design and aesthetic simulation of garment in virtual environment. This CAD system provides cutting-edge technology which helps the designer evaluate the apparel's functional performance, in terms of moisture management, thermal management and comfort. It also helps the designer understand different properties of textiles materials through simulations.</p> <p data-bbox="842 846 1410 1357">The project was successfully completed in October 2013. 190 sets of fire services Uniform No.3 were developed of which, 40 sets were for field wear trial tests and 150 sets were for comfort evaluation in firemen's daily routine activities. These newly-developed uniforms has applied a systematical scientific approach to reduce firemen's thermal stresses/ strains and risk levels, as well as to improve the comfort and safety of firemen during training and firefighting.</p> <p data-bbox="842 1417 1410 1727">Up to now, HKRITA has licensed this technology to three parties, of which two are education and training institutes and one is a large department store in Canada. Shinshu University of Japan, one of the licensees, is ranked top three in the area of textiles research in the world.</p>

Project / Technology	Status / Progress
<p data-bbox="215 275 722 389">SimFactory – A Computerized Coaching System for Sewing Line Management</p> 	<p data-bbox="842 275 1410 864">Based on data collected from the real production environment of garment factories, this project has developed a computerised coaching system for frontline managers and supervisors to apply industrial engineering techniques and “what-if” analysis to improve the efficiencies of industrial sewing line dynamics for better production planning and control in garment manufacturing. Through simulation of virtual sewing lines, the system helps production management personnel design optimal solutions for manpower and machine allocations.</p> <p data-bbox="842 927 1410 1160">The coaching system is developed in collaboration with the Clothing Industry Training Authority (CITA). One training course has been provided by CITA for a garment company in October 2013.</p>

**Hong Kong R&D Centre for
Logistics and Supply Chain Management Enabling Technologies (LSCM)
Highlight of Operation in 2013-14**

I. New R&D Projects and Industry Contribution (in \$million)

	<u>2012-13</u>			<u>2013-14</u>		
	No. of New Projects	Project Cost	Industry Contribution	No. of New Projects	Project Cost	Industry Contribution
Platform	6	54.8	9.3 (16.9%)	2	23.2	5.6 (23.9%)
Collaborative	2	3.2	1.6 (50.8%)	3	4.6	2.4 (52.7%)
Seed	-	-	n/a	1	2.6	0.6 (24.1%)
Total:	8	58.0	10.9 (18.7%)	6	30.4	8.6 (28.2%)
Public Sector Trial Scheme Projects	5	9.9	n/a	7	12.3	n/a

Note: Figures in brackets denote the level of industry contribution.

II. Operating Expenditure (in \$million)



	2012-13	2013-14
Staffing	11.6	13.4
Accommodation	3.7	4.0
Equipment	0.7	0.4
Others	4.9	2.6
Total:	20.9	20.4





III. Industry Income Received (in \$million)




	2012-13	2013-14
Sponsorship for projects	7.97	8.45
Licensing/Royalty	0.16	0.09
Contract Services	0.15	0.16
Others	-	-
Total:	8.28	8.70


IV. Progress of R&D, Commercialisation and Use of R&D Deliverables in the Public Sector


A video featuring selected projects of LSCM is available at the following link – <http://youtu.be/r7j0qnIfYpY>

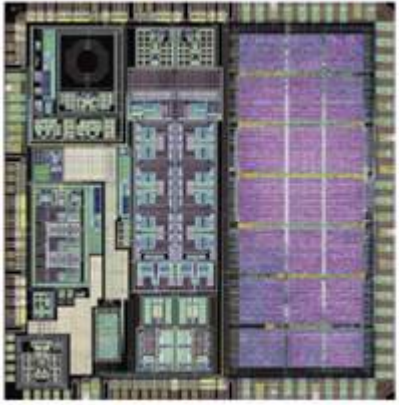

Project / Technology	Status / Progress
<p>Advance Trucks' Arrival Notification System for Hong Kong Air Cargo Industry at Hong Kong International Airport</p>  <p><i>Advanced arrival signal triggered by RFID-tagged trucks passing through Tsing Ma Bridge</i></p>  <p><i>RFID Reader to be installed at Tsing Ma Toll Plaza</i></p>	<p>LSCM is currently working on an ‘Advance Trucks’ Arrival Notification System’. The project is supported by the Airport Authority Hong Kong and Hong Kong International Airport Carrier Liaison Group (a trade organisation representing the air cargo, mail, courier and express cargo industries in Hong Kong).</p> <p>With the application of trucks’ windshield Radio-Frequency Identification (RFID) tags and installation of RFID reader at the Toll Plaza of the Tsing Ma Bridge, the system will inform the air cargo terminals 30 minutes in advance before the trucks arrive so that the air cargo terminals can make relevant preparations (e.g. loading bay scheduling, docking space allocation, etc.) based on the estimated arrival time to shorten the trucks' waiting time, from an average of 2 hours at present to within 60 minutes.</p> <p>The project has been commenced in December 2013. On-site trial run will be conducted in late 2014.</p>

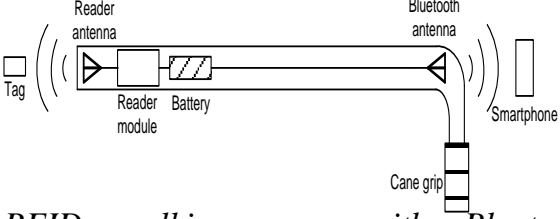
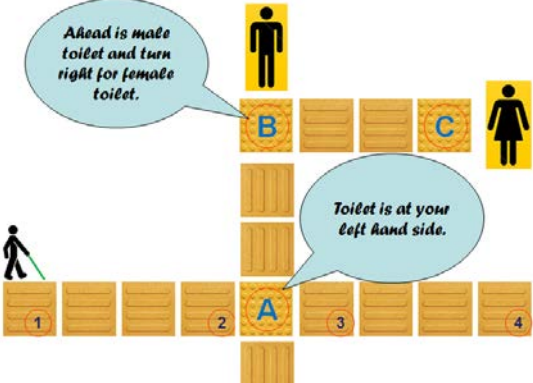

Project / Technology	Status / Progress
<p data-bbox="204 297 799 371">Innovating and Efficient Wireless Mesh Network for Outdoor Environment</p>  <p data-bbox="204 589 730 622"><i>Outdoor Wireless Mesh Access Point</i></p>  <p data-bbox="204 1023 730 1057"><i>Improving WiFi coverage in the quay</i></p>  <p data-bbox="204 1319 515 1352"><i>Outdoor Mesh Router</i></p>  <p data-bbox="204 1830 624 1863"><i>Light Tower at Port Terminal</i></p>	<p data-bbox="831 297 1398 528">LSCM has supported a local information and communications technology company and the Hong Kong University of Science and Technology (HKUST) to develop an outdoor WiFi mesh router.</p> <p data-bbox="831 589 1398 779">The routers have been deployed in a large scale trial in a cargo terminal in Kwai Chung and were proven to have high throughput, fast mobility and robust resilience.</p> <p data-bbox="831 840 1398 958">LSCM, the local company and HKUST strive to promote this product to other sectors.</p>


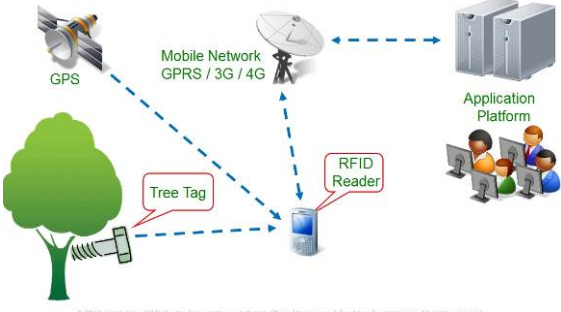

Project / Technology	Status / Progress
<p data-bbox="204 297 724 412">Location-based Technologies for Real-time Site Safety Management System</p>  <p data-bbox="204 703 528 741"><i>A RFID-tagged helmet</i></p>  <p data-bbox="204 1182 807 1301"><i>Tracking site workers' locations by RFID-tagged helmets (Ngau Tau Kok Slope Reinforcement site)</i></p>  <p data-bbox="204 1854 807 1930"><i>Real-time workers' locations shown in PCMS</i></p>	<p data-bbox="829 297 1401 607">LSCM has developed a Proactive Construction Management System (PCMS) based on Building Information Modelling (BIM) and RFID technology. It is the first attempt to use PCMS for the construction industry to detect any potential dangers in construction sites.</p> <p data-bbox="829 672 1401 864">With the support of the Hong Kong Housing Authority and Civil Engineering and Development Department, LSCM is testing the PCMS at the following trial sites:</p> <ul data-bbox="829 880 1401 1126" style="list-style-type: none">• Public Rental Housing Development at Po Heung Street, Tai Po;• Ngau Tau Kok Slope Reinforcement; and• Hung Sui Kiu Bus Station.

Project / Technology	Status / Progress
<p data-bbox="204 297 799 412">Enabling Technologies for Baby Tracking in Hospital Environment (Tamper resistant & reusable baby tag)</p>  <p data-bbox="204 1021 799 1099"><i>Baby Tag Sensing Monitoring System piloted at a local private hospital</i></p>  <p data-bbox="204 1693 724 1731"><i>Baby Tag prototype (patent pending)</i></p>	<p data-bbox="831 297 1398 412">A private hospital is piloting LSCM's 'Babytag' and baby monitoring system in its infant care ward in early 2014.</p> <p data-bbox="831 472 1398 586">The system can monitor up to 70 babies and 200 medical equipment/asset simultaneously using RFID technology.</p> <p data-bbox="831 647 1398 842">With inputs and positive feedbacks from medical and nursing staff from the hospital, LSCM has filed two patent applications for the unique Babytag design and system features.</p>

Project / Technology	Status / Progress
<p data-bbox="204 297 715 371">Wearable Tag for Elderly Care at Community Care Centres</p>  <p data-bbox="204 909 762 947"><i>Wearable RFID tag embedded in a vest</i></p>  <p data-bbox="204 1518 807 1592"><i>RFID reader installed at care centre's checkpoints</i></p>	<p data-bbox="829 297 1401 763">LSCM, HKRITA and ASTRI have jointly developed a system on 'Wearable Electronics for Better Quality Community Care for the Elderly'. It involves an outerwear made of Nu-Torque fabric embedded with RFID system. It can provide better monitoring of the elderly in our community centres, particularly those who might be more susceptible to losing their way due to Alzheimer's disease.</p> <p data-bbox="829 831 1401 981">Riding on the success of this trial, LSCM will continue to promote relevant LSCM technologies to social and welfare sectors.</p>

Project / Technology	Status / Progress
<p data-bbox="204 297 801 450">Development and Commercialisation of RFID Reader Chip for Authentication Applications Based on China RFID Environment</p>  <p data-bbox="204 925 801 1003"><i>LSCM RFID Reader IC Chip Design (Registered IC Layout Design)</i></p>  <p data-bbox="204 1317 801 1395"><i>RFID reader device using LSCM Lightweight RFID Reader Chip</i></p>	<p data-bbox="831 297 1401 533">LSCM is collaborating with a local RFID company to commercialise a LSCM-designed UHF RFID reader chip, which is targeted for anti-counterfeiting and authentication applications in the Mainland market.</p> <p data-bbox="831 589 1401 824">The chip will enable the development of low-cost RFID reader devices with small form factor and low power consumption. As such it is expected that the RFID market will be further expanded.</p> <p data-bbox="831 880 1401 1037">The collaborative project commenced in November 2013 and initial prototype will be ready for evaluation in the first half of 2014.</p>

Project / Technology	Status / Progress
<p data-bbox="204 297 778 371">Reader Chip Prototype for Navigation Aid for Visually Impaired</p>  <p data-bbox="204 719 805 792"><i>RFID walking cane with Bluetooth connection to smartphone</i></p>  <p data-bbox="204 1200 805 1274"><i>RFID embedded tiles providing location information</i></p>  <p data-bbox="204 1765 805 1839"><i>Pilot run to be conducted in HK Society for the Blind</i></p>	<p data-bbox="829 297 1398 568">With the support of the Hong Kong Society for the Blind, LSCM will develop a RFID system to improve navigation assistance for the visually impaired persons. The proposed system will be easy to deploy, maintain and affordable.</p> <p data-bbox="829 629 1398 824">A reader will be integrated to guiding cane to read the RFID-tagged guiding tiles. LSCM will also develop a mobile application to provide audible navigation information to users.</p> <p data-bbox="829 884 1398 1039">The project has already been commenced in March 2014. On-site pilot run will be conducted in the fourth quarter of 2014.</p>

Project / Technology	Status / Progress
<p data-bbox="204 297 481 331">Tree Management</p>  <p data-bbox="204 723 571 757"><i>Nail Tag screwed on trees</i></p> <p data-bbox="212 819 496 853">Technology Infrastructure</p>  <p data-bbox="204 1178 807 1256"><i>Tree inventory management system enabled by Tree Tags</i></p>  <p data-bbox="204 1597 807 1675"><i>LSCM Low-cost RFID Reader with Bluetooth connection capability</i></p>	<p data-bbox="829 297 1398 454">LSCM is designing specific RFID nail tags for the Hong Kong Housing Authority for tree inventory and logistics management.</p> <p data-bbox="829 510 1398 667">Four LSCM-designed tags of different sizes, reading ranges and mounting methods will be produced for different types of tree and different functions.</p> <p data-bbox="829 723 1398 1037">A customized RFID reader will also be tested by Hong Kong Housing Authority for their tree inventory control applications. The reader has a small form factor and embedded Bluetooth connectivity for pairing with industrial grade rugged smartphones for data integration.</p> <p data-bbox="829 1093 1398 1216">The project has been commenced in March 2014. On-site pilot run will be conducted in the fourth quarter of 2014.</p>

**Nano and Advanced Materials Institute (NAMI)
Highlight of Operation in 2013-14**

I. New R&D Projects and Industry Contribution (in \$million)

	<u>2012-13</u>			<u>2013-14</u>		
	No. of New Projects	Project Cost	Industry Contribution	No. of New Projects	Project Cost	Industry Contribution
Platform	5	10.7	1.9 (17.7%)	2	3.2	0.4 (12.5%)
Collaborative	7	59.8	33.1 (55.3%)	4	6.4	3.5 (54.8%)
Seed	10	19.2	n/a	8	15.0	n/a
Total:	22	89.7	35.0 (39.0%)	14	24.6	3.9 (15.9%)
Public Sector Trial Scheme Projects	-	-	n/a	2	1.4	n/a

Note: Figures in brackets denote the level of industry contribution.

II. Operating Expenditure (in \$million)

	2012-13	2013-14
Staffing	26.8	31.6
Accommodation	3.7	4.2
Equipment	2.9	12.1
Others	4.7	8.3
Total:	38.1	56.2



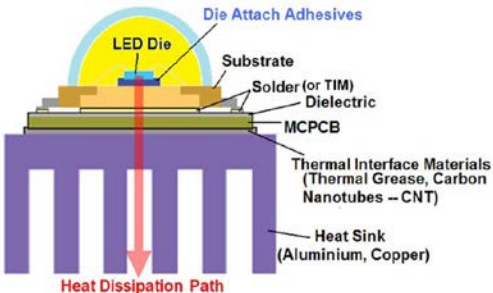

III. Industry Income Received (in \$million)


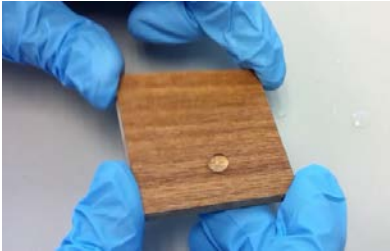
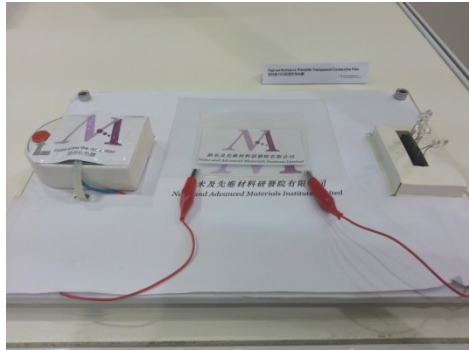
	2012-13	2013-14
Sponsorship for projects	21.30	13.57
Licensing/Royalty	0.35	0.03
Contract Services	1.43	1.32
Others	-	-
Total:	23.08	14.92

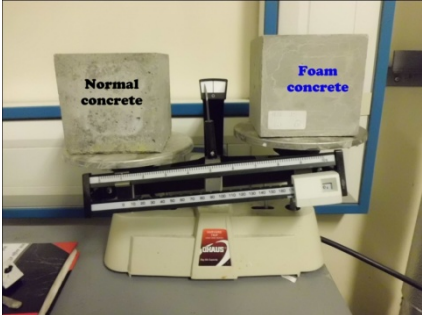
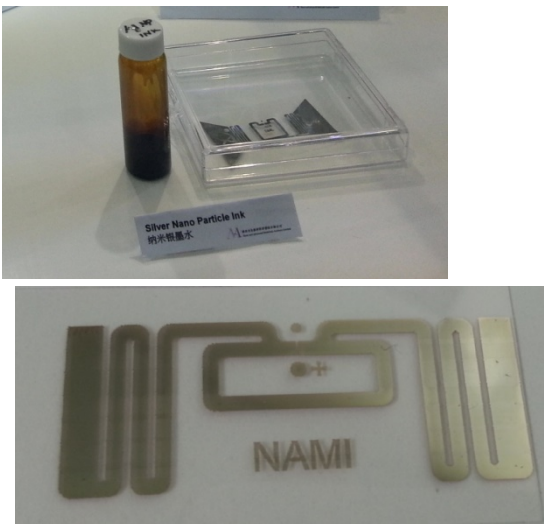
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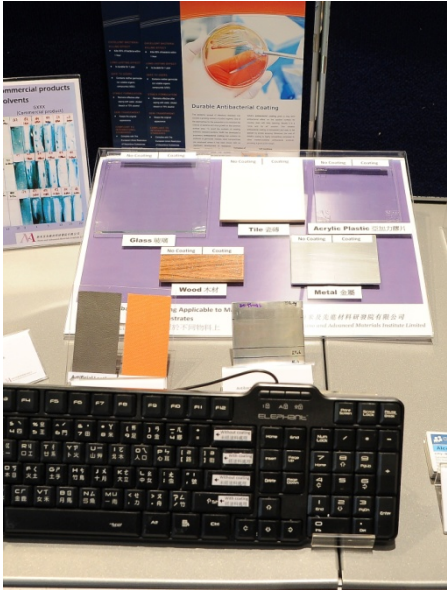
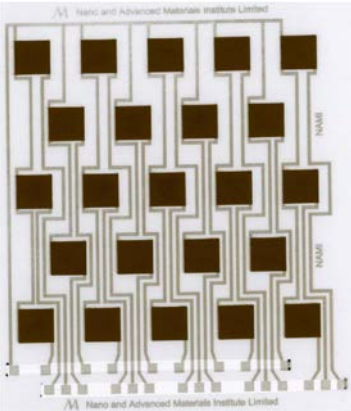
A video featuring selected projects of NAMI is available at the following link – <http://youtu.be/zpYwSY9ydvM>


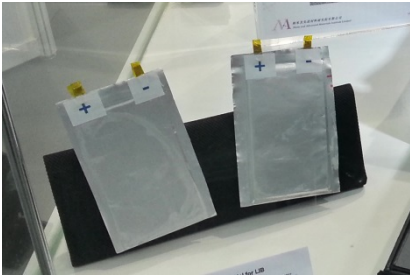
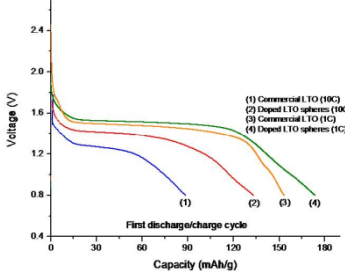
Project / Technology	Status / Progress
<p data-bbox="209 465 786 533">Advanced Thermal Insulation Coating Material</p>  <p data-bbox="209 817 683 851"><i>Trial sites at CIC training centers</i></p>	<p data-bbox="836 465 1401 772">The high performance thermal insulation coating is applicable to walls and roofs. It could reduce heat diffusion from surface to bottom by reflecting most of the radiant heat waves. The coating could effectively lower the temperature up to 16 degree Celcius.</p> <p data-bbox="836 840 1401 1187">NAMI has licensed this product to a Shenzhen-based technology company in August 2012 on a non-exclusive basis. The company is scaling up its production of this material and conducting some trials in collaboration with several major construction companies in Hong Kong and the Mainland.</p> <p data-bbox="836 1254 1401 1646">NAMI has collaborated with Gammon Construction Limited to conduct outdoor tests in its site offices of Hong Kong Science Park (HKSP) Phase III, Po Shan Road in Mid-levels and St Paul's Hospital. The trial result has showed that after using the thermal insulation coating, there was 25% saving in electricity consumption of air-conditioning in the site offices.</p> <p data-bbox="836 1713 1401 1937">Furthermore, NAMI is collaborating with the Construction Industry Council (CIC) to conduct trials at its training centers. The trial will target other substrates such as cement-based materials, fiber boards, etc.</p>

Project / Technology	Status / Progress
<p data-bbox="193 224 766 414">Plasma Lighting - Development of Advanced Die Attach Adhesives with Nano-Fillers/ Microcapsules for High Brightness LED (HB-LED) and Mirror-like Coating on Magnesium</p>    	<p data-bbox="829 224 1404 537">Plasma lighting is a forward-looking advanced lighting technology. It is an environmental-friendly technology that offers high illumination, low cost solution with high CRI (natural illumination) and directional source. It is applicable to infrastructure that requires high power lighting.</p> <p data-bbox="829 593 1404 795">An industrial sponsor has licensed the advanced die attach adhesives technology as well as mirror-like coating on magnesium and used it as background IP for a R&D project.</p>

Project / Technology	Status / Progress
<p data-bbox="204 226 810 376">Multifunctional Environmental Paint for Wooden Furniture Based on Organosilica Nanosol and Nanomaterial Additives</p>  <p data-bbox="209 573 671 622">Commercial water based paint I Commercial water based paint II Commercial water based paint III NAMI formulation</p> 	<p data-bbox="831 226 1399 461">NAMI has developed a high performance environmental paint to replace existing solvent-based paints which may contain hazardous ingredients (e.g. volatile organic chemicals, heavy metals, etc.).</p> <p data-bbox="831 521 1399 633">A coating manufacturer is interested in the technology. Licensing is under discussion.</p> <p data-bbox="831 694 1399 929">An industrial sponsor has also expressed interest to obtain a licence of the technology as background IP for the development of an environmental-friendly fire-retardant coating for molded plastic parts.</p> <p data-bbox="831 990 1399 1225">HKSP will provide a trial site for an upcoming public sector trial project. The trial would demonstrate its applicability on the various types of the substrates in both indoor and outdoor environment.</p>
<p data-bbox="204 1294 810 1406">Development of High-Performance Printable Transparent Conductive Film Based on Nanomaterials</p> 	<p data-bbox="831 1294 1399 1373">Several industrial companies have expressed interest in the technology.</p> <p data-bbox="831 1433 1399 1579">Samples have been sent to a Mainland company and a listed company in mid-December 2013 for testing and evaluation.</p> <p data-bbox="831 1639 1399 1796">Another paper manufacturer has expressed interest in applying the technology to e-book readers. Discussion is in progress.</p>

Project / Technology	Status / Progress
<p data-bbox="193 210 820 383">High Performance Cementitious Materials for the Construction of External Wall with Enhanced Thermal Insulation</p> 	<p data-bbox="820 210 1412 383">NAMI has developed a light-weight cementitious material (foam concrete) with proven strength and thermal insulation property.</p> <p data-bbox="820 434 1412 629">An industrial sponsor has licensed the technology and used it as background IP for development on light-weight hydrophobic cementitious sound barrier.</p> <p data-bbox="820 680 1412 763">A collaborative project on this material has been approved.</p> <p data-bbox="820 815 1412 1211">NAMI is also conducting a public sector trial on this new material. The prototypes will be in the form of two demonstration rooms, one using foamed concrete and the other using normal concrete. The difference in energy consumption between the two rooms will be monitored. The trial is supported by the Hong Kong Housing Authority.</p>
<p data-bbox="193 1279 820 1406">Development of Metal Nanoparticle Inks and Its Printing Method for Printed Electronics</p> 	<p data-bbox="820 1279 1412 1451">A printing consumables company selling toners and inks is interested in the technology. Licensing is under discussion.</p>

Project / Technology	Status / Progress
<p data-bbox="204 226 724 338">A Germicide-Free and Durable Antibacterial Coating for Hospital Facilities</p> 	<p data-bbox="831 226 1401 421">Field test of this material was successfully conducted at a hospital. The coating is durable for at least 9 months under routine wiping with alcohol pads.</p> <p data-bbox="831 479 1401 633">HKSP will be a supporting organisation of a coming public sector trial project and the antibacterial coating will be put on door handles at different sites.</p> <p data-bbox="831 694 1401 969">In the future, NAMI will continue to optimise the formula. Apart from testing against bacteria, the optimised formula will be tested against fungi and viruses. Meanwhile, NAMI has started to approach industrial partners to draw their awareness to this product.</p> <p data-bbox="831 1028 1401 1261">Several industrial parties are interested in applying the coating to their products, including protective film for mobile phones and medical devices. Samples are being prepared for industry assessment.</p>
<p data-bbox="204 1330 660 1442">High-Performance Printable Temperature Sensor Based on Nanomaterials</p> 	<p data-bbox="831 1330 1401 1525">An industrial sponsor has licensed the technology and used it as background IP for development on wearable temperature sensor. The project has been approved and commenced.</p> <p data-bbox="831 1583 1401 1904">The IP of the technology leads to a contract research which was commenced in May 2014. An industrial sponsor has licensed the technology and used it as background IP for development of semiconductor nano inks for thin film transistor backplane.</p>

Project / Technology	Status / Progress
<p data-bbox="204 226 783 421">Development of Advanced Composite Pellets and a Novel Supercritical Fluid Extraction Process for Micro-Powder Injection Moulding Technology to Industries</p> 	<p data-bbox="831 226 1401 383">This project developed a new micro-powder injection moulding process which reduces material costs and processing time.</p> <p data-bbox="831 443 1401 674">NAMI will conduct a public sector trial on this technology which will provide opportunity for demonstrating the product features to the industries via fabrication of complicated components for some real cases.</p>
<p data-bbox="204 846 767 958">Doped Nano-Lithium Titanate (LTO) for High Performance Lithium Ion Batteries</p>  	<p data-bbox="831 846 1401 1003">NAMI will conduct a public sector trial on this technology in collaboration with the Hong Kong Critical Components Manufacturers Association.</p> <p data-bbox="831 1064 1401 1413">Design of the demo unit of the battery will be finalised by June 2014. It will be a prototype integrated with LED patterns to be demonstrated with fast charging rate. The key objective is to increase awareness of NAMI's LTO material to the targeted industry/customers and facilitate commercialisation.</p>