APEC Center for Technology Foresight (APEC CTF)*

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Abstract

Increasingly, more people and institutes, both national and international, are interested to learn more about technology foresight. This article uses the terms "Technology Foresight" and "Foresight" interchangeably to represent all types of foresight process designed to cover any project topics and scales. Moreover, we recognize foresight as a different type of activity with different emphasis on the importance of technology. To elucidate the above statements, multi-economy foresight projects are likely to be concerned with the interactions among physical science, social science, technology, economics, environment, and politics as noted in the adopted foresight definition (3rd paragraph on the Introduction).

Technology foresight explores how and why certain technologies should be developed to serve the needs of our future societies, starting from a vision to a reality. It could be claimed that the APEC Center for Technology Foresight (APEC CTF) was the first multi-economy foresight organization. This article covers experience derived from APEC CTF's activities and foresight practices, which is hoped to be a contribution to the global community.

Introduction

APEC[1] Center for Technology Foresight is enthusiastically stepping into its seventh year in 2004 and is heading towards the new multi-economy foresight studies in the year 2004 and 2005. The center was established in February 1998 in Thailand, with support from the APEC through the Industrial Science and

* http:/www.nstda.or.th/apectf

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Technology Working Group (ISTWG). [2] Thailand, as an active contributor to this project, hosts the center under the kingdom's National Science and Technology Development Agency (NSTDA).

APEC CTF aims to serve and involve all the member economies and to develop and diffuse foresight capability across APEC through multi-economy studies, foresight networks, training workshops, consultancy, and related activities. The center's adopted definition of foresight is:

> *"Foresight involves systematic attempts to look into the future of science, technology, society and the economy, and their interactions, in order to promote social, economic and environmental benefit."*

Organizational Structures

APEC CTF receives advice from an International Advisory Board (IAB) of international experts and a Steering Committee (SC) of Thai officials. While the former provides advice on APEC CTF programs, the latter ensures the undertaking and accountability. The center has six staffs.[3] The financial budget of the APEC CTF is provided by the Royal Thai Government, APEC Central Fund through participation of experts on the multi-economy projects, and in-kind contributions from APEC and non-APEC economies.

Foresight Expertise

The foresight techniques include scenario creation, Delphi survey, technology roadmapping, discussion workshops, patent analysis, critical technologies, etc. The APEC CTF's key areas of expertise are scenario creation and Delphi survey, but technology roadmapping is being used increasingly.

• Scenario Creation

APEC CTF has been using scenario planning workshops at all levels[4] of foresight projects, i.e., multi-economy, national, sectoral, and organization. Previous experience showed that scenario creation technique was quite successful compared with the Delphi survey technique. It is an excellent and flexible tool for group discussion, brainstorming, and networking among the stakeholders. In addition, it opens gateways to explore new ideas for planning, implications, policy setting, and decision making. APEC CTF conducted scenario workshops for six multi-economy foresight projects from which 19 alternative pictures were drawn.

• Delphi Survey

From the regional Delphi survey experience, APEC CTF learnt that Delphi processes contained both advantages and disadvantages. For example, Delphi is an excellent foresight technique for obtaining ideas from experts on a large scale and the processes had worked well in a single economy. However, the procedures required tremendous time and intensive resources on the logistics and identifying experts and their expertise was difficult on the multi-economy scale. Furthermore, requesting the experts' questionnaire answers was burdensome. Another weak point found in the regional Delphi processes was that the question about "year of realization in APEC economy" was impractical because experts in other specific areas did not fully understand the impacts of the issue and could not predict precisely the year of occurrence on each question.[5] Other disadvantages included language diversities, cultural varieties, and levels of technological readiness within APEC.

In the two methodologies, the degrees of the stakeholders' involvement are slightly different. Participants at scenario creation workshops contribute their insights and wisdom individually while Delphi processes involve larger number of specific experts' opinions through the questionnaires to provide a consensus. Importantly, without such involvement, a foresight project could not succeed. In addition, the outputs and outcomes of the projects depend on the organizers' ability to enlist the relevant representatives of the stakeholders who are decision-makers, administrators, practitioners, clients, and customers.

APEC CTF Foresight Projects and its Activities

• APEC-Wide Foresight Projects

By the end of 2003, APEC CTF had completed six[6] APEC-wide foresight studies. All projects were developed and focused on science and technology. Criteria of the topic selections were adopted from the survey opinions on potential topics at APEC CTF's feasibility studies. APEC CTF captured the principles that were gradually developed at the IAB meetings. The final set of criteria included:

1. The issues concern most member economies, with at least four agreeing to participate in the study and potential to share the results with all the rest;
2. The issue transcends national boundaries so that it can go beyond anything that might be achieved by a national or bi-lateral study;
3. The issue is likely to be of general, public concern/benefits and not one that is likely to be dealt with by the private sector; and
4. The issue has important technological components but not necessarily "high-tech" ones.

The procedure of the APEC-wide foresight projects needs various processes. Normally, they involved four key elements of the foresight process which are "inputs", "foresight work", "outputs", and "strategy".[7] In addition, APEC CTF has adopted stages of the projects into three major phases: pre-foresight, main foresight, and post foresight.

The pre-foresight involved project initiative concerning of the above criteria of topic selection. Consensus support was essentially the important part of the initial step. Significantly, the processes were developed according to the APEC Guidebook[8] which provided suggested guidelines on managing the financial aspects, reporting, and evaluation aspects of APEC projects. Official proposal along with project cost calculations submitted to the Budget Management Committee (BMC) for budget scrutiny and approval. Preliminary, inputs of the pre-foresight stage involved strategic information gathering from experts' opinions in recognizing important issues. Appropriate foresight methodologies i.e. scenario creation, Delphi survey, and technology roadmapping were identified deliberately and thoroughly along with overview and position papers from experts from specific areas were built comprehensively.

Once the first stage was completed, APEC CTF became fully in charge of the main foresight activities, i.e., building up the roles and identification of the key players, and acquiring outputs and outcomes, and/or potential policy implications derived from stakeholders participated in the project - from workshops, scenario creation, and policy development. This stage included extensive numerous managerial activities and logistics.

At last, the post foresight stage was to disseminate outcomes of the foresight project studies among the APEC region and to widen their impacts. Post foresight might include publications, presentations, visits, seminars, and follow-up studies.

• Foresight in APEC

APEC CTF had played an important role in promoting foresight and its activities throughout the APEC region. More than a dozen APEC economies have already recognized the benefits of technology foresight. Furthermore, many articles and presentations by the APEC CTF have been produced for national and international events. In some APEC economies, foresight has been institutionalized as a national body of long-term planning while sectoral foresight projects are increasingly initiated through training workshops and consultation in such countries as Malaysia, Vietnam, and Thailand. APEC CTF is often invited to give advice and consultations.

▸ Foresight in ASEAN[9]

ASEAN consists of 10 countries[10], seven of which are members of APEC economies. APEC CTF was invited to facilitate the ASEAN Technology Foresight and Scan Project. The main objectives of the project are to promote the foresight capability

among ASEAN countries through workshops and pilot projects, to establish regional networks of foresight champions, and to demonstrate values of foresight activities. Each ASEAN country is provided with a portfolio of the foresight processes from project designs through implementations. It is expected that foresight team of each country will continuously receive support from national authorities. APEC CTF learnt that encouraging each country to finish their project proposal was the most difficult part due to their priorities and previous engagements.

▸ Foresight in Thailand

Foresight in Thailand has gradually been developed and may be classified into three levels: national, sectoral, and organizational.

At the national level, despite the six-year of the APEC CTF's operation, only two foresight projects were considered to be comprehensive nationwide. The exercises were conducted jointly with APEC CTF and its host, NSTDA. The first one entitled, *"Future Key Technologies for Thailand,"* used Delphi survey technique and took place in 1995. Issues of important technologies, year of realization of the technologies, and development constraints were included in the questionnaires. Unfortunately, the results of the study did not influence either national policies or NSTDA's. The second project was about *"Science and Technology in the Year 2020"* ran from 1999 to 2000. This project attempted to create awareness on the importance of science and technology and to connect them with the social and economic development of Thailand. Inputs from stakeholders generated 13 commissioned papers, which involved status, strategies of science and technology, and future directions of the sectors.

APEC CTF successfully encouraged sectoral foresight projects in Thailand. Other local agencies were urged to undertake foresight projects through a variety of methods that suited their needs. To duplicate the success of APEC-wide foresight projects, the first sectoral project was on "Technology for Learning and Culture in the APEC region 2020," followed by "IT for Education" and "IT for SMEs" from 2001 to 2002. Another sectoral project was entitled "Thailand Drug Systems," which was organized by Thai Health Research System Institute in 2003. The institute learnt through scenario planning workshops and became a proven success of foresight capability diffusion while the institute's medical doctors and pharmacists gained first-hand experience in foresight process and methodologies.

APEC CTF gave advice and consultation to Thailand's state enterprise Public Warehouse Organization in 1999, National Metrology Institute of Thailand, an autonomous public agency, in 2000 and Technology Promotion Association (Thailand-Japan), a private organization, in 2002. The main objective was to apply foresight to their strategic repositioning. Foresight was increasingly used by many other organizations; however, the confidentiality of the private sectors posted a major difficulty for us to observe and obtain information about their foresight movement.

• APEC Technology Foresight Network, APEC TFN (http://www.apectf.net)

The APEC Technology Foresight Network was initiated and developed through the support of the National Research Council of Canada (NRC) in 1999. The project was officially launched and fully operated in late 2001. Its website was designed to be a pathway to foresight-related information and for foresight experts and practitioners to enhance communication among themselves to stimulate collaboration, development of foresight techniques, and best practice within APEC economies and globally. Members are able to share ideas and experience through their foresight projects and publications. Importantly, it is expected that the project will provide an efficient way to diffuse the results of foresight activities. APEC CTF is

the moderator that facilitates the exchange of information, ideas, and foresight expertise, and continues its efforts to campaign for new members and attractive discussion forums. Currently, there are 83 membership profiles[11], 36 experts, 19 organizations, and seven events.

The most difficult part of this project is to promote an interactive discussion forum on APEC TFN's website against the disinterest of its members. APEC CTF is currently seeking advice from experts in encouraging members to have active discussion on the TFN' s website platforms.

• Training and Consulting Activities

Since the APEC CTF establishment, we have been offering training workshops and consultation services to the APEC economies. Various trainings were held throughout the member economies. APEC CTF is occasionally invited to provide foresight information and demonstration. It is expected that such consulting services will assist and encourage national, sectoral, and organizational institutes to undertake foresight activities of their own and enhance their knowledge and experience. The most prominent accomplishment of these mentor activities was derived from the advisory roles to the Malaysian and Vietnamese institutes whose stakeholders actively exercise their foresight activities at all levels. So far, we have conducted three foresight workshops and one lecture for Malaysia. National Institute for Science and Technology Policy and Strategic Studies (NISTPASS) of Vietnam decided to establish a national foresight unit in 1999 with assistance from APEC CTF. An "APEC Symposium on Technology Foresight" was held in early 2001, followed by two more workshops for Vietnam's food-processing and tea industries.

In addition, APEC CTF has organized a yearly training on "Tools for Managing the Future" since 2002. The training courses are designed to promote and develop competency in using a portfolio of foresight tools such as scenario planning, Delphi survey, technology roadmapping, environmental scanning, and etc.

• Foresight Conferences and Public Seminars

Foresight conferences gave participants opportunities to learn and reflect on the latest foresight studies among stakeholders, foresight experts and practitioners. Since 1998, APEC CTF has organized nine foresight public seminars and conferences, most of which taking place in Bangkok, Thailand. National Institute of Science and Technology Policy (NISTEP), Ministry of Education, Culture, Sports, Science and Technology of Japan invited APEC CTF to be a co-organizer of the two international foresight conferences in Tokyo in 2001 and 2003.

Far from being a mere theoretical report of the academia, the face-to-face interactive conferences, as we have learnt, have created a generous resource of valuable knowledge, wisdom, and ideas shared among foresight experts, and encouraged promising foresight collaborations.

• Website (http://www.nstda.or.th/apectf)

Since October 1997, the website has been providing information about foresight and APEC CTF's activities to its member economies as well as the global community. It is also an information resource on technology foresight and an open gateway for interested visitors. Research papers, foresight articles, and reports are available for free downloads.

Active movements on the site reflect increasing curiosity and demands for foresight knowledge. Currently, there are over 170,000 visitor counts or an average of 70 hits per day.

• Publications

Several publications and reports were produced since 1998. They can be categorized into three types: general books on foresight, articles on foresight experience and activities, and conference papers. Furthermore, every APEC-wide foresight project produced two volumes of report studies that were distributed extensively among APEC economies.

There were also numerous foresight presentations in the area of science and technology. Some materials concentrated on specific projects while others involved APEC-wide foresight studies.

• Future Plans

Due to numerous operational obligations, APEC CTF has to prioritize its activities. First of all, it is seeking collaborations for future regional foresight projects from member economies. Secondly, the center is submitting an official project proposal to the ISTWG to get the approval for a "Future Fuels" project. Next are the post foresight activities and the follow-up of APEC-wide foresight projects with each economy. In 2004, APEC CTF will contribute more inputs from the sixth APEC-wide project[12] to the Life Sciences initiative in Thailand.[13] The foresight implications are intended to be technology-and environment-oriented. Finally, APEC CTF is developing itself to become the center of both foresight theory and practice within APEC while promoting active foresight networks and capabilities to serve the region.

Conclusion

The increasing number of visiting counts on APEC CTF's website each year proves that foresight movements on various issues have attracted more attention from every corner of the world. However, many people especially those who are involved with APEC CTF's foresight activities, might feel discouraged to transform their interest into actual practice because they do not fully understand foresight concepts. Furthermore, some may discontinue their foresight participation, feeling that foresight processes are too complicated and time-consuming.

At the national level through the APEC CTF's learning experience and involvement in diverse activities, it appears that foresight reports have insignificant impact on science and technology policies or on NSTDA itself. Perhaps this is because foresight is still a new concept in Thailand and the process needs a "champion" at high level participation from the high-level authorities. Furthermore, implementing results derived from foresight processes into policy-making inevitably faces challenges in handling abstract information and confidentiality, not to mention political conflicts, cultural differences, social concerns and egotism of those involved, etc.

However, thereafter, in 2003, important impact of the fifth APEC-wide foresight project on nanotechnology had revealed; consequently, nanotechnology project initiative of Thailand conventionally occurred. The nanotechnology has been realized important in the future.

Despite all restraints, the national and international institutes along with the public and private sectors should continue to explore the future of foresight because, in the long run, valuable knowledge and solutions to many problems could arise from such attempts for the benefits of the global community.

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Notes

1. Asia-Pacific Economic Cooperation is a cooperative grouping of "member economies" located around the Pacific, Currently, it has 21 members: Australia, Brunei Darussalam; Canada; Chile; Hong Kong, China; Indonesia; Japan; South Korea; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; Philippines; Russia; Singapore; Chinese Taipei; Thailand; USA; and Vietnam.
2. Industrial Science and Technology Working Group which its goals and objectives relate to the following statement of APEC Leaders in their Osaka Action Agenda: *"Our vision for the twenty-first century is of a dynamic and prosperous Asia-Pacific region built on the development and application of industrial science and technology which improves quality of life while safeguarding the natural environment."*
3. Six staff members: Executive Director, 2 Policy Researchers, 2 Assistant Policy Researchers, and an Administrator. (The number of staff members increased from three to six in October 2001)

4. Sripaipan, C., APEC CTF' staff members. (2003). Presentation at the Second International Foresight Conference, Tokyo, Japan. *Foresight Activities and Strategic Policies of Thailand.*
5. Tegart, G. *Multi-country foresight activities.* (2001) *Experience of the APEC Center for Technology Foresight, presented at the International Conference on Technology Foresight.*
6. Six APEC-Wide foresight projects completed: 1. Water Supply and Management in the APEC Region 2. Technology for Learning and Culture in the APEC region to 2010; APEC Megacities: 3. Sustainable Transport for APEC Megacities 4. Healthy Futures for APEC Megacities 5. Nanotechnology: the Technology of the 21st Technology 6. DNA-Analysis for Human Health in the Post-Genomic Era.
7. Voros, J. *A generic foresight process framework vol. 5.3 2003 pp. 10-21. The Emerald Foresight.*
8. Guidebook on APEC projects, published by APEC Secretariat, 4th Edition, August 2000.
9. ASEAN: Association of Southeast Asian Nations.
10. Brunei Darussalam, Cambodia, Indonesia, Laos PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam.
11. Each profile contains personal information, contact address and URL, foresight expertise and experience, lists of publications and projects, interests, and etc. Memberships are classified as "expert" and "organization". Events can be posted freely by members or non-members.
12. DNA-Analysis for the Human Health in the Post-Genomic Era.
13. The project was powerfully initiated with the collaborations of the US and the Thai governments.

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