For information
on 21 November 2006

LEGISLATIVE COUNCIL PANEL ON COMMERCE AND INDUSTRY

Operation and Management of Hong Kong Applied Science and Technology Research Institute Company Limited

PURPOSE

This paper informs Members of the operation and management of the Hong Kong Applied Science and Technology Research Institute (ASTRI), its strategic plans and how far it has been able to achieve its targets and goals, as well as how the research and development (R&D) deliverables of ASTRI have enhanced Hong Kong's competitiveness in technology-based industries.

INTRODUCTION

2. Founded by the Hong Kong Special Administrative Region Government, ASTRI started operation in 2001 with the public mission of performing high quality R&D for technology transfer to industry, developing needed technical human resources and acting as a focal point that brings together industry and university R&D assets to enhance Hong Kong's technological competitiveness on a continuous basis.

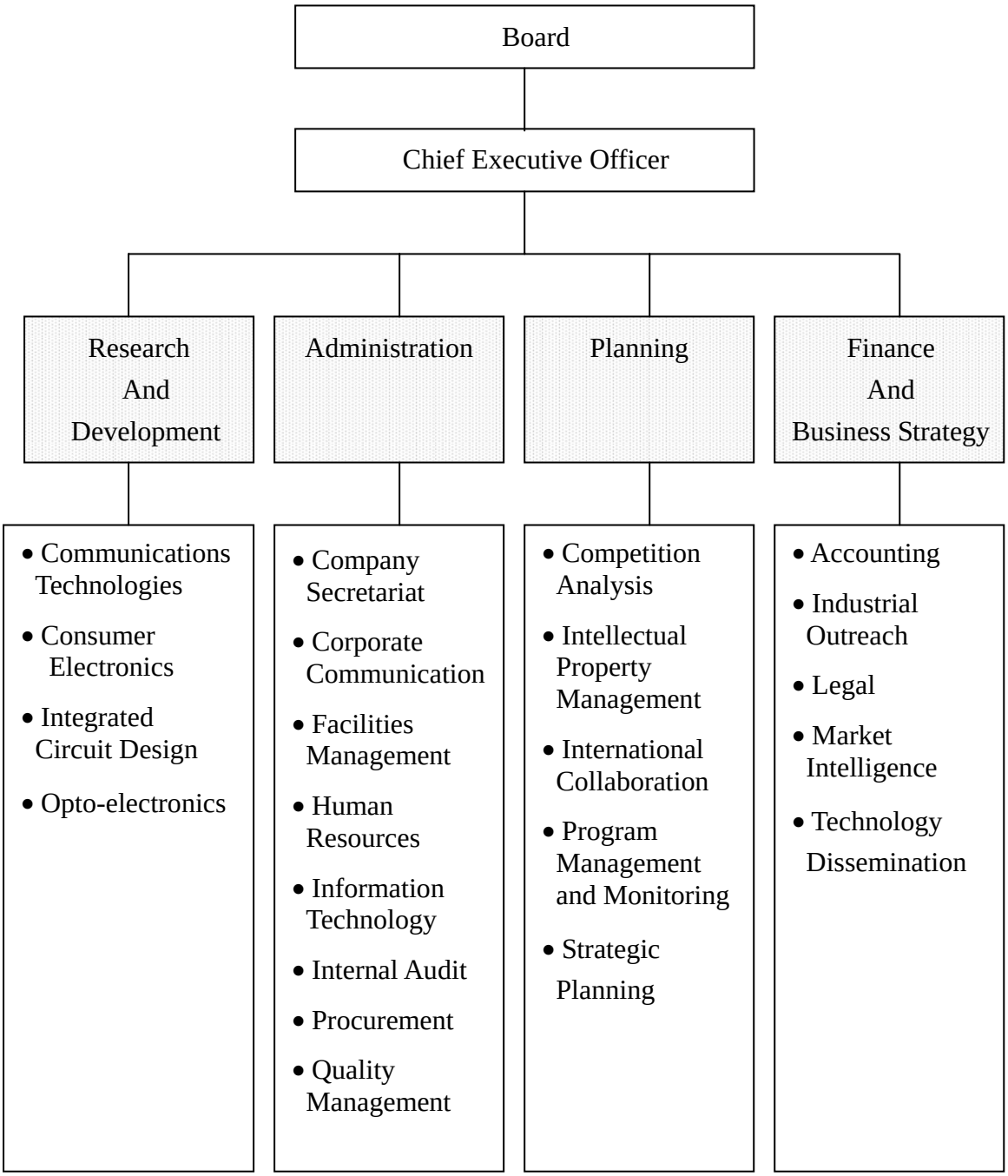
3. In April 2006, ASTRI was designated by the Innovative and Technology Commission (ITC) as Hong Kong's Information and Communications Technologies (ICT) R&D Centre, under which it operates four technology areas, namely Consumer Electronics, Communications Technologies, IC Design and Optoelectronics.

ORGANISATION STRUCTURE

4. ASTRI is headed by a Chief Executive Officer (CEO) and is governed by a Board of Directors comprising representatives from the industrial and commercial sectors, the academia and the Government. Three functional committees, namely Finance and Administration Committee, Technology Committee and Audit Committee assist the Board in managing the business of ASTRI.

5. The CEO is responsible to the Board of Directors for the overall management of ASTRI. He is assisted by R&D Directors who are in charge of the

various research initiatives and the Headquarters Executives who look after the administrative, financial, business development, technology management and other support functions of the institution. As at 31 October 2006, ASTRI has 363 staff, of which 298 are research personnel. Below is the organisation chart of ASTRI by functions:



OPERATING FOCAL POINTS

6. As a publicly-funded applied research institution, ASTRI operates under the principle that such institutions exist for the maximisation of "public good", and this public good is measured by the "economic impact" and other benefits they bring

to their beneficiaries – the industry and ultimately the community as a whole.

7. In order to generate and sustain the economic impact, the operation of a successful applied research institution such as ASTRI need to focus on the following:

(a) "Customers", i.e., the companies which transfer the technologies and intellectual properties developed by the research institutions and commercialise them for econmic returns, and the research projects undertaken by ASTRI should be market-driven which cater for the need of the customers and the industry; and

(b) "Technology Transfer", i.e., the paid transfer of well-defined product technologies, service technologies or enabling technologies, through a license contract, a service contract or other legal means, from the R&D institution to its industry customers for the purposes of commercialisation. For an applied research institution to link their research to potential customers, and then on to commercialisation successes, technology transfer is the critical path.

ASTRI OPERATING MODEL : CUSTOMER-FOCUSED R&D

8. Based on the above considerations, ASTRI builds its operations on the practice of "customer-focused R&D". It is a methodology that aims to maximise the "customer impact" of R&D and makes the conversion of research into real results a systematic process. This systematic process builds customer focus into every aspect and every step of the R&D programs run by ASTRI, from their initiation to the eventual transfer of the generated intellectual properties (IPs) to the customers in the following manner:

(a) hire and train R&D leaders who are not only outstanding technologists and seasoned professionals, but also possess extensive "domain knowledge" of the industries they specialise in;

(b) plan and substantiate compelling technology visions to engage potential customers before the R&D projects are to be initiated - these visions are then broken down to projects for their implementation;

(c) identify clearly the customers before the project is approved for launching;

(d) work with the customers as early and closely as possible - treat the customers as partners of R&D rather than just the receivers of developed technologies;

(e) build R&D teams that are not only capable to innovate for new IPs but also possess the knowledge and skills to make those innovations cost-competitive, market-compatible, manufacturable, serviceable, etc., so that they can be readily transferred to the potential customers for commercialisation; and

(f) identify, build and upgrade core technologies continuously to anticipate and satisfy the varying needs of its wide customer base dynamically.

9. A very critical part of the customer-focused R&D ASTRI practices is the rigorous setting and monitoring of quantitative performance targets to ensure that all the customer-focused considerations described above are addressed effectively. These targets are used as the essential basis for the performance appraisal of the R&D groups and their leaders in ASTRI, and they are set at the beginning of the financial year and monitored continuously for attainment. The three main types of quantitative performance targets adopted by ASTRI are:

(a) number of technologies transferred to industry per year - this is the most crucial as they are the "path" toward the commercialisation of the IPs developed by the R&D projects;

(b) number of patents filed per year - this is important because patents are the essential indicators of the worthiness of innovations, and they are the very basis of the technology transfer activities; and

(c) contributions from industry per year - as a R&D institution begins to engage customers and start to build a valuable brand name to its customer base, eventually the incomes from this customer base through various services such as the licensing and sales of technologies, design services, product development services, etc. will start to increase.

ACHIEVEMENTS

10. In the two and a half years since May 2004 when the present administration of ASTRI brought in and implemented the customer-focused R&D methodology described above, ASTRI has made substantial progress.

Technology Transfers

11. The number of annual technology transfers to industry has grown from a total of 2 in 2003-04 to 10 in 2004-05 and 18 in 2005-06. This financial year our target is set at 31, i.e., a further 72% growth over the achievement in 2005-06, and in the first six months we have already transferred 18 technologies to the industry. We plan to increase this important performance indicator to more than double the present output at the end of the first five years of ICT R&D Centre under the guidance of the ITC.

12. The following are some of the highlights of ASTRI's achievements to date:

(a) ASTRI's photonics work has resulted in the successful development of data-rate optical transceiver subassembly packaging technologies which are best suited for broadband applications that demand fast and secure exchange of data between computers and the enterprise storage system. Such photonics products can help bring down the cost of data management in enterprises. In 2004, ASTRI sold its photonics packaging technologies and related assets to a leading electronic component company to form a new photonics business in Hong Kong;

(b) ASTRI is a world leader in advanced video compression technology which is a key technology that enables the much anticipated Internet-based consumer electronics applications. A successful product we developed from this technology is the IPTV set top box technology with rich features such as MPEG2, MPEG4 and H.264 compatibility and supporting TV broadcast and video on demand capabilities. An ASTRI licensee of this technology has recently won the international bid for Shanghai's IPTV service – the first licensed IPTV service operator in all of the Mainland;

(c) advanced electronics packaging technologies are a key enabler of future wireless and portable devices as they are becoming smaller and smaller, and containing more and

more functions within a very small space. ASTRI has built a top-tier advanced packaging program and transferred a number of technologies to the industry for commercialisation. This January, this team along with its industry partners has won the best product award in 1 of the 12 competition categories at the annual Consumer Electronics Show in Las Vegas – the major consumer electronics event of the world;

(d) light emitting diodes (LED) are a major new technology that is widely anticipated to enable the transition of essentially all lighting applications to the much more versatile and energy efficient solid state lighting in the foreseeable future. Its potential market size is of the order of US$100 billion. ASTRI's LED team has built up a substantial portfolio of inventions in this promising technology domain, among these is the "active dynamic LED backlight" technology which was cited by the LEDs Magazine as the "*technical developmental state-of-the-art*" for the next generation flat panel TVs after a prototype, jointly produced by ASTRI and its industry partner in Hong Kong, was demonstrated at the Society for Information Displays conference in San Francisco this past June;

(e) another ASTRI technology that is world-class in quality and has been successfully commercialised is the H.264-based Real Time Surveillance technology. This technology offers the best H.264-based real time surveillance capabilities wirelessly with the low bandwidth requirements. ASTRI has successfully transferred this technology which is presently powering the real time surveillance systems at three major international airports;

(f) ASTRI has successfully developed smart antenna technology that targets wide-area cellular-like WiFi services at one-third the deployment cost of the market leader. This technology has been spun off from ASTRI as a new company to provide this service internationally. We expect them to be very competitive both in the region and around the world;

(g) ASTRI has successfully transferred its advanced asymmetric digital subscriber line (DSL) technology to

one of the world's top ten IC designs companies. Through the transfer, this world-class company has located and built up its IC designs centre in Hong Kong; and

(h) ASTRI's Voice over IP Research Program has developed a most advanced and complete set of core communication technologies for next generation phone devices and successfully transferred these technologies to industry customers for commercialisation. For instance, the IP phone products are already being sold in the European market by our licensee, while the wireless phone system was licensed by multiple tier-one manufacturers for commercialisation. According to the report "TDC Trade: Profile of Hong Kong Manufacturer Industries", Hong Kong is the largest exporter of telephone sets in the world. ASTRI has not only brought next generation phone technologies to this industry, but also provided the critical know-how for these manufacturers to move up the value chain in this promising market.

13. A list of all of ASTRI's technology transfers during the past years is shown in the table below:

FY 2003/04	1	Interactive English learning software	A HK based consumer electronics design house
	2	Payment by phone technology	A HK based internet and network service company
FY 2004/05	1	Photonic packaging technology	One of the world's leading magnetics companies based in HK
	2	WiFi Access Point firmware	A leading wireless product manufacturer in Taiwan
	3	H.264 IPTV Set Top Box	An HK SME, developer and provider of end-to-end web based multimedia solutions
	4	WiFi Access Point	A leading U.S. wireless communication semiconductor company
	5	Interactive English learning software	A HK SME that sells hardware and software

	6	H.264 decoder and porting to TV Media box	A leading global Japanese manufacturer of audio & video communications products
	7	Interactive English learning software	A leading book publisher based in HK
	8	Interactive English learning software	A leading book publisher based in HK
	9	SIP based VoIP Phone	A HK manufacturer of telecom & network products
	10	SIP based VoIP Phone	A HK OEM, ODM and contract manufacturer
FY 2005/06	1	SIP based VoIP Phone	A HK supplier of contract manufacturing and design
	2	H.264 Home Media Centre	A HK SME, developer and provider of end-to-end web based multimedia solutions
	3	H.264 IPTV Set Top Box	A subsidiary of a HK listed company
	4	WiFi Firmware	A leading wireless product manufacturer in Taiwan
	5	H.264 Home Media Centre	A leading acoustic products manufacturer in Taiwan
	6	H.264 Real Time Surveillance	A leading acoustic products manufacturer in Taiwan
	7	H.264 codec for Video Phone	A network product design house in Korea
	8	ADSL wireline IC design	A leading fabless IC designs company in the U.S.
	9	SIP based VoIP Phone	A HK based consumer electronics manufacturer
	10	SIP based VoIP phone	An OEM, ODM and contract manufacture company in HK
	11	WiFi network management system	A leading wireless product manufacturer in Taiwan
	12	Air-Solid heat exchange technology	A light source company in Taiwan

	13	SIP based WiFi VoIP Phone	A HK based manufacturer of consumer electronic products
	14	H.264 Home Media Centre	A leading acoustic products manufacturer in Taiwan
	15	Portable Multimedia Engine for Smart Phone	A China based handset design house
	16	H.264 IP Set Top Box	An Australia listed consumer electronic design company
	17	Interactive English learning software	HK SME, focusing on selling hardware and software
	18	H.264 IP Set Top Box	A communications and network solutions provider in Taiwan
FY 2006/07	1	LED backlight technology	A LED packaging company in HK
	2	SIP based VoIP phone	An OEM, ODM and contract manufacture company in HK
	3	WiFi Access Point and related technologies	HK based WiFi equipment design house
	4	H.264 IP Set Top Box customisation	An Australia listed consumer electronic design company
	5	H.264 Home Media Centre	A HK startup company
	6	H.264 Home Media Centre	An Australia listed consumer electronic design company
	7	Laminate substrate based SiP	One of the world's leading magnetics companies based in HK
	8	Power IC packaging design and analysis	A leading Taiwan manufacturer of LEDs, including lamps, displays and infrared products.
	9	H.264 Home Media Centre	A HK based communications product manufacturer
	10	H.264 Real Time Surveillance recorder software	A leading acoustic products manufacturer in Taiwan
	11	Low Drop Regulator IC	HK based IC design house

	12	SIP based WiFi VoIP Phone	A leading HK manufacturer of consumer electronic products
	13	Wireless Video Adapter	A market leader for tablet DVD player products based in HK
	14	Image Signal Processing Integrated Circuit Design Technology	A HK based IC development house
	15	Step-Up DC/DC converter IC	A HK based IC design house
	16	H.264 Real Time Surveillance recorder software customisation	A leading acoustic products manufacturer in Taiwan
	17	Smart Optical Sensor Technology	The world's largest supplier of integrated assembly and packaging solutions based in HK
	18	SIP based VoIP Phone	A HK based manufacturer of telecom and network products

Patents

14. The number of patents filed by ASTRI has been growing fast in the past three years. They grew from 14 in 2004-05 to 31 in 2005-06, and this year we plan to approximately double again to 61. IPs, including patents, are the most important asset for a publicly-funded R&D institution like ASTRI. On the one hand, they reflect innovation and inventiveness, and serve as the foundation for ASTRI's most important business – transferring technologies. On the other, legalised IP rights protect taxpayers' investments in ASTRI's R&D programs. For these reasons, we set up procedures for the rigorous documentation and management of the processes involved and establish Patent Committees consisting of technical and IP management specialists to review and screen each pending applications for originality, feasibility and marketability to ensure that the filing of these patents are indeed necessary and advantageous.

Industry Contributions

15. Industry contributions are perhaps the most challenging of the three targets ASTRI annually set. It requires considerable maturity of the R&D organisation and teams, as well as the track records of reliable services before it can grow and expand to substantial amounts. In order to become proficient in doing this eventually, ASTRI has set target to generate industry contributions at 10% of R&D expenses in the first year of operation of the ICT R&D Centre, and to reach 40% by

the fifth year of the ICT R&D Centre's Five-year Plan. We believe that the learning we are gaining continuously, and the successes we have had so far with the transferring aspect of its overall technology dissemination efforts, ASTRI should be able to build up the track records and maturity to generate significant contributions from industry for our technical programs in the future.

ASTRI OPERATING STRATEGY

16. ASTRI has a simple strategy to create value from applied research. It consists of the three elements as described in the ensuing paragraphs:

Practise Customer-focused R&D

17. As has been extensively discussed above, to practise customer-focused R&D is always the focal point of ASTRI's operations. It is the systematic methodology that consistently ensures customer-oriented results from its research work. By achieving more than 30 technology transfers to industry a year, customer focus is now not only a methodology, but also a "culture" of ASTRI's entire operation.

Establish a "Human Resource Edge" in the Region

18. The development of world-class technologies and IPs depends on world-class talents. Hong Kong is an international economy in the China region, and possesses the factor conditions better than anybody else to attract and accumulate world-class technical talents. Such is Hong Kong's primary comparative advantage in technology, and ASTRI must leverage this advantage to build the R&D teams that give Hong Kong the edge.

Run on Core Technology Platforms (CTPs)

19. A CTP can be defined as "*a set of technical competencies that combine to create a wide range of market winning applications for the customers*." They are especially crucial to publicly-funded R&D institutions as these institutions are tasked to serve the technical needs of a wide industry customer base, with each company's needs somewhat different from the others. Having the CTPs allows the R&D institution to adapt and combine to meet the various requirements so that it can serve the widest customer base it can serve effectively.

20. ASTRI's operating strategy can in fact be summarised into one simple formula:

CTPs + Customers = R&D Success

If ASTRI possesses strong CTPs and continuously strengthens them, and we always put the customers front and centre, then our R&D work will always translate into

customer and economic impact. That is ASTRI's formula for consistent R&D successes. The substantial number and robust growth of our technology transfers are indications that this formula is working.

MANAGEMENT FOR QUALITY

21. In addition to always trying to develop world-class IPs and transfer them effectively to industry customers, ASTRI puts a lot of emphasis on assuring the quality of both the research it does and the management processes it executes.

R&D Quality Assurance

22. To assure the quality of its R&D programs, ASTRI goes through a four-step process both for its annual planning and the vetting of its individual projects, and conduct continuous monitoring of all ongoing projects.

23. Every financial year ASTRI conducts its Annual Planning Cycle consisting of the following steps:

(a) annual update of ASTRI's Five-year Plan in October;

(b) review of Key Technology Initiatives by ASTRI's Domain Advisory Committees which consist of local industry and academic leaders;

(c) review of ASTRI's overall strategy and its execution by ASTRI's Technology Advisory Committee which consist of world-renowned international technology experts; and

(d) ASTRI Board review and approval.

24. In addition to annual planning and reviewing, each of ASTRI's R&D projects is further vetted individually. The vetting process includes the following steps:

(a) internal review by ASTRI internal experts;

(b) external review by industry and academic leaders;

(c) Board-level Technology Review Panel review and approval; and

(d) final approval by funding agency, i.e. ITC.

25. All of the ongoing R&D projects are continuously monitored through ASTRI Board review in six to nine months from project commencement to evaluate the effectiveness of customer engagement. Half-yearly progress reports will be submitted to the ITC to examine the project progress against its stated milestones. The projects are also subject to quarterly reviews by the Technical Committee of the Board, and each of the ongoing projects is monitored monthly for progress by ASTRI's Vice President, Planning and his staff.

Management Quality Assurance

26. To achieve good governance, the Company's Corporate Governance Manual was compiled and approved by the ASTRI Board in 2003. The Manual, which includes the prevailing policies and procedures approved by the ASTRI Board, facilitates the Board and management to run and oversee ASTRI's business in an open, transparent and accountable manner. It can be updated and modified from time to time, with the Board's approval, to take into account necessary changes and developments required to improve ASTRI's operation modes.

27. To assure management quality, ASTRI is one of the very few R&D institutions in the world that has its management processes certified with ISO 9001:2000 standards in addition to having a Board-approved Corporate Governance Manual. The four essential objectives for ASTRI's ISO-based management system are Transparency, Speed, User-friendliness and Governance.

28. ASTRI launched the effort to achieve ISO 9001:2000 certification in July of 2005 and achieved it in March 2006. All together ASTRI's ISO system consists of 40 processes ranging from Human Resources, Accounting, Intellectual Property Management, Project Management, Procurement, Finance and Business Strategy, Legal Services, Administration to Internal Audit and 141 procedures. These documented procedures serve as the linkage between the principles in the Corporate Governance Manual and the routine operations, describing step-by-step interactive tasks among ASTRI staff in various departments. These procedures, along with relevant flow charts, are posted on the Intranet to provide ready reference for all employees to use.

29. Externally, the Independent Commission Against Corruption (ICAC) has conducted reviews on ASTRI's procedures in its use of research funds, commercialisation procedures and HR Practices. We will continue to seek the advice of the ICAC in monitoring ASTRI's various management procedures to ensure that its business is conducted in a fair and transparent manner. Furthermore, ASTRI is subject to examination by the Audit Commission and ASTRI's Internal Audit Team is carrying out regular audit reviews to ensure that there are sufficient and cost effective management of ASTRI's operations.

ASTRI: STRIVE TO BECOME A STRATEGIC ASSET FOR HONG KONG

30. ASTRI has built in the initial years of its operation a systematic "operating platform" that has been proven to produce world-class technologies and complete a substantial volume of market-ready technology transfers to the industry in a consistent manner every year. We intend to fully utilize and continuously enhance this systematic operating platform in the future so that ASTRI can become a strategic asset and a unique leverage for Hong Kong's industries and businesses to position themselves in the technological future of China and beyond.

Hong Kong Applied Science and Technology
Research Institute Company Limited
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