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The development of technology foresight: A review

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ABSTRACT

The term "foresight" has long been used to describe readiness to deal with long-term issues (especially on the part of governments). This term "Technology Foresight" took off in the 1990s, as European, and then other, countries sought new policy tools to deal with problems in their science, technology and innovation systems. Large-scale exercises drew in numerous stakeholders as sources of knowledge and influence, and the prominence of these exercises led to "foresight" being used much more widely to describe futures activities of many kinds. While few new tools and techniques have been developed in these exercises, they represent an unprecedented diffusion of forecasting, planning and participatory approaches to long-term issues. Futures approaches are, in consequence, far more officially acceptable and legitimate than in the past.

1. Introduction

In the 1970s and 1980s, I was engaged in futures studies at the Science Policy Research Unit (SPRU) at Sussex University. Mainly this was deskwork. I was fortunate in that the desk was near those of some of the world's most creative and insightful researchers into innovation processes, and I was immersed in the rapidly expanding field of innovation studies. From the mid-1990s I was swept along in (and sometimes surfed) the wave of technology foresight activity that built up from this time. This moved well beyond deskwork, with groupwork of various kinds, engagement of large networks, and relations to policy processes. My perspectives are inevitably shaped by these experiences, though I have attempted to validate them through literature review and discussion with other scholars.[1]

Innovation researchers at SPRU played a central role in shifting terminology, and indeed in catalysing the wave of foresight activities that exist around the world. In the early 1980s, John Irvine and Ben Martin examined the application of futures methods to Science and Technology (S&T – and STI will refer to S&T and Innovation) policymaking round the world. Their books, *Foresight in Science* in 1984, and *Research Foresight* in 1989, explored how priorities are set (mainly by governments) in funding research [1,2].

Earlier SPRU work on technology futures – with which Irvine was well-acquainted – had been labelled "anticipation", "forecasting", and "futures studies" [3–5]. Irvine and Martin (I&M) introduced the term "foresight", according to Martin[2], partly as a humorous counterpoint to "hindsight". SPRU researchers had undertaken retrospective analyses of the sources of innovations, and were familiar with "Project Hindsight", which traced the origins of contemporary technologies [6]. Indeed, I&M devoted the second chapter of *Foresight in Science* to outlining Project Hindsight and other retrospective studies of innovation.

I&M's influential studies foregrounded "Foresight" as a popular way of describing broad programmes of study of research and innovation plans and priorities in the light of potential long-term future developments. Though neither of their books carried the term in their titles, "Technology Foresight" (TF) became widely used to describe such programmes. This essay cannot review all of the experience generated by Technology Foresight Programmes (TFPs) in the last twenty years (see [7]). It focuses on how one terminology became so influential in describing a set of approaches in futures work. Partly the terminological shift is, as Linstone

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[1] Thanks in particular to Clem Bezold, Jim Dator, Aant Elzinga, Luke Georghiou and Ben Martin.

[2] See his paper in this issue.

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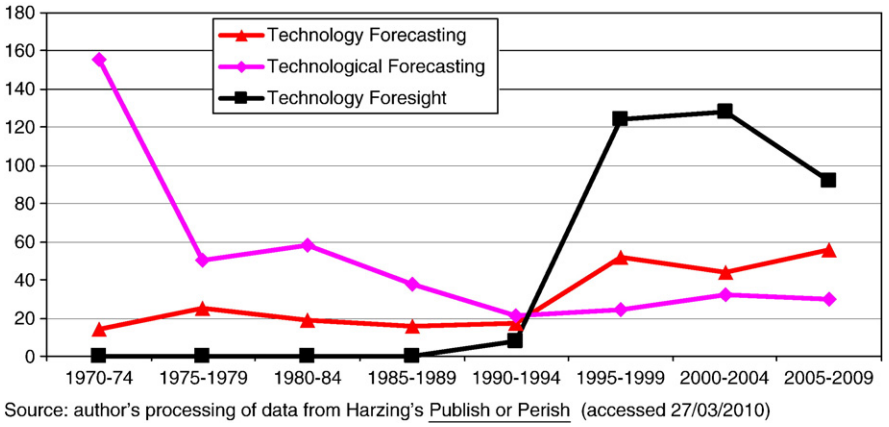

Fig. 1. Publications featuring key terms in their titles, 1970–2009.

hints in his introduction "On Terminology" in this issue, simply a matter of fad and fashionable labels. Partly it signifies specific approaches with specific emphases within the futures field. This essay will explore just how distinctive and novel these are.

The terminological shift is displayed in Fig. 1, using data generated from Harzing's "Publish or Perish" [8].[3] The graph contrasts publications with the terms "technology foresight", "technology forecasting", or "technological forecasting" in their titles – concepts to which authors are directing readers' attention.[4]. Despite very noisy data,[5] the results are striking and plausible. TF emerges from nowhere, in the 1990s, to be easily the most widely used term.

2. Foresight in hindsight

"Foresight" has a long etymology, referring to a capability that humans have exercised for time immemorial. The word was familiar enough in Renaissance England to be used in Congreve's *Love for Love* (1694) – Mr Foresight is an illiterate believer in signs and portents. In an industrialised world, H G Wells argued for systematic study of future implications of new technologies. *Anticipations of the Reactions of Mechanical and Scientific Progress upon Human Life and Thought* (1901) [9] projected a better society, consciously shaping human affairs and an "ampler future". Three decades later he expostulated:

> "…though we have thousands and thousands of professors and hundreds of thousands of students of history working upon the records of the past, there is not a single person anywhere who makes a whole-time job of estimating the future consequences of new inventions and new devices. There is not a single Professor of Foresight in the world." (1932 radio broadcast – p90 in [10])

More systematic approaches to technology forecasting were undertaken in the USA. The 1937 National Resources Committee (NRC) report, *Technological Trends and National Policy including the Social Implications of New Inventions* [11], argued for examination of regularities and trends in technology invention and development:

> "Though the influence of invention may be so great as to be immeasurable … there is usually opportunity to anticipate its impact upon society since it never comes instantaneously without signals. For invention is a process and there are faint beginnings, development, diffusion, and social influences, occurring in sequence, all of which require time. From the early origins of an invention to its social effects the time interval averages about 30 years." (p.iv)

The terms "forecasting" and "prediction" are used repeatedly in this report. "Foresight" appears twice, more or less as a synonym for "forecasting"; "technology foresight" or "technological foresight", are absent. The NRC study was led by the sociologist William F Ogburn, who had earlier examined the patterns of invention, and developed the theory of "cultural lag" – difficulties faced by societies in keeping pace with technological change. (For a useful compilation see [12]; on Ogburn's contribution to innovation studies see [13]). The NRC study – and Ogburn's work on measurement of social change[6] – was

[3] This program works with information derived from Google Scholar, cleaning the material somewhat, and allowing the user to process it in various ways.

[4] The term "foresight" alone is unsuitable for such a data analysis exercise, because it is used in a number of contexts that are far removed from forecasting and futures studies. The journal *Foresight* dates from 1999, *The International Journal of Foresight and Innovation Policy* 2004. Of course, other journals have a long lineage: for example *Technological Forecasting and Social Change* and *Futures* both date from 1969.

[5] There are many publications with no date assigned to them, and there are some evident mistakes and duplications. There is no reason to think that these problems vary systematically across the various terms used.

[6] Ogburn was pivotal in developing what we now know as social indicators and social reporting: his long-term orientation was grounded in empirical analysis of current developments. He concluded that statistical work often failed to demonstrate the expected wide and rapid social change in the wake of policy changes such as the New Deal; many social structures and processes are relatively slow-moving, in the face of political as well as technological initiatives.

commissioned during the Great Depression. Fundamental questions were being raised about the course of social and economic development; the limitations of market mechanisms were stressed by political movements espousing scientific planning and technocracy.

Technology forecasting proceeded to develop its tools and techniques, with contributors to the NRC report like Ogburn and Samuel Gilfillan playing important roles in developing methods of scanning and trend analysis in numerous subsequent studies. In post-war America, a wide range of futures methods were developed in military planning and the space programme. Technology forecasting was accompanied by methods of scenario planning and strategic analysis in the military context, and the space programme saw an emphasis on "normative" forecasting approaches ("how can we get a man on the moon?").

3. Foresight in the United States

"Foresight" was just one among many words used to describe long-range forward-looking activities. Marien included it among a long list: "also known as futures studies, futures research, futurology, futuristics, futurics, foresight, forecasting, prognostics" [14]. "Foresight" seems to have been mainly used to describe activities in US government – Clem Bezold has recently looked back at this experience [15]. Bezold's 1978 book, *Anticipatory Democracy* discussed foresight (defined on p118 simply as "systematic looking ahead"). for the US Congress [16] A day-long seminar in 1975 on "Outsmarting Crisis: Futures Thinking in Congress", for instance, had been developed by the Committee for Anticipatory Democracy[7] at the request of Senator John Culver and others. The Congressional Clearinghouse on the Future was subsequently initiated, to provide future-oriented services to members of Congress and their constituents.

Senator Culver had also been a member of the bipartisan Bolling Committee – the House Select Committee on Committees – that proposed a series of reforms for the House of Representatives. One was the House "foresight provision", adopted in 1974. This directed each House committee (except Budget and Appropriations) to:

> "review and study any conditions or circumstances which may indicate the necessity or desirability of enacting new or additional legislation within the jurisdiction of that committee (whether or not any bill or resolution has been introduced with respect thereto)"

and to continually:

> "undertake futures research and forecasting on matters within the jurisdiction of that committee." (see [17]).

Though Bezold now remarks [18], that "the provision is there, yet seldom complied with" (p124), it did trigger futures work: a Futures Research Group was established in the Congressional Research Service, working with outside experts and committee staff to organise congressional hearings. Another use of the term "foresight" is in the Foresight Seminars on Health & Innovation (formerly, the Foresight Seminars on Pharmaceutical R&D), running since the 1970s.[8] The aims were: early warning of emerging issues that might become the subject of legislation; improved awareness of future prospects when preparing legislation; encouraging conscious coordination of policies across committees (examining how legislation might impact across areas, setting priorities through the budget process, etc.); and supporting oversight activities of Congress and committees [15].

The Office of Technology Assessment (OTA) was set up in 1972 as an arm of the U.S. Congress, to provide it with authoritative analysis of the complex scientific and technical issues of the late 20th century. Though a significant player in long-term analysis of technological change, it seldom referred to "foresight" (surprisingly, given the use of the term elsewhere). The word appears in fewer than 10% of the 700+ documents published on CD-ROM as the *OTA Legacy Volumes*.[9] In almost all cases, it appears just once, to refer either to forecasting or futures work, or to sagacious judgement about long-term prospects. There are two exceptions.

First, a 1982 report [19] discusses the relationship between modelling efforts and governmental foresight. This cites John Richardson's "Toward Effective Foresight in the United States Government", a June 1979 study for the U.S. Department of State — on institutional barriers restricting foresight capabilities. Many of these themes remain resonant forty years later.[10] The use of "foresight" in this 1982 OTA study veers between "forecasting" and intelligent assimilation of forecasts. When it discusses proposals for improving Government foresight, among its four fundamental priorities is to "link the Government's foresight capability with its policymaking and management activities" (p61). This also resonates, with the effort to link Technology Foresight Programmes to STI policymaking seen in Europe in the last decades.

[7] Bezold refers to important contributions from Alvin Toffler and Jim Dator.

[8] A list of seminars from 1978 to 2003 is available at: http://www.altfutures.com/foresightchronicle/PDF/seminarlist.PDF Some feature mainly short-term policy analysis, others confront long-term threats and opportunities. Some focus on technology issues, and thus are juxtaposing "foresight" with this technology orientation.

[9] OTA publications are available online at http://fas.org/ota/search-ota-reports/ (consulted 10/03/2010).

[10] They include: lack of top-level support for foresight; lack of experience with work by the "best talent" on broad, long-term issues; bureaucratic rigidity, compartmentalization and specialization, along with time pressures, reducing cooperation among departments; policy-level officials changing position or interests while analyses are ongoing, and lacking knowledge and experience to properly use models; modellers failing to make their work comprehensible or relevant; poor communication between users, contractors, and producers of models and forecasts; lack of political interest (from policymakers and the public) in the long-term future.

Second, a 1995 report introduces "technology foresight" when the UK TFP is included in a review of scientific priorities in other countries [20]. TFPs worldwide were gathering momentum – but the OTA's days were numbered. A conservative Congress deemed it an unnecessary luxury, and it was closed in 1995.

This helps to explain how the *Handbook of Technology Foresight* could conclude that

> "There is remarkably little use of the term in the futures literature until the 1990s: it is possible to search the major texts and handbooks without any use of the term – or if it is employed, it is merely used in passing as a convenient synonym, and is not dwelt upon. There are few reference points for scholars attempting to ground the term in a futures tradition…" ([21] p7)

This is an accurate account of the futures *literature*, especially technology-oriented analyses. In contrast, the use of the term "foresight" was quite well established in US government and other public arenas (e.g. Jim Dator was working on "judicial foresight" – the first judicial foresight conference was held in Hawaii in 1972 [22]); but few publications emerged using this terminology. The term "Technology Foresight" itself was hardly ever encountered in these discussions of governmental foresight. A notable exception is an essay written by Cahn and Primack's [23] discussing the signing of the 1972 Technology Assessment Act (establishing the OTA as an office of the United States Congress). Their use of the term foreshadowed later TFPs' orientation to informing policymakers about future opportunities, risks, and contexts for their decisions. But until the European TFPs of the 1990s, the OTA made little reference to "technology foresight".

This also helps situate Joseph Coates' elaboration of the term in 1985[11] – independently of the emerging European TFP movement – in an essay on foresight in government

> "Foresight is a process by which one comes to a fuller understanding of the forces shaping the long-term future which should be taken into account in policy formulation, planning and decision making … Foresight includes qualitative and quantitative means for monitoring clues and indicators of evolving trends and developments and is best and most useful when directly linked to the analysis of policy implications. Foresight prepares us to meet the needs and opportunities of the future. Foresight in government cannot define policy, but it can help condition policies to be more appropriate, more flexible, and more robust in their implementation, as times and circumstances change… It is not planning – merely a step in planning" ([28], p343)

Despite coming from a rather different tradition, the European TF movement widely cited this as a rare, authoritative definition of foresight. It identifies foresight with preparedness and not just forecasting, and with linking forecasts and planning. The further linkage to wide participation, a defining feature of many TFPs, is absent, however.

4. Technology foresight in Canada

The Science Council of Canada explicitly linked technology and foresight in the 1980s. Aant Elzinga – another leading scholar in social studies of science, science policy and research evaluation – prepared a 1983 feasibility study, *Foresight as Anticipatory Intelligence* [29]. This preceded the Science Council's "national consultation" on Emerging Science and Technologies (EST).[12] It established a Unit for EST in 1984: with five staff members at its peak, this became known as the foresight unit (Elzinga, personal communication).[13] While the Science Council performed functions like those of America's OTA [30] its EST activities prefigured those of Europe's TFPs. It focused mainly on threats, opportunities, and national scientific and engineering capabilities, associated with innovation in generic technologies (new materials, microelectronics, biotechnology) and strategic topics (aquaculture, forestry technologies, and transport). It explored relevant social and economic trends, market demands, and factors like funding and public attitudes. Many of its tools reappeared in later TFPs: nation-wide surveys, expert interviews, workshops and panels.

Elzinga subsequently noted that:

> "the foresight process was often just as if not more important than the accuracy of the forecast; … the deliberations involving many different actors, scientific and nonscientific, spurred a consensus building process that made it easier to effect various changes; … helped focus the different actors' vision and harmonize their views as to priorities and approaches in relevant areas of science. … [It] was anchored within scientific communities and in governmental decision-making machinery as well as industry, [this] was clearly important for the success or failure of the outcome, including subsequent efforts to effect change. Legitimacy and participation were two important elements in the whole process…. the whole exercise too was dependent on political good will. … a new government that did not see any need for research foresight but believed that the "picking of winners" would be taken care of by the market place… was able to ignore and proceed indirectly to dismantle the whole enterprise." ([31] p10)

[11] A 1983 study that reviewed "foresight" activities in over fifty organisations is cited much less frequently [24], and a 1990 study of foresight activities in US state governments again appeared before the European TF movement had really taken off [25] – see also the report on the second annual World Future Society seminar on "Government with Foresight" [26]. I have not yet located a copy of a 1988 book [27].

[12] I&M [2] see these Canadian activities as influenced by national consultations earlier held in France, and Elzinga had gathered intelligence on similar activities in other countries as well as visiting Washington to talk to the Congressional Research Services, OTA and others.

[13] A web search reveals that commentators retrospectively describe this as a research foresight or technology foresight unit.

These reflections resonate with subsequent European TFP experiences, which rediscovered the importance of learning and process benefits (consensus-building, networking) – and to avoid talking of "picking the winners". By then, a new conservative government had taken an axe to the Science Council, and the foresight unit was closed.

5. Technology foresight programmes

The explosion of TFPs in the 1990s brought the term "foresight" to prominence worldwide, eclipsing "forecasting" and "futures" as Fig. 1 demonstrated. The pivotal step was I&M's 1984 *Foresight in Science* [1]. At the time of this first study they had not encountered the Canadian work. I&M reviewed it in some detail in 1989 [2] – published roughly at the same time as the plug was pulled on the EST work. Nor was the more general use of "foresight" for US governmental activities picked up (OTA staff did not emphasise the term). I&M chose "foresight" as a play on the hindsight approach in innovation studies, and they also articulated the approach in terms familiar to STI policy analysts. Foresight was:

> "… the only plausible response … to resolving conflicts over priority-setting caused by escalating experimental costs, limited resources, complexity in scientific decision-making and pressures to achieve 'value for money' and socio-economic relevance. … a systematic mechanism for coping with complexity and interdependence as it affects long-term decisions on research, in particular facilitating policy-making where integration of activities across several fields is vital." ([2] p3)

I&M had been particularly struck by Japan's long-established Technology Forecasting (now Foresight) activities. Japanese researchers had visited the USA in the 1960s, to learn about tools for moving their STI policy beyond "catch-up", to the frontier of technological innovation. Japan's potentials and opportunities, across a broad spectrum of technologies, were examined, within networks of academics, industrialists, and policy makers, using tools like Delphi and systematic trend analysis. I&M noted the use of bottom-up inputs and the process benefits of the TFP; it was part of Japan's transformation from technology imitator to innovation leader:

> "the difference in the level of scientific foresight activities between Japan and other industrialised nations revealed very clearly in this study must be seen as one of the factors (and clearly there are many others of significance) contributing to the country's markedly better performance over recent years in technology-based industrial sectors" ([1], p152).

The implication was that European STI policies could use similar approaches to help upgrade innovation systems – European countries, in additions to worries about becoming also-runs in critical areas of technology, faced constraints on public expenditure alongside demands to increase science budgets.[14] enabling countries to compete better with the global technology leaders. But I&M argued that the Japanese cultural context and institutional environment mitigated against simply copying approaches developed for that different milieu.

I&M's 1984 work was funded by the UK's Advisory Council on Science and Development (ACARD), the Government's main advisory body on S&T matters, which sought ways of identifying promising areas for R&D. Their 1989 work was funded by the Dutch Ministry of Education and Science's Directorate General for Science Policy. The Netherlands pioneered European TFPs, experimenting with "Foresight studies" for strategic technology policy decision making, by the beginning of the 1990s [32]. Public and private stakeholders were brought into assessment of emerging technologies, so as to develop common perspectives and coordinated actions.

This Dutch exercise constructed a list of fifteen important emerging technologies. Three priority areas were selected for in-depth analysis (on the basis of such criteria as widespread application potential) – mechatronics, adhesives technology, and chipcards and electronic labelling. Consultancy studies generated reports that informed strategic conferences, aimed at eliciting more views and mobilising change agents. van Dijk concluded from the experiment that:

> "considerable emphasis should be given to *learning approaches* rather than deterministic forecasts and blueprints…. The relevance of the *process* of a technology watch as an interactive communication and learning path exceeds the intellectual value of the end report…. We need a form of *concerted action:* not the content, but the interaction, the actors, and the different stages and timings ought to be planned for and facilitated by the government…. The production and transfer of knowledge is a two-way process in which the cognitive and normative values of the participating actors change permanently. All stakeholders in the foresight process have their own interests, knowledge, and vision. Together they produce possible pictures of the future that can become self-fulfilling prophecies when they act according to the knowledge generated during the foresight process. … legitimation and authorization are needed before starting a foresight experiment. Perhaps the participation of high-level field experts and departmental decision makers was a critical factor in our process. But … you also need the employees in the line to prevent "not invented here reactions." The involvement of strategic thinkers, expert knowledge on specific technologies, and also positive attitudes from decision makers and implementation agencies will improve the later applications of the results. … Governments can operate more successfully when they act as coproducers with other stakeholders in a more incremental planning process." ([32], pp233–234)

[14] An additional factor was political controversies around some new technologies, as concerns about skills and employment, inequalities, and environmental issues, privacy and human identity were crystallising. Policy tools like technology assessment and research evaluation were widely introduced in Europe – including TF, whose emphasis on broad consultation and dissemination of results gave it the greatest public exposure.

The UK lagged some years behind the Netherlands. *Foresight in Science* was subtitled *Picking the Winners*; its jacket cover illustrated this with an illuminated plant dwarfing two shaded weaklings. But the Conservative Party in the UK had long attacked the Labour Government for thinking that bureaucrats could pick winners among different industries, when in the end they regularly taxed the successful; firms to finance losers. This was a favourite theme of Prime Minister Thatcher, who proclaimed at a press conference in 1985 that "you only win the business by producing the best design, the best value, and governments on the whole, as we learn from things like Lear Fan and De Lorean, are not the best at picking the winners". [33] Her political memoir continued to insist that

> "in a market economy government does not – and cannot – know where jobs will come from: if it did know, all those interventionist policies for 'picking winners' and 'backing success' would not have picked losers and compounded failure." ([34], p93).

I&M had not, of course, been talking about propping up troubled firms. The Dutch TFP formulation defined a middle way:

> "Governments that will not follow a strategy of 'picking the winners' or leaving "everything to the 'lottery of the market' try to find promising emerging technologies with potential for their economic system. From these they try to 'nurture' future winners." ([32], p223–4)

In the UK, TF become viable only after Thatcher's resignation. Although misalignment between science and commercial exploitation was recognised as a major problem, and ACARD in 1986 set out questions about how to identify key R&D areas, progress was not made until the early 1990s. An interdepartmental working group was established to consider methodologies for identifying and prioritising emerging technologies important to the UK. It proposed a TF-like exercise, piloted in late 1992. Ben Martin was commissioned to review research foresight approaches, and make recommendations for a national UK TFP. The 1993 White Paper on Science and Technology Policy, *Realising Our Potential* announced this forthcoming TFP. It stressed building new networks and establishing new working partnerships between scientists and industrialists. Bureaucrats would have to learn from other innovation stakeholders:

> "Government must therefore work closely with the scientific and industrial communities to determine the appropriate mechanisms for setting priorities both in terms of the areas of research to support, and the level of funds to be committed to them" ([35], p2).

The TFP, launched in 1994,[15] involved literally thousands of people. Expert panels elicited information from a wide range of sources, and identified key technological and market opportunities, for major technology sectors. After a frenetic year in which efforts were heavily structured around the need to feed in to imminent policy documents, the focus of activity became even more process oriented. [16] Such weight on the process of foresight, as well as the products it generates, is a frequent feature of TFPs.

A central feature of this and many other TFPs was engagement with numerous stakeholders and sources of expertise. "Fully-Fledged Foresight" in TFPs involves combining *prospective study* of long-term opportunities and alternatives (i.e. conventional forecasting and futures work – typically using multiple methods)[17]; *participatory orientation* (consultation and networking to access disparate sources of knowledge, to legitimate the process, and/or to embed knowledge into many stakeholders' planning and strategies – this is where the process orientation of TFPs is particularly significant); and *policy-relatedness* (fitting the exercise into policy debates and decision timetables – often a priority-setting and thus product-oriented process in the earlier TFPs – rather than remaining an ivory-tower affair).[18] [41] This combination of activities is certainly not unknown in the futures field more generally, but TFPs have made it a much more common approach.

The first and second cycles of the UK TFP (and other mid-'90s programmes in Germany, France, Sweden, etc.) took the form of free-ranging Foresight. The TFP surveyed a very wide spectrum of areas of STI, covering many specific fields of technology and many sectors of the economy. This approach was adopted in many other countries' TFPs, as nations sought to reorient their research funding systems or innovation systems more generally. (Many of these initiatives are examined in Georghiou et al, 2008; one point is that many countries that had previously been part of the Soviet bloc confronted very urgent requirements for such reorientation.)

In contrast, the Dutch and Canadian exercises – like the OTA's work, and that of the ongoing UK Programme's third cycle (commencing 2002) – are organised around studies of just a few specifically chosen areas at any one time. They are focused

[15] The Programme dropped the word "Technology" from its title early on, since this was seen as deterring potential participants from several areas of social and economic life. Its current website is http://www.foresight.gov.uk. (accessed 27/03/2010).

[16] As TF was promoted by international organisations, including the European Commission and UNIDO, the UK experience was widely disseminated. Just as the UK drew on the Japanese experience without slavishly copying it, so other regions could draw lessons from Britain's "fully fledged foresight". This, and the role of *process* benefits alongside such *products* as reports and priority lists, is stressed in such manuals as [36,37]. Some criticisms of the experience include (1) privileging technological over social innovations when addressing social problems and opportunities; (2) excluding most public services and public administration from the UK TFP; (3) the limits of participation and the scope for special interest pleading, even when thousands of stakeholders have been mobilised.

[17] Often using methods reflecting the four poles of the Popper diamond [38] – creativity, formality, expertise and interaction.

[18] The phrase "Fully-Fledged Foresight" was a reaction to the growing use of "foresight" to refer to all sorts of forecasting activity. But the combination of the three elements is not unique to TFPs – the French tradition of *la prospective*, at least in Godet's formulation [39,40], integrates a similar triplet (here, *anticipation*, *appropriation* and *action*). An emphasis on processes and learning is also apparent in this line of work.

Foresight [41].[19] The UK Programme, for example, now operates by running four or five projects at a time. Some are "push" issues emerging from technology development, others "pull" issues reflecting social or economic problems. Projects are only launched where high-level commitment can be elicited (such as having a Minister or Chief Scientific Office taking a central role or chairing the project steering committee). This ensures "ownership" of the Foresight results.

The UK Programme's third cycle was significantly reoriented in another way. The second cycle was seen as trying to appeal too diffusely, to too many stakeholders. In reaction, current activities are designed more to bridge gaps between different parts of government, which needs to tackle challenges and opportunities that defy departmental boundaries and responsibilities. (Bezold had advocated such a role for foresight in US government and legislature in the 1970s, though technology was not foregrounded as a cross-departmental challenge.) UK Foresight shifted from a concern with wiring up the whole national innovation system, to achieving better coordination among policy stakeholders around shared long-term perspectives. The current UK arrangements can be characterised as focused governmental foresight.

6. Conclusions

"Foresight" has long had the connotations of preparedness and prudence, as opposed to simply forecasting future contingencies. Prospective analysis is integrated into policy/strategy thinking/planning/action. This was apparent in the North American activities of the 1970s and 1980s, and was one of the central elements of Japanese TF from the 1970s, and then European TFPs from the 1990s on, together with TF activities now underway around the world today for informing STI policies. These have been heavily influenced by the European experience, which in turn drew on Japanese and American approaches. What has been added to the action-orientation is the participatory elements and process orientation of "fully-fledged" TFPs. The term "fully-fledged foresight" was introduced to demarcate the TFPs that bring long-term perspectives to bear on policy decisions, and encourage wide participation[20], from more limited activities. For the popularity of the term "foresight" has meant that it is also now used to rebadge far more limited approaches – shorter-term perspectives, more conventional forecasting work, academic research with little policy engagement, and desk-based studies and simulations without networking and broad knowledge bases. Definitions of the term proliferated, some banal, some informed by wide experience as in Coates' 1985 article, and respected futurist Rick Slaughter's 1995 *The Foresight Principle* [42]. Following his involvement in the UK TFP, Loveridge contrasts such activities with wider understandings of foresight [43].

Policy engagement is one thing, but policy discussions are frequently compounded with political conflicts. Even in the UK, whose TFP survived changes in government since the mid-1990s, views articulated in TF work can become political footballs. Specific scenarios or policy suggestions may be portrayed by opponents of the current administration as proving its pernicious intentions. With a new administration preparing major cuts in public expenditure, Foresight may well be vulnerable. The long view is often sacrificed in the face of immediate problems, and several important TF and technology assessment programmes have been destroyed elsewhere by partisan politics. The UK programme has had a major impact on the future orientation of several parts of the UK political system, as well as significantly influencing TFPs elsewhere [7]. It remains to be seen whether the UK programme is sufficiently well-embedded to maintain its current scale and effectiveness. Foresight approaches are far more widely known and appreciated now than in previous decades, so they may well be foresight without the programme.

7. Afterword

While the first draft of this essay with the journal editors, *Futures* (April 2010 issue) staged a debate about futures nomenclature, with the phrase "What's in a Name" appearing in the titles of these essays! The rationale for this debate – what should the futures field be known as? does it make sense to standardise terminology? – differs from that underlying the current essay. But points made there bear on the present discussion.

Sardar, kicks off the debate, being rather dismissive of the term 'foresight'. He cites Ruben Nelson's account of the rebirth of the Canadian Association for Futures Studies as Foresight Canada. "Nelson is correct to point out that the term foresight is much easier to understand for the lay public and managers than futures studies" ([44], p179). Since one of Sardar's problems with foresight is the lack of an equivalent in many languages (this probably depends on what idea one is trying to translate),[21] the public and managers are English speakers. Sardar mentions Polish as one such language: the semantic void has not prevented a recent TFP in Poland.

A second problem with the term "foresight" is rather puzzling, in that shortly after suggesting that

> "A great deal of foresight work is concerned with 'scenario planning', which, in my opinion, is devouring futures studies"

Sardar goes on to argue that

> "foresight is intrinsically singular in nature. The term suggests a monochromatic vision, a solitary way of 'foreseeing' with a sole outcome." ([44], p180)

[19] This term was introduced [39] to characterise the major shift in direction between the second and third "cycles" of the UK Foresight Programme (the word "Technology" had been dropped in the '90s).

[20] Such participation may vary between a substantial but simple widening of the expert pool involved, to a more or less large-scale programme of dialogue and consultation.

[21] Though he also asserts that every culture has some notion of "the future or tomorrow" (are these really the same?), he does not demonstrate that this makes it easy to grasp the concept of future studies.

Scenario analysis generally involves exploring alternative futures, rather than singular ones. Even multiple scenario analysis may be rather monochromatic: the alternatives can be extremely narrowly restricted "canonical variations". This was a justifiable critique of early US futurology, for example Kahn and Weiner's scenarios in *The Year 2000* [45]. It remains to be demonstrated that this is the typical case for TFPs. A quick inspection of the UK TFP's website will locate noncanonical scenarios.[22] Ben Martin as far back as 1995 stated that "The aim of foresight is systematically to explore … alternative futures. Thus, Foresight involves a consciously "active" attitude towards the future, recognising that the choices made today can shape or even create the future" ([46], p. 140). Rappert quoted this in *Futures*, Sardar's own journal [47]. Rappert's nuanced article critiques the rationalistic assumptions of TFPs, while acknowledging their responding to perceived future uncertainties.

Another essay seems to share this perception of foresight as being monochromatic (or *vanilla* futures?). Michael Marien's response to Sardar claims that ""Foresight," presently a term in ascendance, deflects attention from considering alternative futures" ([48], p190). It is hard to see that this is the case in major European TFPs. Some downplay scenario work, but others – notably the Norwegian exercise, but often elsewhere – put it at the fore. Projects within the UK TFP third cycle employ extremely diverse scenarios – for example, divergent trajectories of global governance of environmental issues underpin several studies (cf [49]). Futurists like Slaughter [42] explicitly use "foresight" to refer to a future preparedness that involves thinking about alternative futures. Marien is renowned for decades of concise and comprehensive accounts of the highlights of the evolving futures literature, and his opinion is not to be taken lightly. He may be sensing some uncritical tendencies in TFPs, or be responding to the reappropriation of the term "foresight" to more narrow activities.

Before the discussion of scenarios and monochrome visions, Sardar made a slightly different point.

> "When managers ask for foresight they are actually asking: how can I do this in the most prudent – that is careful and cautious – way to achieve the results that I want. That is a legitimate question; but it is not a question about alternative potentials of the future. What the managers and bureaucrats want is a product—something that tells them, à la Lenin, what is to done to avoid certain pitfalls or make the most of certain future potentials. And I think that is the real essence of foresight: it is product oriented. This is why foresight is most commonly associated with business and bureaucracies like the EC which use the term exclusively. And it has the added advantage of the illusion that the product comes wrapped with wisdom—with foresight!" ([44], p180)

TFPs are liable to be constrained by the needs of managers and bureaucrats – an accusation has long been levelled against the work of futurists more generally. (For early versions of recurrent criticism see [50], and [51] in which Irvine is already discussing the application of futures methods in exploring political or technological change to help achieve social goals. Among more recent critiques, Monbiot vituperatively criticizes the UK Programme [52]). He who wants a tune, must speak to the piper (or find other musicians). But the argument about "product orientation" completely fails to grasp the process orientation of much TFP activity. The stress on networking, on linking up the innovation system, or sharing and coproducing visions and strategic thinking, is fundamental to much TF, noted clearly when Elzinga reflected on 1980s work, [31] in van Dijk [32]; in Ben Martin's commentaries (e.g. [53]), and repeatedly by contributors to *The Handbook* [7]. Is this polemic flogging a dead horse or simply tilting at windmills?

The other contributions mainly confirm points made in the current essay. Thus Masini notes that

> ""Foresight", as well-known, has been the most widely employed term in recent times. Initiated in the 1980s, it is now acknowledged not only by many in the area, but also by the general public." ([54], p188).

She points out that the term, diffusing beyond Europe, sometimes displaces existing terminology for futures studies. Masini makes a good case for looking at distinctive "futures" approaches undertaken in diverse cultures.

Finally, Tonn reports that

> "Reactions to the word foresight are much more positive than most I receive for any term with any root of the word 'future' in it. Most people believe they and society ought to practice foresight, even if they do not completely understand that it requires imagining potential futures beyond time frames encompassed in normal everyday decision making." ([55], p196)

While the reasons for the distrust of "futures" and (limited) acceptance of "foresight" raise questions beyond the scope of the current essay. But Tonn's comment suggests that, in addition to the added legitimacy that has been provided by TFPs, the current ascendancy of "foresight" reflects alternative formulations' lack of traction. What does this say about the ways in which futurists (whether they define themselves as forecasters or foresighters) go about communicating their work?

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