Introduction

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Biographical notes: Benjamin J.C. Yuan received his PhD Degree in Electrical Engineering from State University of New York at Buffalo. He was the founder and the first Chairman of the Institute of Management of Technology at National Chiao Tung University, Taiwan, in 1991. He served as a visiting scholar at the Massachusetts Institute of Technology (MIT) and the British Royal Academy in 1990s, and his name was listed in the *Who's Who in the Computer Industry for 1990* and the *Who's Who among American Young Men for 1990*. He was also recognised as an 'Outstanding Teacher' by the Taiwan government in 1994. The International Association for the Management of Technology (IAMOT) has awarded him an outstanding researcher in 2004, and he also has been the Editor-in-Chief of several leading domestic and international journals.

Alfred Li-Ping Cheng is currently Associate Professor at National Chiao Tung University and jointly a research fellow at the Chung-Hua Institution for Economic Research. He received his PhD in Economics at Northern Illinois University. His teaching courses at Universities are Economics, Microeconomic Theory, Transaction Costs Economics, Science-Technology Policy and Economic Evaluation, Information Economics, Game theory, and Taiwan and China Economies. His research has been focused on transaction costs analysis and institutional economics, with applications on corporate governance, information economics, service and technology strategy, innovation and entrepreneurship, SME and business development, sports economics, financial economics, foresight studies and STI policy.

The term 'national-level technology foresight' was coined in 1984 by Irvine and Martin in their book and Lederman's paper. In the 1990s, two decades after Japan first conducted technology forecasting in 1971, many nations began to conduct national foresight activities. In 1999, many researchers like Martin, Grupp, Cuhls, Georghiou, Slaughter

and Kuwahara published influential case studies and theoretical papers that provided the foundation for the current research. In the 21st century the benefits and importance of technology foresight research is now understood and more widespread practiced. Technology foresight has become one of the most useful and popular instruments for S&T policy-making, long-term planning, and resources allocation decision-making.

Nowadays, the majority of reports, websites and document information generated by about 40 countries are of educational or promotional purposes, but many are still logical and structural information and valuable experiences that can be found in the academia journals. This special issue reviews theories and practices by Martino, Georghiou, Cheng, Porter, Kobayashi-Kumeno-Shirai-Inujima and Yuan et al. on national foresight and the related activities such as regional foresight, consensus building, new typology of foresight and some recent advances on methodology. Distinguished papers are selected from around the world with different prospective. The unique but flexible nature of foresight mechanism as an emerging policy formulation tool is demonstrated by Glenn, Damrongchai-Keenan-Tegart, Park-Son, Gong-Cheng and Yuan et al. Meanwhile, implications from each country's experience are drawn with practice-base. The papers highlight insightful lessons of internet-based decision support system on foresight programme can be a good reference for researchers and practitioner. The major contributions are as followed.

Firstly, they categorised on analytical and academic publications and established bases on understanding the insights and benefits of foresight, the empirical cases of foresight, foresight methodology, and the risk and implementation framework of foresight. The reviews on the literature tried to answer the pressing concerns for Taiwan's foresight projects by an overview and organisation of journal papers on national foresight. In their research, the application of the SDOS search engine of Inderscience and Elsevier was used to screen 494 relate papers published from 1984–2005 in which 117 key papers were selected. By doing this, three distinct periods, four trends and six implications for Taiwan's national technology foresight were identified. The identified six selection types of foresight field models provide benchmarking criteria for international comparison.

As for the typology of foresight, Porter's paper posits nine dimensions to distinguish different types of foresight studies. It arrays a rich repertoire of 13 families of foresight methods. It then suggests considerations in deciding which of those methods suit the various types of foresight endeavours. Porter stresses that there is no one-way to effectively conduct foresight studies. 'Technology Foresight' conveys multiple meanings. Even more importantly, those different meanings encompass a variety of different objectives. Meeting those objectives requires a variety of methods. In this paper, Porter strives to lay out the key dimensions on which technology foresight activities differ and to suggest how they imply different ways to perform the requisite analyses.

Secondly, consensus building is one of the key issues on participative foresight even though it has become a popular tool in planning science and technology policy. Despite consensus building being listed as an important dimension of the advantages of foresight, few studies have discussed foresight from the perspective of consensus building. The paper by Yuan et al. systematically review three participative foresight cases based on three preconditions of consensus building, and attempts to draw some implications based on the comparison of these cases. The paper contributed on conducting an analysis based on three dimensions of consensus building, including definition of problem, structure of negotiation, and motivation to participate, using three

national foresights, including UK Technology foresight in 1994–1998, Swedish foresight in 1998–2000, and German FUTUR in 2001–2004. Their analysis reveals some significant factors of consensus building in participative foresight.

Martino's paper delineates several recent advances in technology foresight activities, particularly those involving more powerful methodology. Topics discussed include the Grey Model, several new models of diffusion of innovations, and important idea about the roadmapping method. Some of the most significant advances of the past few years are discussed below. These specific advances have been selected either because they represent significant progress along traditional lines of research in technology foresight, or because they appear to offer something completely new to the field of technology foresight. The paper focuses on these important advances, rather than attempting to survey the entire field of technology foresight.

Another new unveiled model is called NeXT. In the paper by Kobayashi et al., they focus on the methodology of setting the themes for R&D. In order to promote R&D more effectively, namely – the NeXT model, which consists of two stages: foresight of the priority areas based on the conflicts between near-future trends and verifying the priority areas – show a method for calculating a degree of conflict using FURPS+ model. In addition, they evaluated this methodology by comparing with the results of the 7th Technology Foresight, which was conducted using the Delphi method. The NeXT model comes in compliance with the characteristics of the current society in which the link between technology and society is stronger than ever before, all the while applicable to a wide range of fields.

The implementation of foresight in recent years has changed from the focus on traditional analysis to group and network communication. A major trend in foresight is the use of the Internet for mass participation. The integration of expert meetings and blogs helps to reduce the cost of foresight and facilitates the process of reaching a foresight consensus. Cheng's paper argues that the way of knowledge organised and the relevant policy formulated be more closely related to the structure of decision support system as a network of a nation. The transaction-cost explanation helps reshape the organisation of foresight institutions in their role and rights structure which in turn invokes a well-established decision support system.

In Glenn's paper, around 90 interviews were conducted around the world to collected opinions about globalisation and risk management of science and technology. Globalisation with exponential acceleration of knowledge stimulates all areas that interact, creating even further acceleration of changes in S&T and innovation activities, causing new synergies, leading to new capacities. The synthesis of interview about risk management identifies seven interdependent elements including International Definitions and Initial Guidelines, International S&T Organization, University Education, Global S&T fund, S&T Forums, Media, and International Treaties.

Georghior, Keenan and Miles assess the impact of the UK's evolving national foresight programme' assesses the impacts of three-stage National Foresight in the UK based upon a recently completed evaluation by PREST. Characteristics and contents of the three cycles of exercise are analysed and reviewed. It is worthy of noting that the UK exercise is aiming to set priorities and build networks as a broad instrument of science and innovation policy to a set of science-based discrete projects reaching across government.

In order to more effectively evaluate, and assess the impact of foresight on policy, Damrongchai, Johnston and Tegart's paper proposes a typology of foresight outcomes.

Based on their typological foresight study on human health care, foresight is progressively being embedded into policy decision as a planning, consultation and decision-making tool.

Park and Son highlight a Korean foresight activity aiming at the year on 2030. Expert committee, Delphi-survey, and scenario workshop were adapted in the process to widen the participation of stakeholder and to enhance link to policy measures. The authors demonstrated the foresight idea and refined for the future-based demands and needs through widening up the participation of stakeholders and policy makers. This practice resulted in an internally consistent decision support mechanism.

Recent national foresight conducted in China is analysed by Gong and Cheng about China's technology development aiming towards 2020. China conducted Delphi survey in six fields of information, biotechnology, new materials, energy, environment and resources, advanced manufacturing to help the constitution and the conduction of its national medium and long-term science and technological development plan. The result indicated an important insight towards closing the technology gap between China and the leading countries. The adoption strategy of cooperation between China and leading countries is also implied.

Yuan et al. discusses a popular internet tool, blog, as a consensus forming mechanism in foresight. Two main studies were conducted, including mechanism design study and an experimental study based on semiconductor material industry in Taiwan. The paper also compares blogs of foresight in various nations and an experimental blog of foresight on semiconductor materials. The experiment verifies the advantages of cost effectiveness and time efficiency, resulting in good response of blog as a foresight platform.

The justification from studies in this issue provides path-dependent research pattern: 1984–1998 was the emerging and gradual growth period with research based on the collection and comparison of national foresight; and 1999–2005 was its rapid growth period, where many researchers reviewed the implementation of national foresight and proposed new frameworks for applying methodology and evaluation. Currently, the trends in this domain are moving toward:

- the integration of quantitative and qualitative methodology for the design and evaluation of national foresight
- the increasing cross national border and field foresight activities as well as using electronic tools

The remaining unsolved issues, at least, are:

- the further development of the optimal procedures of technology foresight
- having more choices available on the evaluation framework of foresight

Foresight studies seem to vitalise many policy issues worth further studies.