The Role of NECTEC to promote IT Research

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It is my great pleasure to be here today to share with you the role of my organization, the National Electronics and Computer Technology Center, or NECTEC for short, to promote IT research in Thailand. Please allow me to mention here that we welcome collaboration from every organization and everyone that shares our vision to drive the country's economic and social development by enhancing our technological capability, particularly in the area of electronic, computer, information and communication technologies.

Let me start with a brief introduction about my organization. NECTEC is a statutory government organization under the National Science and Technology Development Agency (NSTDA), Ministry of Science and Technology. NSTDA was established under the Science and Technology Development Act in 1991. NECTEC is one of the four national research and development centers under NSTDA, each having different technology specialization which are, biotechnology, material sciences, electronics and computer, and nanotechnology. Our main role is to conduct as well as to support research and development in the filed of electronics and ICT, with an aim to strengthen the competitiveness of Thai industries and enhance the well-being of Thai people. To this end, we do both in-house research and provide research funding to universities and/or research institutes. Other missions besides R&D are technology transfer, human resource development, and infrastructure development.

Since 2006, NSTDA has employed the cluster-based approach as a practical means of linking research to marketable innovations. Under this strategic plan, NECTEC is responsible for the promotion and development of the Software, Microchip, and Electronics (or SME, for short) cluster. In addition, we are responsible for R&D and capacity building of ICT-related platform technologies to serve technology innovation. In this regard, we have put emphasis on three main technologies, which are, knowledge engineering, sensor, and security technology. With various expertises of our researchers, such as, data mining, high speed computing, image and signal processing, etc., we could add value to complement NSTDA's R&D clusters which

includes food and agriculture, human health and medicine, software microchips and electronics, automotive and transportation, energy and environment, chemicals and textiles, and the disadvantaged and under-privileged sector. In carrying out our mission, our goal is to enhance a linkage between research communities and industries through industrial clusters and programs established under the strategic plan of NSTDA.

Within the SME cluster, we have identified four sub-clusters that we would emphasize our R&D activities. These are:

First, the Hard Disk Drive, or HDD Program: This program aims to enhance and promote Thailand's competitiveness as being the world's number one HDD manufacturer through the next decade. The program emphasizes the development of human resources in both quantity and quality. In terms of quality, the goal is to increase the technological capabilities of manpower who work in various stages of the industry value chain, especially in the following areas; automation, electrostatic discharge and contamination, software and simulation, and materials.

Recently, we have collaborated with Western Digital, which is the US-based HDD manufacturer who has their large production facilities here in Thailand, to train local researchers on read-write head technology. Under the collaboration, NECTEC will send 15 researchers who are pursuing their doctoral degrees in local universities to be trained in Western Digital's laboratory in the United States for one and a half years. After which they will be back to set up a laboratory for the company in Thailand to produce read-write heads for one year. Then they will go back to their research institutions to use their knowledge to make further technology developments in the area.

Under this collaboration, NECTEC will subsidise 50 per cent of the training costs for all 15 researchers while Western Digital would oversee the remaining costs.

Second, the Radio Frequency Identification, or RFID program: This program aims to assist the indigenous industry to meet the local demand in RFID applications by partnering with potential stakeholders in targeted sector which includes, for example, agricultural sector, health and medical sector, and automotive and transportation sector.

Third, the Information and Mobile Application, or IMA Program: This program aims to support and promote R&D on information and mobile application to strengthen and add value to software and mobile industries, as well as other related industries in Thailand. The main research areas are information application and mobile/handheld/PDA applications.

Fourth, the Embedded Systems, or ES program: This program aims to supplement the design and construction of solutions for precision automation, factory automation, electronic terminals for RFID and smart card, automotive electronics, and general household gadgets.

Embedded systems are a combination of computer hardware and software designed specially for various application devices. It is expected that embedded systems will be used increasingly in new intelligent devices in automobiles, cameras, mobile phones, household appliances and toys. Furthermore, as the world is moving into the post-PC era, the requirements for embedded systems, especially in various kinds of gadgets and electronic devices, is increasing. Therefore, we believe that embedded systems is an area where both local hardware and software developers can play a role, and there are huge opportunities for local development, so we intend to build up this industry. Activities under this program will focus on three main application areas; those are embedded systems in agritronics, embedded systems for energy management, and embedded systems in consumer electronics.

As the world is moving into the post-PC era, the requirements for embedded systems, especially in various kinds of gadgets and electronic devices, is increasing, so this is also a potential area for local development

With respect to platform technologies, as I mentioned a bit earlier, we emphasize on three areas: sensor technology, security technology, and knowledge engineering technology.

First, Sensor technology program: This program aims to capture new opportunity of using sensors in several areas such as consumer electronics, health care, ICT, agricultural and automotive industries. As sensors are to be used in many devices, they offer potential in terms of business applications for local development.

Second, Security technology program: This program responds and handles incidents concerning computer security on the Internet. It aims to ensure safety of information on computer systems and reduce risks from cyber crimes. As technologies related to security (information, computer and network security) will play a more significant role in a connected world, we believe this area will be increasingly important and therefore, it's necessary that we build our capacity as well as human resources to catch up with technology development in this area.

Third, Knowledge engineering technology program: This program focuses on the development of technology capabilities on knowledge management. It is based on engineering discipline that involves computational knowledge processing. The program aims to help solving industrial problems and providing technology solutions for the knowledge society. This includes technologies for acquisition, collection, access, process, sharing and integration, and service of knowledge.

In carrying out our missions, especially those pertaining to R&D we have 15 in-house laboratories conducting technology R&D as follows:
1. Embedded system laboratories
2. Industrial control and automation laboratory

3. Software engineering technology laboratory

4. Open source software development laboratory

5. Computer and peripheral testing laboratory

6. Photonics laboratory

7. Nano-electronics and MEMS laboratory

8. Optical and Quantum communications laboratory

9. National security technology and innovation laboratory

10. Network technology laboratory

11. Knowledge elicitation and archiving laboratory

12. Large scale simulation research laboratory

13. Human language technology laboratory

14. Image technology laboratory

15. Biomedical signal processing laboratory

Furthermore, we seek alliances from both academia and industries to work with us in all research programs through our external funding mechanism. The principle we use is that the needs of the industry comes first, then we try to look for technology solutions to help address those needs and problems, to assure that our technology development activities exist to serve the real demand in the market. In working out the solutions, we may do on our own, or collaborate with others, especially the universities.

To help enhancing local value-added of the Thai electronics industry, we have established Thailand Microelectronic Center or TMEC, which specializes on wafer fabrication technology. TMEC is tasked with the work to develop human resources who are capable of a more upstream technology as well as to help establish an upstream industry that would give the added value to the country. Presently, TMEC has identified our niches to focus on the creation of silicon bio-chips and bio-sensors, rather than chasing after the latest CMOS technology. Other areas of research include the development of nanotechnology silicon microphones and silicon loudspeakers.

Recently, we have announced one of our flagship program called Digitized Thailand. This program aims to develop Thailand's national digital archives by collecting and transforming all physical data scattered around the nation into digital form and allowing people at all levels to gain access to an enormous wealth of knowledge at any time and from anywhere over the Internet. The rationale of this program is that in the near future we would enter the content industry era and therefore we must find ways to manage and handle the growth of content and information effectively and efficiently. It is hoped that once completed, this program will help to improve the literacy of Thais and push the country towards being a true knowledge-based society.

The three-year project, which will run from now until 2010, will start by collecting Thai-based data available on the Internet and put it into the archive. The development includes

encouraging local libraries as well as many institutions across the nation to convert useful physical data into digital formats for further development. The program will focus on five major aspects: knowledge, language, culture, history and tribes. NECTEC will develop a framework to set guidelines for data collection and digitization. It will also include standards development on interoperability, data management, information search and information security to allow all data to be digitized, stored, shared and accessed using the same format while facilitating information exchange across the network.

In the development process, several technologies are involved, for example,

- Natural language processing technologies including a web crawler, are key elements to help deliver information scattered in many places to users.
- Knowledge-engineering technology, including large database management system and data mining technology also plays an important role in building and maintaining knowledge-based systems
- Other technologies including networking, security and the development of an application program interface (API) will help to help facilitate access, search and to deliver information to users through various devices.

The success of this program will thus requires strong collaboration from several organizations and I would like to call your attention that NECTEC would be glad to work with everyone to drive this initiative forward.

Lastly, I would like to touch upon some other challenges which we, as a research organization, have to keep in mind while moving ahead, for example:

- Hardware development would progress dramatically and would be totally different from how it was many decades ago. In the future, hardware might no longer be silicon-based, but would be based on molecular and quantum computing; molecular computing which focused on the computational power of molecules and aimed to achieve faster and more cost-efficient information processing with a lower consumption of energy would emerge over next 10 years, coming sooner than quantum computing. And this is important because the fundamental equipment will be transformed and if a computer's structure is changed, the concept of writing software writing will also be changed.
- The connection between humans and technology would be based more on natural language processing and computers would not just be on desktops, but would be everywhere around us and become more robotic in nature and be able to function in many ways.
- The look of operating systems and software tools would change and would become more intelligent.
- There would be a greater use of software applications.

With these profound changes ahead, the challenge to the industry, therefore, is how to further serve users' requirements and offer the greatest benefits to them. And our research programs must prepare to adequately address these challenges and work closely with the industry to bring about technology solutions that are appropriate for the country and at the same time, have the potential to be exported to foreign markets. Nevertheless, NECTEC is just part of the whole system. To make technology research and development in the country really successful, we have to work with partners in all fields. Most importantly, we must be friends and partners, and we must bring about trust when we come to work together.