Science and Public Policy, 37(1), February 2010, pages 31–40
DOI: 10.3152/030234210X484784; http://www.ingentaconnect.com/content/beech/spp

Critical success factors for government-led foresight

Jonathan Calof and Jack E Smith

This paper reports on an integrated research program involving three related studies that examined successful foresight programs. It analyzes the key factors that appear to determine whether or not foresight, once launched by a government, can be successful. The study was performed by a team of researchers in Canada in the period 2005–2007. It found eight key factors, beyond the usual ones associated with the application of leading edge methods. The overall conclusion is that the methodology, appropriate budget and techniques alone are insufficient factors to explain the success of foresight programs. The interview results indicate that success is ultimately defined as the impact of the foresight exercise on government policy, and as the growth of the foresight function. Taken together, the results should help organizations establish the parameters for a successful foresight program.

CANADA HAS DEVOTED considerable energy to understanding the whys and wherefores of foresight, largely as a prelude to asking what would be useful to do and how it might be resourced and scoped to connect to emerging policy challenges. A review of the literature reveals much in the way of foresight methodology and the rationale for foresight but little about the factors that lead to foresight success. As will be reported later in this paper, even the concept of what constitutes *foresight success* does not appear to be well defined. This paper reports on two related studies that examine successful foresight programs. It analyzes the key operational success factors that appear to determine whether or not foresight, once launched by a government, can be successful and why. In this approach, we are not attempting to question the degree to which the prevailing political-foundational context is supportive, since we wish to focus on the determinants of success once the basic context has already (or mostly) been assured and is in place.

A common theme emerged in the interviews. Although there can be a wide range of benefits associated with the foresight process, all interviewees mentioned the importance of the results of foresight being used to inform or guide policy decisions. Thus, program impact via policy appears to be the most important macro-objective for foresight. This makes sense not just because of the alignment of interests but also because, in the present era of public funding accountability, remaining viable in the long term seems to be a critical indicator of success.

In terms of critical success factors it was interesting to note that all the studies showed that foresight delivery and reporting methodologies were very similar around the world and so best methods practice is spreading rapidly within the foresight community. Thus, although the methodology of foresight study and focus is important, it is insufficient as an indicator of success.

Eight factors were identified as the critical keys to success in government-led foresight programs:

- Focus on a clearly identified client.
- Establish a clear link between foresight and today's policy agenda.

Jonathan Calof (corresponding author) and Jack E Smith are at the Telfer School of Management, Desmarais Building, University of Ottawa, 55 Laurier Avenue East, Ottawa K1N 6N5, Canada; Emails: calof@telfer.uottawa.ca and jesmith@telfer.uottawa.ca.

This paper is a revised version of a paper presented at the Third International Seville Seminar on Future-Oriented Technology Analysis: Impacts and Implications for Policy and Decision-making, held 16–17 October 2008 at Seville, Spain. At the time of writing, Jack E Smith was Senior Advisor Federal Foresight and Innovation Strategy, Defence R&D Canada.

Jonathan Calof is recognized as one of the leaders in intelligence and business insight. A professor of international business and strategy at the Telfer School of Management at University of Ottawa, he combines research and consulting in competitive intelligence, foresight and management insight in the creation of the university's management insight program. He is a director of the Intelligence Teaching and Research Academic Network, a global intelligence network, and a board member of the Canadian Association of Security and Intelligence Studies. He is a prolific author with over 150 publications to his credit and also serves on the editorial board of several publications.

Jack Smith has been an adjunct professor at Telfer School of Management at the University of Ottawa since 2009. He has had over 25 years of experience of federal government policy, technology and innovation program development. Since founding the Office of Technology Foresight at the National Research Council in 2002, he has led or been an advisor to collaborative foresight projects in several emerging science and technology (S&T) domains such as: biosystemics; nano–bio–info convergence; bio-products; future fuels for APEC economies; animal health; bio-health innovation and stewardship, and future professional readiness for physicians and veterinarians. He maintains active connections with foresight organizations in Europe, Asia, the US and Brazil.

- Nurture direct links to senior policy-makers.
- Create strong public–private partnerships.
- Develop and employ methodologies and skills that are not always used in other departments.
- Ensure a clear communication strategy.
- Integrate stakeholders into foresight programs.
- Take advantage of the existence of, or create, a national–local academic receptor and training capacity.

While we are quite confident about focusing on those factors which enable foresight to be successful once launched by government, we are less clear about the necessary pre-conditions for initiating foresight that can be positioned for success. Thus, we conclude the paper by identifying a series of questions that will require further research to confirm the influence of political-foundational and mandate factors on foresight structure, delivery strategies and operational positioning.

Methodology

The primary study methodology was interviews with the directors of successful foresight programs to learn from them what factors led to success and, of course, how they defined success. The first step was then to identify successful foresight programs. Thirty experts from ten countries were sent a brief questionnaire and asked what they thought were the best contemporary foresight organizations, and which factors were instrumental in their assessment of those organizations.

About 15 experts from ten countries and five international organizations responded. In the second phase, we examined the institutions viewed as having the best foresight practices and we conducted detailed phone and/or email interchanges and interviews trying to establish their reasons for success (how they evolved, how they are structured, their wish list, their view of problems). An assessment of this qualitative data was coupled with more quantitative data (budgets, number of employees etc.) to identify similarities and commonalities in answers and design that could be used to develop a list of best practices. The interviews were also designed to elicit the institutions' perception of what constitutes foresight success.

Organizations and representatives interviewed included: Forfas in Ireland, the National Institute for S&T Policy (NISTEP) in Japan, the Asia-Pacific Economic Cooperation (APEC) Center for Technology Foresight in Thailand, FinnSight 2015 (encompassing a mix of Nokia plus three government agencies (VTT, TEKES, and SITRA) and the Helsinki University of Technology) in Finland, Foresight in the UK, the Denmark National Technology Board, and a leader in regional foresight in Spain.

In the next phase, nine foresight institutions identified during the first study were contacted, direct contact was then established and we then wrote to them requesting additional information, both to confirm the results from the first study and to obtain more detail on motivations, budgets, results etc. The results of the interviews were examined by an expert group who in turn selected commonly recurring comments made by the foresight directors that appeared to be critical success factors. Finally, these factors were used to examine Canada's nascent foresight program to predict whether or not it would succeed.

Foresight: how is success defined?

At the most basic level, success can be defined as attainment of the foresight programs goals. The problem is that, as past studies have found, there are numerous and diverse goals (see Table 1).

Ladikas and Decker (2004) similarly identified the broad impacts of foresight exercises which they divided into technological/scientific aspects and societal impacts (see Table 2). However, there are some who feel that success should not be based on program impact. For instance, according to Hennen (2000: 154) technology assessment is:

> ...not designed to directly influence political decision making, but to prepare knowledge that is relevant for decision making.

Given the range of defined goals and measures of success, one of the objectives of the research was to look at how the practitioners of foresight defined primary program success. After a comprehensive review of foresight evaluation and evaluation in general, Barre and Keenan (2006) concluded that an

Table 1. Foresight: FTA objectives reported by the European Foresight Monitoring Network (EFMN)*

A review by the authors of reports on mapping foresight by the EFMN reveals the wide range of objectives that different nations and members of the European Community have used to guide their foresight design

Quality of products

- Produce future-oriented materials for the system to use
- More informed science, technology and innovation priorities
- A source of inspiration for policy system actors
- Development of reference materials for policy-makers and other innovation actors
- Creating a language and body of practice for thinking about the future
- More comprehensive, multi-lens approaches to accommodate diversity

Networking and collaboration are prominently featured in most foresight processes, with the result that the organization and quality of the social interactions are themselves key objectives

Organization and quality of social interactions

- Aid and help elaborate discussions of the future
- Creation of new networks and clusters of expertise, re-positioning of old ones
- Support the empowerment of (innovation and futures) systems actors
- Facilitate thinking out of the box, challenge mindsets
- Establishment of communications structures between innovation actors
- Contribute towards the development of actor identities

Foresight provides many opportunities for enhanced learning about how complex systems can be adapted, so as to gain agility and strengthen preparedness

Learning effects – impacts

- Supports system actors to create their own futures
- Gain insights into complex interactions and emerging drivers of change
- Detect and analyze weak signals that enable actors to 'foresee' changes ahead
- Provide anticipatory intelligence about the systems and their changes to system actors
- Promote collective learning through open exchanges of information and experiences
- Stimulation of others to conduct their own foresight exercise after being inspired
- Enhanced reputational position and positive image of those running a foresight exercise
- Creates a shared vision amongst diverse actors
- Builds trust and shared basis of experience between system actors
- Facilitate better understanding of potentially disruptive change
- Development of significant new ways of thinking about challenges and opportunities
- Highlighting the need for systemic approaches to both policy making and innovation
- Accumulation of relevant experience in how to think about the future and using foresight tools to do so
- Better understanding of a territory's strengths and competencies

Finally, most foresight projects are explicitly designed to appeal to policy-makers' needs for more certainty, or reduced levels of risk, even about prospective situations or events that contain inherently unpredictable aspects

Impacts in terms of strategy formulation for action

- Support decision making
- Strengthen strategy formulation: better informed about risks
- Better evidence-based policies
- Improve policy implementation
- Using foresight to evaluate and future-proof strategies and priority actions
- Making the case for increased investments in R&D

Note: * See the website of the EFMN <http://www.foresight-network.eu>, last accessed 3 February 2010

evaluation of future-oriented technology analysis (FTA) should be based upon an assessment of *foresight quality* in terms of the conjectures produced, as well as the integrity of the processes employed: e.g. debates, inclusiveness, actor alignment etc. and *foresight impact* in terms of learning effects, and strategy formulation for action by system actors. Conceptually, this would be a complex multifaceted evaluation based on the broad impacts of an FTA process. Similarly, Amanatidou and Guy (2006) have pointed out the direct and indirect benefits of FTA:

> Foresight programmes are usually evaluated in terms of the achievement of initial objectives and the scale and nature of direct, anticipated impacts. However, indirect and/or unanticipated impacts that fall outside the scope of specific programme goals and objectives have also been reported.

Most of the articles referenced in this section provide evidence for the broad benefits, both direct and indirect, associated with foresight exercises. However, what should be the dominant benefit of foresight? For determining success we need to clearly identify and articulate the intended direct benefits of foresight. Georghiou and Keenan (2004) recognized this when they wrote that:

> Despite the spread of foresight experience across Europe and beyond, there has not so far

Table 2. Foresight impact dimensions

Dimension	Impact issue		
	Raising knowledge	**Forming attitudes and opinions**	**Initiating action**
Scientific and technological aspects	*Scientific assessment:* i.e. assessing technology options in a transparent manner; comprehensive overviews of consequences included	*Agenda setting:* i.e. engaging in the political process, debates; stimulating public engagement and introducing visions, scenarios and other means to raise awareness	*Re-framing the debate*: i.e. suggesting or presenting a new action plan or initiatives to further scrutinize the problem and its key dimensions; and/or providing new orientation to examine established policies
Societal aspects	*Social mapping*: i.e. where the structure and intensity of conflicts are made apparent	*Mediation*: i.e. self-reflection amongst actors; 'blockade running' to resolve barriers; and bridge building to move forward	*New decision-making structures, processes*: i.e. demonstrating new ways of governance and ways to intensify the extent of public input and debate
Policy and implementation aspects	*Policy analysis*: i.e. policy objectives fully explored and existing policies evaluated	*Re-structuring policy*: i.e. more comprehensive policy content, more evaluation of policy through debate and higher perception of democratic legitimacy	*Decisions taken*: i.e. policy alternatives filtered, innovations implemented and legislation adopted

> been a serious attempt to understand its effects in aggregate. In particular, foresight has not been evaluated as an instrument of science and innovation policy. Thus the real effect of foresight on priorities may be difficult to determine.

This concept of direct impact was also identified by van der Meulen *et al.* (2003):

> In comparison to futures studies and forecasting, the literature on foresight has paid little attention to its actual strategic value.

Carlson (2004) also echoed these sentiments.

Foresight success: what factors are associated with foresight success?

We did not find much literature that looked at foresight success factors. Buetschi and Nentwich (2000) identified several context or foundational success factors for influencing the political role of participatory technology assessment (see Table 3). These studies tell us that FTA exercises should not be viewed independently of their contexts and they remind us that FTA is also a socio-political activity and should be understood as such. Rollwagen *et al.* (2006) looked at FTA from the corporate perspective and identified several criteria (content and process) for improving the effectiveness of foresight studies (see Table 4).

Survey process

From the preceding discussion, the objective of this paper and the study in general is to better understand exactly what foresight success is and the factors that lead to this success. Essentially, it involves asking a series of strategic questions to national foresight experts identified through global foresight networks, followed by our analysis and synthesis of the results. Conceptually, this study seeks to find the most successful foresight programs and study them.

The initial study, designed and delivered in the period 2005–2006 was a survey of foresight leaders around the world identified from international meetings, followed by an expert analysis that delved more deeply into best practices. Thirty experts from ten countries were sent a brief questionnaire and

Table 3. Success factors influencing the political role of participatory technology assessment

Societal	Institutional	Process properties
Good timing and public controversy	Political connections and linkages	Precise definition of political goals
Alignment with policy-making agenda schedule	Credibility and reputation of the sponsoring and performing institutions	Perceived fairness of the process
Political relevance of topic		Orientation of the product and practical implementation
Political culture open to informal participation		Involvement of political actors in the process

Table 4. Criteria for improving the impact of foresight studies

Foresight content criteria	Plausibility; convenience and usability of results; inspiration and appropriate temporal perspective
Foresight process criteria	Structured way of production and deliverance of foresight thinking; high levels of interaction; inclusion in organizational renewal procedures; ideational entrepreneurship; persistence and innovation, especially in communications; synchronization with the business agenda of the organization

asked what they thought were the best contemporary foresight organizations, and what factors were instrumental in this assessment of those organizations. About 15 experts from ten countries and five international organizations responded. The objective of this phase was to identify the organizations that the experts in foresight felt were the most successful.

Phase 1 of the first study asked the following questions:

- Which five countries do you believe have the most advanced, productive or successful foresight programs?
- Of the countries you have identified, can you point out some best practices or elements that you feel contributed most strongly to the program's success?
- What are some of the barriers to the establishment and implementation of a successful Foresight program? Are there pitfalls to be avoided?
- What are the critical differences in national foresight program models? Please provide examples.
  - Structure and organization?
  - Relationship to national government?
  - Resourcing?
  - Social vs. S&T focus?
- What, in your opinion, are some of the most successful assessments of recent foresight exercises? What tools/metrics/parameters work best to measure impacts?
- Can you point to any major policy, economic or scientific impacts that you believe can be attributed to a national foresight program?
- Please review our proposed list of countries/ individuals chosen for our direct survey. Are there any errors or omissions?
- Please feel free to comment on any aspect of Canada's foresight program or activity. Your advice and insights would be welcomed

In the second phase, we examined the institutions viewed as having the best foresight practices and we conducted detailed phone and/or email interchanges and interviews trying to find out their reasons for success: how have they evolved, how are they structured, their wish list, their view of problems. An assessment of this qualitative data was coupled with more quantitative data (budgets, number of employees etc.) to identify similarities and commonalities in answers and design that could be used to develop a list of best practices. The interviews were also designed to elicit the institution's perception as to what constitutes foresight success.

Foresight organizations and national foresight programs from the following countries responded to our first study:

- Forfas in Ireland;
- NISTEP in Japan;
- APEC Center for Technology Foresight in Thailand;
- FinnSight 2015 (encompassing a mix of Nokia plus three government agencies (VTT, TEKES and SITRA) and Helsinki University of Technology) in Finland
- UK Foresight, third phase 2004–2008; and
- Denmark National Technology Board and Spain Regional Foresight (also identified as countries that had used foresight in more specific applications related to national policy development).

Phase 2 of the first study focused the interviews on deriving a deeper understanding of the models and success factors identified from the answers to the phase 1 questions:

- What is the national foresight mandate?
- Who are the key clients of national foresight?
- What is the relationship of foresight to government policy and economic decision-making structures?
- What is the foresight funding model?
- What levels of resources has foresight received?
- How are foresight resources allocated?
- What is the foresight project selection process?
- How has the foresight program evolved over time?
- Do you have a foresight wish list?

In the final phase, senior representative(s) from the nine foresight institutions identified during the first study were contacted by email and/or through direct telephone conversations to request additional information, to confirm the results from the first study and to seek additional information and clarity. This study involved various qualitative and quantitative research methods including: a detailed literature review; a short email questionnaire; interviews with foresight practitioners, managers responsible for national foresight efforts in various countries, and; reviews of foresight project level summaries and overviews from the EFMN (part of the European Foresight Knowledge Sharing Platform which monitors and maps foresight activities all over the world) were undertaken (called Dynamo and consisting of foresight project briefs and other documents).

Our second study looked at the following countries:

- Ireland, Japan, Finland and the UK;
- Denmark (Spain was exchanged in favour of Australia to have more global diversity and three more European countries were added); and
- Australia, Netherlands, Germany and France.

The second study aimed to extend the analysis by asking the following questions:

- What motivated your government's foresight efforts in the first place? (What were the specific needs? What were the challenges? Were you copying other national efforts?)
- To whom did your country look to when starting its national foresight efforts?
- Did you need to build a business case for foresight in your government? How was that done?
- What were the direct outcomes from your national foresight initiative? (novel policy initiative(s), greater public foresight awareness, increased networking, new programs, direct impact on the innovation infrastructure etc.)
- Is there an annual budget for a national foresight program or foresight support in your country? What amount?
- How many full-time equivalent staff per year work in the national foresight program? (2007)
- Is financial support for foresight in your country stable, growing or decreasing in 2007–2008?
- Is there a central foresight web page? Are web links included?
- Is there a foresight support agency (or department) in your government?
- Are the foresight activities centralized or decentralized? (e.g. within a specific ministry or done individually in each agency with no central support or supported by some central foresight body or outside research institute or both)
- In your opinion, has your country done anything unique that is making foresight work in your context or culture?
- What do you think are the critical success factors?
- What has your country done in various foresight initiatives (national, supra-national, regional or sector) to promote public participation?

So much data was collected during these studies than it could not all be reported in one paper, so more papers will follow. For the purposes of this paper, however, we will only report on data related to the two primary research questions: firstly, what is defined as program success, and secondly, how is success attained.

Results

The definition of success

Overall the studies provide a rich array of insights and observations-data on the most dynamic public foresight programs in the world. As Table 5 indicates there can be competing primary and sub-objectives. This is consistent with past studies. This wide variety of goals makes the process of defining narrow goals and success measures quite complicated.

Despite the divergence of objectives, a common theme emerged in the interviews. All interviewees mentioned the importance of the results of foresight being used to inform or guide policy decisions. So we concluded that achieving program impact via policy appears to be the most important macro-objective for foresight: this makes sense not just because of the alignment of interests but also because remaining viable in the long term, in this era of public funding accountability, seems to be critical in itself as an indication of success. As many subjects stated, *survival is difficult without a visible and positive impact on policy.* This suggested two dominant criteria for success: impact and survival.

Table 5. Foresight objectives

Main objective	Sub-objectives
Increase societal and economic well-being	• Economic growth and national competitiveness • Societal well being, covering social, environmental, cultural and economic factors • Identification of solutions to problematic areas. (need-driven) • Understanding the interaction between technology and the society. (e.g. what is enhanced ? made obsolescent ? retrieved? reversed? –McLuhan Tetrad Model)
Define priority areas for technology policy	• Survey national technological development • Stimulate development in priority areas of technology development and research; thus stimulate the development in these areas • Better understanding the interaction among technologies and realize gains resulting from this interaction • Allocate funding for research and the improvement of industrial competitiveness
Develop technology and innovation policies	• Improve the co-operation among different stakeholders • Develop the planning and implementation of technology policy • Understand the best methods and use of foresight

Results: critical success factors

What is interesting to note from all the studies was that the foresight delivery and reporting methodology were very similar around the world and so best methods practice is spreading rapidly within the foresight community. Thus, while the methodology of foresight study and focus is also important, it is insufficient as an indicator of success.

Taken together, the studies identified many similarities. For example:

- Program architecture: In reviewing the collected data, there was relatively little program diversity seen from country to country.
- Audience: The target audience for all national foresight exercises appeared to be broad in scope, with single exercises typically having multiple audiences.
- Financial support for national foresight programs has been increasing or stable in all the countries that replied to the survey, including Japan, Ireland, the UK and Germany. The reverse appears to be happening in Canada, where the Office of the National Science Advisor, where the foresight program was being supported, was terminated in 2008.
- Sponsors: Governments (both national and sub-national) and government agencies were the main sponsors of foresight exercises accounting for 95% of the sample.
- Program spending. From the limited sample size, it is noticeable that Canada spends far less on national foresight efforts but comes out on par on spending in sector or industry foresight efforts;
- Methods used: Four methods were particularly popular: literature reviews, scenarios, brainstorming, and expert panels. The most striking result is the popularity of the four methods: largely irrespective of the types of outputs being generated.
- Outputs: In the nine-country sample, policy recommendations were the most common type of output from national and sub-national foresight exercises, followed by scenarios, analysis of trends and drivers and research priorities.

There were also interesting differences observed. For example many different governance structures were observed:

- In Ireland, Forfas[1] sees itself as the national policy advisory board for enterprise, trade, science, technology and innovation. It operates under the auspices of the Department of Enterprise, Trade and Employment.
- In Japan, S&T foresight activities feature a recurring national iterative Delphi technology poll, and also include a quarterly international journal. These are managed by the NISTEP within the Ministry of Education, Science, Technology Sports and Culture (MEXT).
- The APEC Center for Technology Foresight is a Bangkok-located applied research and foresight center established and supported by APEC, through active co-operation of Thailand and other APEC member economies, with Canada playing a prominent role as a strategic partner and project advisor. This center is hosted by Thailand's National Science & Technology Development Agency (NSTDA).[2]
- Finland has a mix of agencies but the key organizational factor is that there is a strong historical commitment to technology foresight and a central innovation and futures committee of the parliament chaired by the prime minister.
- Another difference was in the area of participants. The number of participants engaged in the foresight exercises was variable, with no discernable pattern or trend evident. There was a correlation with spending and program participants.

Therefore, it would appear that the administrative structure and many other factors which differentiated 'the successful programs' could not be viewed as key success factors. But as different as the programs were, there were many consistent comments in the interviews that provides the beginnings of a model on what is required for foresight success

- Focus(es) on a clearly identified client: In all cases these successful *functions were housed within a ministry responsible for innovation*. In Ireland this was the Industry Ministry while in Thailand it is the NSTDA. In Finland, the Parliamentary Committee on the Future is supported by a national fund for R&D (SITRA- government investment, augmented by a significant Nokia share sale in the 1990s) as well as by government S&T focused agencies such as the TEKES, VTT, (Ministry of Trade and Industry) and the Academy of Finland, part of the Ministry of Education. Not only were they housed within the correct ministry, this was identified as the primary client for the foresight results.
- Clear link between foresight and today's policy agenda: Using the most advanced foresight methods, matched to the specific task, ensures an effective link to current government actions. *A key requirement is to develop foresight capacity amongst senior decision-makers* so that they can integrate the important tools of technology foresight into advice to government. The UK seems to have developed this capacity the most where the science advisor has repeatedly been able to engage key ministries as joint sponsors and receptors for the results. However, all interviewees talked about the link between what they were doing (foresight exercises) and actual policy.
- Direct links to senior policy-makers: To have a better understanding of policy needs, to obtain much needed budgetary resources etc., the *foresight capacity and stakeholder organizations need*

to be linked with and provide regular briefings to senior policy-makers. This also helps in getting recommendations implemented. Many reported that this was either a normal practice or an ongoing challenge and that indicated progress was being made.

- Public–private partnerships: Most program experts extolled the good relationships they had developed with industry leaders, advanced technology firms or private sector advisors connected in some way to the national policy agenda and/or senior decision-makers. The actual form of the linkage varied from collaborative to co-operative to consultative, but the clear message was that a successful foresight program had to connect in some meaningful manner to private sector actors.
- Develops and employs methodologies and skills that are not always used in other departments: For example, Forfas came into being to address a government gap, i.e. there was a recognized need to use new and more forward looking approaches to help in policy setting. Thus, they brought intelligence and foresight methodologies to the table. APEC Center for Technology Foresight in Thailand has had its strategy planning and scenario approaches used by their host department to help the government itself establish its longer term strategies. In all cases, the *new function was bringing much needed methodologies that had previously not been fully exploited* within the mainstream departments of the government.
- Clear communication strategy: A strategy is needed that *serves to keep key stakeholders aware of ongoing projects and activities*. Excellent foresight is both time sensitive and attractive to those motivated to detect change ahead of its appearance, hence it has significant media value and communications reach. But it must also be well described so that the context of change, including both its challenges and opportunities, can be appreciated. All of the agencies contacted realized how critical this aspect of forward readiness has become. There was a range of creative communication approaches ranging from newsletters and websites devoted to key stakeholders to an approach of getting in the elevator with key decision-makers to give them 60 second elevator speeches.
- Integration of stakeholders in programs: The agencies investigated *all made use of key stakeholders in processes* such as project selection, information gathering and assessment, and provision of key recommendations. This factor while obvious has not always been easy to fully accomplish, and so many experts indicated that this presented constant hurdles to creating the levels of appreciation and support necessary to assure strong policy impacts. Furthermore, many indicated that it was necessary to retain these involvements beyond the period of the actual projects or initial foresight program, because they were an important part of validating the advantage of foresight to new clients and new topic areas.
- Existence of a national–local academic receptor and training capacity: A clear need at the start is a national–local academic receptor capability for foresight skills and training. Hiring from abroad is fine for the start-up phase, but participants consistently stated that one needs a local sounding board that can be aligned with the policy needs/capacities, through providing training, intelligence and policy ideas relevant to future challenges; (PREST-MIoIR at Manchester, UK is an example). Academics that can connect with stakeholders, provide legitimacy and know the methodology are a distinctive asset, and they provide a steady source of new ideas, intelligence and international foresight connections.

Applying the critical success factors to Canada's foresight program

Our studies have identified eight critical success factors. The strength of any model is its ability to assist and predict. In this section, all eight criteria are applied to the Canadian foresight program. At the outset it should be noted that the methodologies that are being used during the program have been evaluated in the past and have been found to be consistent with those associated with successful foresight programs. Thus, this part of the paper applies only the eight critical success factors that are additional to the methodology factor.

At an operational level, the nascent Canadian foresight initiative (2002–2008) was able to produce some excellent projects with strong insights, selectively engage some of the most forward looking senior policy advisors and establish itself as a recognized source of expertise with international partners. Over the years the program went through numerous changes, in the host organization (from National Research Council 2002–2004, to Privy Council Office 2005–2006, to Industry Canada 2007–2008). Table 6 summarizes how we applied the critical success factors to Canada's foresight program. As present (early 2010) there are some encouraging signs of a revival of interest by the Canadian government in a modest S&T foresight initiative so, the authors' assessment may have underestimated the longer term impacts of the activity of the nascent Office of the National Science Advisor (ONSA), which despite a low policy impact may have nevertheless created some appreciation for the contributions that foresight can make to general S&T preparedness.

Based on the studies that were done, the authors envisioned potential problems for the program and made recommendations consistent with the critical success factors identified. Canada's foresight program, based in the National Science Advisor's (NSA) Office was disbanded in March 2008 when the position of the NSA was terminated.

Table 6: Key success factors applied to Canadian foresight

Key success factor	Application – analysis
Significant and clear client: *slightly present*	Originally, it was envisaged that the NSA, reporting to the prime minister, would have the required senior client as well as the necessary stature to engage other cross-government senior clients, as in the UK. With a change in government and a progressive demotion of the NSA function as the new government became more confident in its abilities, this capacity was effectively erased, to the point in 2006–2007 where the only substantive client was the NSA and the science community, now mostly detached from the key innovation policy authorities. Further the funding for projects came from a diversity of government departments with no clear dominant client emerging
Link to current policy agenda: *limited direct evidence*	Since 2004, with two successive minority governments, the policy agenda has been clearly dominated by short-term priorities (sometimes only five years) thus rendering foresight, which tends to focus on five years plus, as not readily applicable to the current agenda, and not welcomed by those responsible for policy development. Despite this disconnect, some relatively successful projects related to health system innovation, bio-economy and enabling technologies convergence were completed that *could have* influenced the policy agenda had there been a policy receptor – most of these having been displaced by a highly centralized politically managed priorities exercise which tended to question the need for or exclude new information
Links to senior policy-makers: *some, but inadequate to defend the program*	Linkages have been mixed, with those domains where senior policy-advisors and policy-makers appreciate the need for longer term perspectives, being clearly more receptive and supportive of foresight initiatives. The result has been projects which align with some of the areas where policy will be required, (e.g. health technology, agricultural innovation, nano–bio–info interface issues) but are not presently at the top of the priority list, which is dominated by legislative domains such as anti-crime measures, tax relief etc.
Public–private connections: *evident but not strong enough to counter inside government weaknesses*	The various foresight initiatives all involved private sector leaders and stakeholders as participants but rarely as sponsors since there are barriers for government to receive private funds other than taxes. Essentially, the culture of government often tends to discourage full partnerships and strong connections due to mutual differences in operating norms
Novel methodologies: *evident but not distinctly recognized*	The foresight program was able to test at least five novel approaches and train over 300 senior government staff and managers in foresight methods so that at least a portion of the policy advisory system has had some exposure/familiarity to these methods
Communications strategy: *limited and without dedicated funding*	The program clearly failed to make inroads on strategic communications because no resources were assigned and current government procedures call for such resources to either be managed from the centre (prime minister's office) or more formally according to departmental needs. Neither case was well suited to the collaborative nature of the foresight process, and the change in government led to a more tightly controlled system for strategic messaging and press relations
Stakeholder integration: *somewhat, but limited by government process controls*	For the most part, key stakeholders at the senior staff and professional levels of organizations and industrial domains affected by the foresight were able to be involved in the process, although again a lack of assigned funds hampered the scope and limited the mechanisms that could be employed
Academic receptors: *somewhat, but little capacity existed in Canada for academic foresight in 2005–2008*	Canada has only a limited number of foresight focused academics, who are widely distributed and lacking in critical mass compared to PREST or Japanese universities, however, most professors who could be aligned with foresight in Canada had some connection to ONSA or to the Foresight Directorate, so despite a low receptor capacity, a reasonable level of connection was generated
Total: *only two out of eight factors were clearly evident*	*2008 Assessment: generally a failure (because) according to the two critical criteria: discernible impact on government policy has been low and the program as initially formulated did not survive*

Compared to most of the other nations represented in our study, Canada was unable to develop a sustainable, integrated foresight program. While the reason(s) for the failure of the program (despite the success of the outputs) continue(s) to be debated in policy circles in Canada, this paper posits that missing so many of the critical success factors doomed it to failure.

Clearly the success factor model has been relevant since, as early as in 2005–2006, it enabled the authors to predict the demise of the Canadian foresight effort.

Conclusion

Despite the diversity in program design and goals, policy impact appears to be a consistent primary objective of programs examined. According to most interviewees, success creates impact, and impact creates survival. In looking at the critical success factors it was clear that they go beyond methodology.

Together the two studies provide plenty of guidance and a list of considerations that are relevant for designers of foresight systems, structures and processes. The key requirement seems to be creating the close linkages with policy-makers that in turn appear to be mainly dependent upon their sensitivity to future challenges, their orientation to the importance of considering diverse futures and the urgency and complexity of problems facing the national policy community. In the words of one interviewee:

> The real problem is not knowing what different countries do, which does not differ much from country to country, but determining how or if the results of the foresight assessment were integrated into policy making in real time. If this

> is not done, then the exercise is of minimal or no value.

This study has produced a list of eight key success factors in addition to the usual ones associated with the application of leading-edge methods. Further studies should validate these factors by applying them to different foresight organizations, both those that succeeded and those that failed. In addition, this study focused on a small set of foresight practitioners (30) and organizations (9), future foresight assessments may wish to expand the sample base in an attempt to both validate the critical success factors and potentially identify new ones.

This is just the beginning of what we hope will be a stream of other research that helps identify factors leading to foresight success. Finally, each of the factors identified needs to be studied in more depth. For example, while we learned that a clear communication strategy was felt to contribute to foresight success, exactly how should these strategies be designed? What are the components for a successful communication strategy? Who should be involved? Who should the target be? Much work is needed on all eight identified key success factors. The foresight literature is rich on the issue of different methodologies and project selection but not on the seven factors identified in this study.

Finally, this study has identified *policy impact* as what should be the key measure of foresight program success. Unfortunately, as was described by Barré and Keenan (2006), research in this area is limited:

> Pleas from sponsors of FTA activities for better accounts of demonstrable impacts are as old as FTA itself. Yet, little work has been done in this area, with most accounts of impacts confined to individual case study descriptions.

The authors endorse the need for further assessments of foresight impact, survival and the dynamics of managing regime transitions that remain a continuing challenge to foresight advocates and practitioners

Notes

1. See website, available at <www.forfas.ie>, last accessed 3 February 2010.
2. See website, available at <www.apecforesight.org>, last accessed 3 February 2010.

References

Amanatidou, Effie and Ken Guy 2006. Interpreting foresight process impacts: steps towards the development of a framework conceptualising the dynamics of 'foresight systems'. Paper presented at the Second International Seville Seminar on Future-Oriented Technology Analysis, held 28–29 September 2006, Seville, Spain.

Barré, Remi and Michael Keenan 2006. Evaluation, impact and learning. Paper presented at the Second International Seville Seminar on Future-Oriented Technology Analysis, held 28–29 September 2006, Seville, Spain.

Buetschi, D and M Nentwich 2000. The role of PTA in the policy making process, EUROPTA Final Report. Copenhagen: Danish Board of Technology.

Carlson, L W 2004. Using technology foresight to create business value. *Research Technology Management*, **47**(5), 51–61.

European Foresight Monitoring Network Mapping Reports 2005–2007. Available at <http://www.foresight-network.eu>, last accessed 3 February 2010.

Georghiou, Luke and Michael Keenan 2004. Towards a typology for evaluating foresight exercises. Paper presented at EU–US Seminar: New Technology Foresight, Forecasting and Assessment Methods, held 13–14 May 2004, Seville, Spain.

Ladikas, Miltos and Michael Decker 2004. Assessing the impact of future-oriented technology assessment. Paper presented at EU–US Seminar: New Technology Foresight, Forecasting and Assessment Methods, held 13–14 May 2004, Seville, Spain.

Rollwagen, Ingo, Jan Hofmann and Stefan Schneider 2006. Criteria for improving the business impact of foresight at Deutsche Bank: lessons learnt in mapping trends. Paper presented at the Second International Seville Seminar on Future-Oriented Technology Analysis, held 28–29 September 2006, Seville, Spain.

Van der Meulen, Barend, Jan de Wilt and Hans Rutten 2003. Developing futures for agriculture in the Netherlands: a systematic exploration of the strategic value of foresight. *Journal of Forecasting,* **22**(2/3), 219–213.