Ten Years of Foresight in the UK

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1. Introduction

The UK national Foresight programme is managed by the Office of Science and Technology (OST). Initially announced in 1993, it is now in its third cycle.[1] Over the last decade it has produced more than one hundred reports, involved tens of thousands of people, and had substantial impacts at home and abroad. But it has also undergone substantial changes, to anticipate which would have required immense foresight on the part of its originators. In many ways the national programme is now only a small part of the UK scene now. This paper provides a personal perspective on some of the main achievements and problems experienced. To put this perspective in context, I should explain that I was a Foresight Panel facilitator in the mid 1990s, and worked alongside those responsible for much of the design and execution of Delphi and other methodologies at that time. Before and since I have been a fascinated observer of the national programme, and active in Foresight and other long term prospective studies. The perspectives outlined here should not be taken as reflecting official views, though I have benefited from interviews and correspondence with those encharged with national programme in the UK.

2. From Futures to Foresight (A Brief History of the Future)

There is a long history in the UK of efforts to improve decision-making and public debate by thinking about longer-term trends, and about the long-term implications of short-term decisions. This after all was the agenda of many of the classical political economists of the nineteenth century (largely discarded as "economics" became established as a narrowly defined discipline). Efforts to envisage desirable futures and directions of social development go back several centuries – Thomas More's Utopia is a major reference point, of course. (Early utopias were usually located in far-off lands or on other worlds. Though as the pace of social and technological change accelerated – and the world became better explored – it became more feasible to portray a better future as indeed being located in the future.) HG Wells called for "Professors of Foresight" early in the twentieth century, and the UK has been a source of "genius visionaries" from Wells' era to those of Arthur C Clarke and his younger contemporaries.

[1] The terminology of "cycles" has been introduced fairly recently, but is a convenient way to demarcate major initiatives in national Foresight in the UK.

Wells' call for institutionalisation of long-term visioning capability was not heeded for a long time. Even when "futures studies" became a global phenomenon in the 1960s, the UK tended to stand back from the wave of activity that saw other countries establish Commissions on the Year 2000 and similar bodies. Only modest activities were initiated, compared to those in North America and continental Europe. Still, the journal Futures was established in the UK, large companies like Shell did develop their scenario analyses and long-term strategic plans there, and a small futurist community came into being - though efforts to create networks among its members have had limited success.

Futurists sought to be more holistic than traditional forecasting exercises. Forecasting usually examines a narrow set of trends, using rather mechanical methods like modelling or extrapolation. Futures work sees to connect together various driving forces, trends, and conditioning factors, so as to envisage alternative futures - rather than simply to predict **the** future. One of the very few academic centres of such work, the Science Policy Research Unit (SPRU) at the University of Sussex, had a world-wide impact with its critique of the Limits to Growth world model. And SPRU was later to be the source of studies of Technology Foresight activities around the world which were to be influential in the shaping of the UK Technology Foresight programme.[2]

The second of the SPRU studies by Martin & Irvine (1989) referred in fact to "Research Foresight" (notably much of their work at this period was funded by the Dutch government, which was to undertake its own substantial Foresight initiatives in the '90s). They saw Technology Foresight, then, as primarily about informing research policies; as:

> "… 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. …) Foresight provides, at least in principle, 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." Martin & Irvine (1989 p3)

The UK had long been recognised as having an innovation problem. Its relatively poor economic performance had long been attributed to recalcitrant trade unions and unmotivated managers. But this received wisdom looked less plausible after ten years of Thatcherism! An alternative diagnosis had been offered by innovation researchers at SPRU, PREST, and elsewhere - that the UK suffered a serious failure of linkage between the scientific research base and industry.

It was argued, first, that too much science was being funded through inertia. This meant that scientists continued to direct finance to the ever-growing needs of their established colleagues, with little examination of alternative lines of research, or of the needs of other stakeholders. It was argued, second, that industry was failing to exploit the knowledge and inventions coming from public science. Also, industrial R&D was well below the levels of most of UK's competitors, except for a few shining exceptions in pharmaceutical and other sectors. As the problem of the innovation system came to be

[2] See Irvine and Martin (1984) and Martin and Irvine (1989).

recognised, the first question to be seriously addressed was how to redirect scientific priorities.

In 1986 the Government's main advisory body on S&T matters, the Advisory Council for Applied Research and Development (ACARD) presented a report that outlined a set of questions for identifying promising areas of **science**, understood as those offering knowledge that could readily lead to exploitable products and processes. This seems to have resulted in little action, however. In the early '90s an interdepartmental working group was set up to identify methodologies that could identify and prioritise emerging **technologies** of importance to the UK. This brought together the UK Government's recently established Office of Science and Technology (the OST - based in the cabinet Office, and thus with a good link to the Prime Minister) and the Department of Trade and Industry (DTI - whose own minister was an important member of government).

Four teams (including ones at PREST and SPRU, as well as a consultancy group and a German institute) were commissioned to work together to develop such methodologies. The scoping study (PA Consulting et al, 1992) suggested that an appropriate methodology would combine the use of expert panels, a Delphi, and a prioritisation process to identify emerging generic technologies. The proposed methodology was piloted in late 1992. At the same time, Ben Martin of SPRU was asked by the Cabinet Office to (again) review existing research foresight practices, and to make recommendations for a national UK Technology Foresight exercise. The 1993 White Paper on Science and Technology Policy, Realising Our Potential, officially announced the UK Technology Foresight Programme - making it clear that this was to inform decisions about how to allocate finite public resources to research and related activities:

> "No one nation can afford to sustain a significant independent presence in all of the burgeoning fields of scientific research. The 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" (OST, 1993, p2).

So Foresight was to be closely tied to priority-setting, to informing the policies to be pursued by government, the Research Councils and other bodies it funded. It was to provide information for a wider community, too, whose decisions could not be directed by government. It was to draw on inputs from this wider community, too, because it was recognised that much of the critical knowledge about key emerging technologies was not possessed by civil servants – even in the OST – nor even by leading academic scientists. Practitioners and researchers in industry would also need to be consulted. These points were made explicitly in the White Paper: but something more was implied here. Alongside the goal of informing decisions on the balance and direction of publicly funded science and technology, was another goal: that of forging "a new working partnership between scientists and industrialists best placed to assess emerging market opportunities and technological trends". This new "working partnership" can be seen as an effort to address one of the major problems of the UK innovation system – the poor links between industry and the science base.

Japan was held up as a country whose innovation system worked well (notably in a much-cited book by Freeman, 1987). Britain's massive Alvey research programme in Information Technology in the 1980s had been inspired by Japan's Fifth Generation

Programme, for example. The Irvine and Martin analyses of Foresight had given considerable attention to Japanese experience, and made much of the technical tools, such as Delphi, used in Japan. But it was apparent that these tools could not simply be transplanted without modification to a very different environment, that they had been evolved in their particular form within a particular environment. Attention had to be given to those features of the UK environment that would have to be restructured if the visions generated by Foresight were to be effectively linked to reality and action. This was built into the first cycle of UK Foresight.

➢ Fully-Fledged Foresight

The term 'Foresight' became increasingly influential since the late 1980s. The journal Foresight was not founded till the late '90s – by an ex-editor of Futures!. But how does Foresight differ from futures studies? In some quarters the terms are used interchangeably, but national Foresight programmes in the 1990s can be seen to have brought to the fore a new configuration of, or at least a previously rare approach to, futures research.

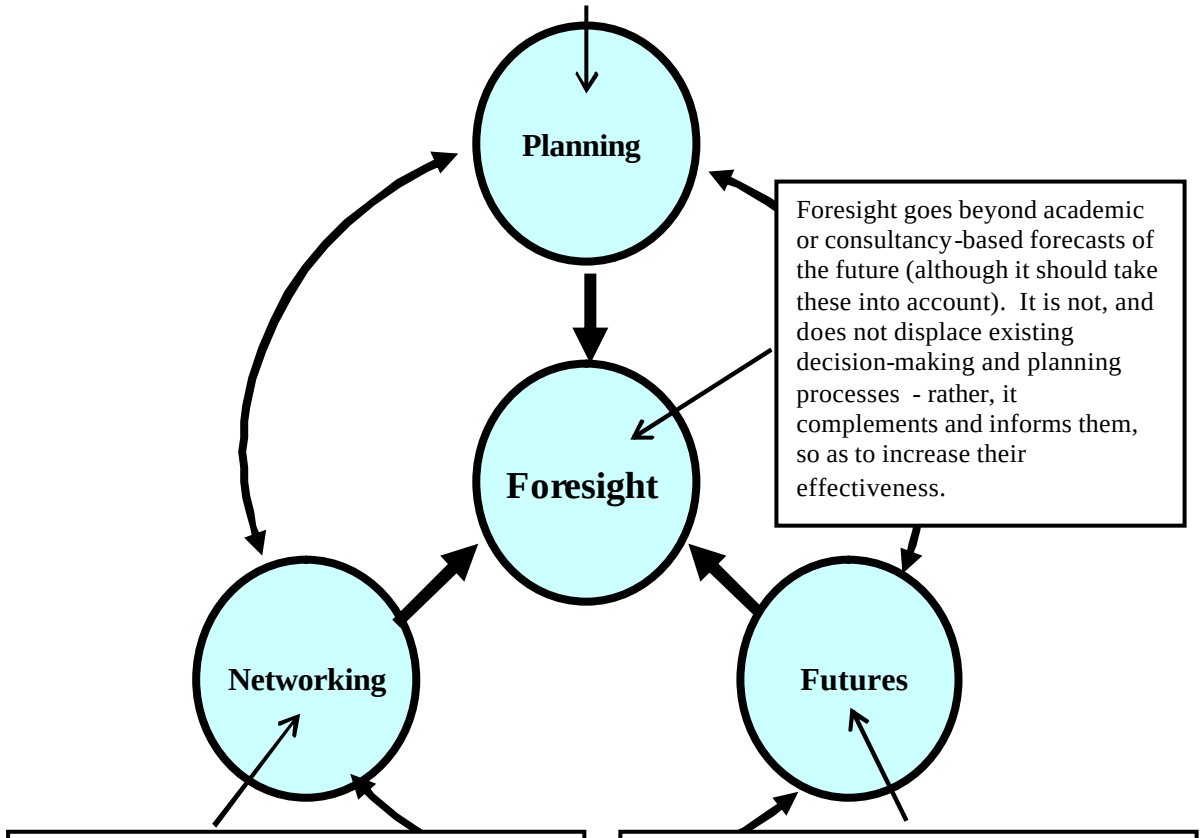
In retrospect, certain crucially new features were associated with the national Foresight programme in the UK and several other countries. Like most much "futures studies" they sought a broad-brush analysis of a wide range of trends and possibilities. But they tended to associate these closely to specific decision-making agendas, and have the sponsorship of influential actors in these agendas. Furthermore, they drew on wider social networks as sources of knowledge, of ideas for visions, and as agents for diffusing visions and implementing the actions to be based on them. Box 1, below, captures the essence of this approach.

We have introduced the term "Fully-Fledged Foresight" to describe those approaches that combine these three elements of long-term analysis and synthesis, participatory networking, and orientation to action. The reason for this is that the success of Foresight exercises has led to the term "Foresight" having gained a certain cachet, a symbolic value, which means that it has been appropriated to cover all sorts of activities. There has been much re-branding of technology watch, environmental scanning, forecasting and similar activities as Foresight, for instance. The term has consequently been somewhat devalued and is frequently misinterpreted – thus we shall use "Fully-Fledged Foresight" to refer to an ideal combination of the three elements.

In "Fully-Fledged Foresight" we see a networking of key agents of change and sources of knowledge, around the development of *strategic visions* based on *anticipatory intelligence*. The process results typically in some formal outputs that can help policy-making – for example, scenarios, action plans, priority lists. The process should also have helped establish a shared sense of commitment to these. And improved networks among the agents concerned should allow for enhanced awareness of their knowledge resources and strategic orientations.

Box 1 A perspective on Fully-Fledged Foresight [3]

In strategic planning, there has been a move from a "rational" approach aimed at achieving equilibrium and stability, to more evolutionary approaches. This follows recognition that high levels of uncertainty are the norm, not the exception, and that economic progress is more a matter of disruptive innovations than of the pursuit of equilibrium. In much modelling and rational planning it was assumed that we can grasp the dynamics of social and economic life on the basis of quantitative changes within stable structures: Qualitative changes frequently undermine such assumptions, and traditional "long-term planning" has been discredited. But the long-term still has to be taken into account in many decisions, and planners have sought better ways to do so.



Foresight goes beyond academic or consultancy-based forecasts of the future (although it should take these into account). It is not, and does not displace existing decision-making and planning processes - rather, it complements and informs them, so as to increase their effectiveness.

Policy development has seen a shift from an elite-driven / top-down to a broader, more participatory approach. This reflects pressures for greater democratisation and legitimacy in political processes. Also, it builds on the increasing awareness that no single body (especially not a government agency!) can know everything that needs to be known in order to effect desired changes. Decision-makers have to live with the fact that knowledge is distributed widely. This is becoming ever more apparent as the world grows more complex (through advances in science and technology, through greater social differentiation, etc.). Thus intelligence-gathering and networking methods have to evolve, too.

In futures studies, there have been several important developments. One is a shift from emphasis on predictive approaches to more exploratory studies, and from one-off studies to more continual iterations of the process of envisioning future challenges and opportunities. Equally important is increasing recognition of the need to involve "users" in the process of study, rather than to present them with a vision or set of visions of the future that descends from "on high". Part of the reason for this is that "futures researchers" have found that such involvement is often essential for the messages of their studies to be absorbed into policymaking in systematic and ongoing ways.

[3] Source: Mike Keenan and Ian Miles 2002 A Practical Guide to Regional Foresight – version 2 Brussels, EC, DG Research

3. UK Foresight - the First Cycle

The first cycle of the UK programme involved a number of overlapping stages of work (Georghiou, 1996), of which the first was "preForesight".

- **Preforesight**

Shortly after the publication of the White Paper in 1993, a Steering Group, chaired by the Government's Chief Scientific Advisor, was established to oversee the running of the Programme. Methodological principles for the programme were established, and consultation seminars held round the UK (not least, to assuage fears that this was to be an exercise in cutting costs of science!).

Following some consultation and conomination analysis (around 800 people are said to have been involved), fifteen "sector panels" were set up – some covered technology or technology-push fields, some covered more user or demand-pull fields. An effort was made to extend the focus beyond manufacturing industries, where most earlier innovation policies had focused:

> "The recognition of the role of the service sectors in the innovative process is a major shift in official thinking and one that has been long overdue...the structure of the service sectors and their institutional settings have a powerful influence on a country's technological activity." (Richard Freeman, 1993, pp18-19),

These panels (see Table 1) were charged with identifying key trends and drivers, benchmarking their sectors, developing scenarios, consulting widely with their communities through a Delphi and workshops, and constructing priorities and recommendations for action. Experts and stakeholders drawn from business, government and academia were appointed as panel members. These participants were identified and given some training – especially the chairs, facilitators and technical secretaries. Note from Table 1 that there was some change in Panel structure over time – some groups were seen to have been effectively separated or combined, and sustained lobbying brought a marine Panel into being. There was also a change in the Programme's title, from Technology Foresight to plain Foresight – apparently the "Technology" element deterred some potential contributors, and foreclosed the issues to be examined unduly.

Panels were really central to the Foresight cycle to an extent that was uncommon in most other national exercises. Though following a common methodology, they had considerable freedom to interpret the details of this, and the pressure of time they were under meant that in practice some activities (like construction of scenarios) were typically neglected. They remained important in the dissemination and implementation stages of the cycle, which would have been far less effective without the proactive stand taken by many Panels.

Table 1: Panels from the first cycle of the UK (Technology) Foresight Programme

Initial Panels	***Later Revision***
Agriculture, Natural Resources and the Environment	Agriculture, Horticulture & Forestry *(split)*
	Natural Resources & Environment *(split)*
Chemicals	Chemicals
Construction	Construction
Defence & Aerospace	Defence & Aerospace
Energy	Energy
Financial Services	Financial Services
Food & Drink	Food & Drink
Health & Life Sciences	Health & Life Sciences
Communications	
IT & Electronics	IT, Electronics & Communications *(merged)*
Leisure & Learning	Leisure & Learning
Manufacturing, Production & Business Processes	Manufacturing, Production & Business Processes
	Marine *(new panel)*
Materials	Materials
Retail & Distribution	Retail & Distribution
Transport	Transport

The Panels had modest resources to spend on consultancy or other inputs, and made various uses of this - e.g. to analyse Delhi results, to prepare an improved version of their reports, etc. Each Panel was provided with a facilitator (trained in the aims and methods of Foresight) and a member of the civil services as a technical secretary (each of whom was shared between two Panels). There was limited co-ordination across Panels - it was left for the Steering Group to integrate the material they produced - and very limited resources by way of a general common framework of statistical indicators.

- **Main Foresight**

The Panels proceeded, through intensive meetings, to consider key issues and trends (with the help of a questionnaire survey and consultations). They constituted subgroups where appropriate.

A major task was preparation of questions for a Delphi survey, instituted in 1994, which was intended to allow Panels to engage a broad base of expertise – it was sent to almost 10,000 people, with almost 3,000 responses received. Each Panel had prepared its own survey within a common framework, and this process was very time-consuming – though valuable for focusing the activity of these groups. However, there were timing difficulties, which meant that the quantitative results of the surveys were only available

at a very late stage, when the Panels had almost completed their reports. Thus the data were not used as fully as they could have been, and the Delphi approach was felt by some participants to have been a failure – though the data have subsequently been used extremely widely.[4]

The OST estimated that some 10,000 people were consulted during 1994, through the Delphi and through a set of regional workshops that Panels undertook. Even with this wide consultation, it was possible to find innovation-connected managers in large companies who were unaware of Foresight, as we discovered in the course of consultancy on "future trend scanning" for one firm to whom the programme proved very interesting.

- **Reporting**

Towards the end of this year the Panels prepared their final reports. These were reviewed by the Steering Committee. This prepared and published its own overall synthesis document, attracting a good deal of attention. It identified 28 generic science and technology and 18 infrastructure priority areas. (Figure 1)

Through the spring of 1995, the Panels' reports were also published in a number of batches. Some 360 recommendations for action were suggested in these. Though they did not attract the same level of publicity as the Steering Committee's report, they were typically examined in detail in the relevant trade press. It has to be admitted that they were very uneven in quality, though all were at the very least professional, and the best reports were outstanding.

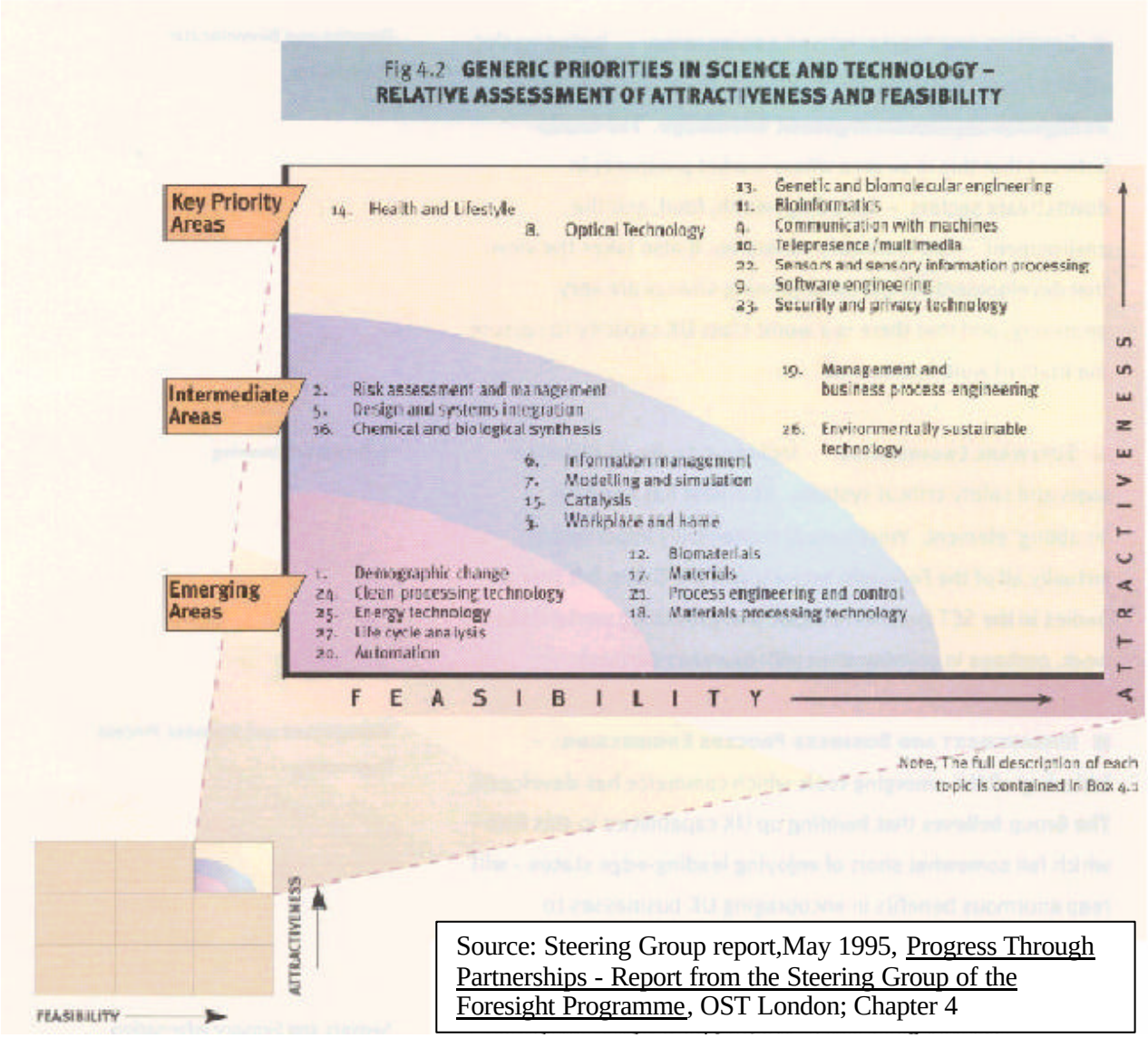
- **Foresight Implementation**

It was apparent that the task of implementing the results of Foresight had not been completely thought through when the programme was launched, and members of panels were heard to express uncertainty about just how their work was to be used. They wanted to see just how their priorities - and the background analyses that informed these - would be fed into policymaking - in the range of organisations that were seen as potential audiences for the work.

The **Panels** played an important role as the 'hubs' of dissemination and implementation of Foresight. They continued to meet regularly into 1999, in order to co-ordinate and/or catalyse follow-up actions on their priorities. Some panels developed explicit implementation strategies of their own, assigning various Panel members the task of making sure that relevant parts of government were responsive to their messages. Many Panel-related initiatives are still ongoing, with workshops, newsletters, demonstration projects continuing to flow.

[4] The Delphi did provide a focus and stimulus for Panel work, that was arguably vital to the success of some of them. This process benefit was not widely recognised, however.

Figure 1: Steering Group Recommendations



Source: Steering Group report,May 1995, Progress Through Partnerships - Report from the Steering Group of the Foresight Programme, OST London; Chapter 4

Between 1994 and 1999, over 600 Foresight events were held and 130,000 copies of the Foresight panel recommendations distributed. The impacts of this effort are hard to estimate, given the numerous channels that were in operation and the intertwining of Foresight with other policy analyses and simple lobbying. But a reasonable estimate is that several hundred million pounds worth of research is 'aligned' with, if not demonstrably a direct result of, Foresight priorities and recommendations. Immediately after the panel reports were published in 1995, £30 million of Government funding went into the **Foresight Challenge** Awards, supporting twenty-four research consortia. In 1997, the initiative was re-labelled as the **Foresight LINK** Awards. There have been three rounds of such awards involving funding of £29 million to 39 projects (a downward trend in the number of projects per round, from 18 through 14 to 7). Altogether, with industry support (in the tradition of earlier LINK schemes, government pays for the public sector contribution to the projects), all of these projects are worth a total of £152 million.

Also in the Public Sector, Research Councils and government departments prepared their responses to the exercise - and one research council (NERC) had already launched its own "miniForesight" exercise (widely seen at the time as an attempt to pre-empt any negative conclusions from the main programme), by NERC. Other organisations have gone on to conduct their own foresight studies since 1995 - and the impacts of these are in part traceable back to the OST Programme, though they may not always align with OST priorities!. Private Industry's responses are harder to assess fully, but we are aware of a lot of interest in the results, with bids being made to Foresight Challenge, and some firms and industry associations launching their own smaller scale Foresight exercises. Such intermediaries became important agents for diffusing the results and principles of Foresight, and OST made some basic tools (Powerpoint sets, etc.) available for this purpose.

The UK Foresight Programme attracted a great deal of attention in Europe and more widely. While several programmes had been launched at around the same time in Europe, this was seen as a particularly successful experience, with a good mixture of priority-setting (product) and networking (process) elements. It had combined wide and high levels of participation with technical sophistication, its results were readily available on the Web, it had influenced policy and retained political support across a change in government. The UK programme alone certainly does not explain the great rise in popularity of Foresight, but it surely played a role in shaping this movement in Europe and elsewhere (e.g. South Africa, and to a lesser extent Latin America and South Asia).

4. The Second Cycle

The first cycle of Foresight was launched under a Conservative government, but the Programme won all-party support. (The main political critique, apart from the academic sniping that is always to be expected when any significant initiatives are undertaken, came from some "green" activists. They were suspicious of the level of industrial participation in the programme, and the danger that this might mute dissent about, for instance, genetically modified organisms, nuclear power, etc.) The advent of a Labour government (with a vision of the “knowledge-based economy” alongside traditional concerns with social justice) if anything increased interest in the Foresight Programme.

However, one important development had occurred in the later years of the Conservative government: for reasons more of political personalities than of long-term strategy, the OST was moved from the Prime Minister’s own Cabinet Office, to a location within the Department of Trade and Industry (DTI). In some ways this made sense, as Foresight has important roles to play in innovation processes and other DTI responsibilities. However, it is significant that the Cabinet Office was to develop its own focus on long-term issues – culminating in the recent transformation of the Performance and Innovation Unit (PIU) into the **Strategy Unit**, while the DTI maintained its own Futures group until very recently.
Following a process of consultation and a consultation report in October 1998, new Foresight Panels were established and the second cycle of Foresight began in April

1999. Alongside the Panels were to be Task Forces, and a new device – the web-based **Knowledge Pool** – was introduced. The intention was that the Panels should publish their consolidated reports in November 2000, following which the Panels would continue to pursue more detailed work and stimulation of action on their recommendations, while a third cycle of Foresight could be planned. In rough outline this agenda was followed, though events did not unfold exactly as planned.

- **Consultation**

The broad conclusions of a consultation process, which took into account discussions and surveys of participants in the first cycle of Foresight, a review by the Parliamentary Office of Science and Technology, and other inputs, a number of main points were established. The existing programme was seen as a rare success that should be built upon. A new cycle was justified on several grounds. It should update and refine the "findings" of the first cycle – and, arguably, be more visionary and better integrated. The perception was that the high time pressures of the first round restricted the outputs in these ways – that better statistical and other information support could have been provided, that scenarios could have been systematically developed, that more challenging and "out of the box" thinking could have been encouraged. There was to be no Delphi.

Perhaps because some Labour Party supporters saw "wealth creation" as following too much of a free market agenda, it was decided to raise the profile of 'quality of life' issues. Actually these had at least in principle stood alongside wealth creation in the first cycle – as is apparent, for instance, in the Delphi analyses (cf. Loveridge, Georghiou & Nedeva, 1996). But there were still concerns that it was the latter that was really driving things, among some Labour Party activists as well as in the environmental movement. An emphasis on economic as opposed to social concerns was, perhaps, reflected in the high levels of business representation on Panels.

Accordingly, another rationale for the second cycle was that it should include a wider variety of participants – including more representatives of Small and Medium Sized Enterprises, as well as people working for the voluntary and public sectors, etc. The second cycle was seen to be moving beyond the technology focus of the first cycle to examine the opportunities that arose from the interaction of innovations in science and technology with wider social and market trends. Participants in the first cycle would certainly have identified with this latter formulation, in fact – but the designing in of more work on social change from the outset – rather than as something that was "discovered" to be a requirement – did mark a significant change. The first cycle did run a substantial risk that "technology fix" solutions would be sought for problems that might well be social in nature. Could this be avoided in the second cycle?
Panels were still to be at the heart of the Programme, and were to be encouraged to "think globally", identifying the challenges and opportunities that the UK was likely to face over the coming 10-20 years and beyond. But there was to be more interaction both across Panels, and more widely. The networking function grew in importance – and the priority-setting elements of Foresight were diminished. Implementation, dissemination and impact assessment were to built in from beginning (though impact

assessment was never properly put in place, despite a project being set up to make recommendations as to how it could be conducted).

- **The Panels**

Work was taken forward through a combination of three thematic and ten sector panels, each looking at the future for a particular field of concern. To some extent, as shown in Table 2.the first cycle's **Sectoral Panel** structure has been retained: but the number was reduced to ten, with a more supply-chain-based approach helping here. (This was particularly influential in the case of the "Food Chain".) Some of the new panels are more overtly application-oriented – for example, in the place of the science-driven Health and Life Sciences Panel, the new cycle offered a Healthcare Panel.

Alongside the sectoral panels were three **Thematic Panels**, addressing broad issues with cross-cutting implications for science and technology – "Ageing Population", "Crime Prevention" (funded by the Home Office, which is responsible for policing) and "Manufacturing in 2020" (all issues widely highlighted as general challenges by panels in the first cycle). The introduction of these panels (apparently others were intended for the future) reflects the difficulties of effectively organising cross-panel activities in the first cycle.

All panels were asked to consider the implications of their findings for another set of thematic issues. These were **education, skills and training** and **sustainable development**, topics which were seen to be so generic as to require embedding within each panel.

Table 2: Panels in the second cycle of UK Foresight

Sector Panels	***Thematic Panels***
• Built Environment & Transport	• Ageing Population
• Chemicals	• Crime Prevention
• Defence, Aerospace & Systems	• Manufacturing 2020
• Energy & Natural Environment	
• Financial Services	
• Food Chain & Crops for Industry	Task Forces
• Healthcare	Around 50 task forces were said to be active, though probably only a handful met frequently and achieved a great deal. Examples of Task Forces include: Energy Futures; Environ-mental Appraisal; Nanotechnology; Retail Logistics; The Future of Information Relationships; The Learning Process in 2020; etc.
• Information, Communications & Media	
• Marine	
• Materials	
• Retail & Consumer Services	

➢ Task Forces

While Panels were intended to be relatively long-lived, they could examine specific issues or address specific problems by establishing **Task Forces**. These would be typically short-lived, and provided an opportunity to enlist a broader constituency of stakeholders into the Programme, and could help promote the Foresight agenda during later implementation phases. Some Task Forces were indeed following up on the recommendations of the previous cycle (e.g. the Foresight Vehicle Programme and Clear Zones stemmed from two of the first cycle's Transport Panel projects[5]). Most of the Task Forces were set up by the sectoral and thematic panels to explore key important issues in detail, though some spanned the interests of more than one panel (e.g. E-commerce). While there were as many as 65 Task Forces documented, it is unclear how many were really effective. Over five hundred people were involved in this round of the programme as members of panels and/or task forces.

➢ Associate Programmes

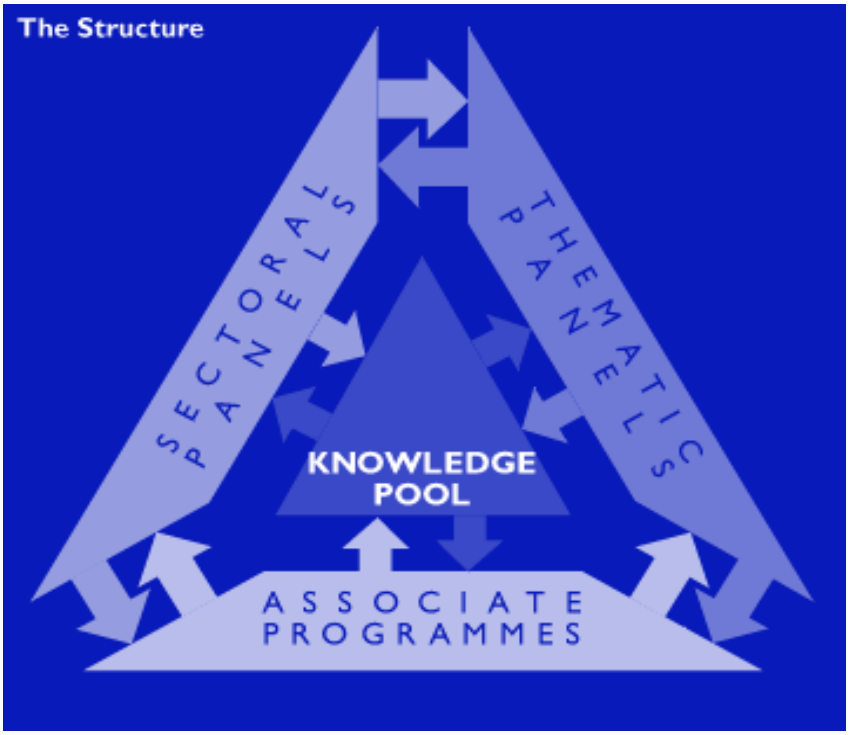
Associate Programmes, undertaken by other organisations (mainly professional institutions and research and technology organisations), were to support the central programme, by looking at specific topics from particular viewpoints, in parallel with the Foresight panels. These received no Government support, but retained a link with OST through Memoranda of Understanding for a specific period (the last of these expired at the end of 2001). Some of the groups established here worked effectively. But at this point in time use of the Web was still not so far diffused that the Knowledge Pool (see below) could really function to link their activities. Also, there were unresolved (if foreseeable!) problems about third parties placing material on a government website.

➢ The Knowledge Pool

As Figure 2 shows, the **Knowledge Pool** was to lie at the heart of the second cycle. This was a much upgraded version of the successful Foresight website (http://www.foresight.gov.uk) that was to go beyond a dissemination function, and serve as the main information gateway for national Foresight. Drawing on sophisticated electronic libraries used in the newspaper industry, it was to provide general Programme information, access to scenarios and views about the future, and management information and working notes for Foresight panels. It was an extremely ambitious undertaking, and a personal view is that it proved an excellent resource for those familiar with Foresight – but was daunting and difficult to use for newcomers, who might even be deterred by some of the sophisticated material made available (e.g. some visualisation of scenarios). It also looked very costly. It did, however, attract some 46,500 monthly Website visitor sessions on average.

[5] This Panel decided to combine its major priorities into a set of three "demonstrator" projects, hoping that this would secure greater visibility and effectiveness.

Figure 2 Structure of the Second Cycle of Foresight



➢ Consultation, Co-ordination, and Reporting

Without a shared methodology like Delphi, Panels lacked a common framework for data production and reporting, and for consultation with a wider community. Each Panel was to develop its own consultation arrangements, setting these out in an Action Plan in summer 1999. Most opted for the preparation and circulation of consultation documents (both paper-based reports and material in the Knowledge Pool). Panels were encouraged to host a variety of regional workshops and seminars during this period. Around 160 seminars and workshops (excluding internal Panel and Task Force meetings) and around 52 Regional Seminars were reportedly held during the second cycle.

103 papers and reports were published. The final Panel reports in December 2000 (included in this total) were to be followed by the Foresight Steering Group producing a synthesis report. After this, the emphasis of Panels and the Programme as a whole was to be on implementation of recommendations.

➢ A Cycle Interrupted

Some time after the Panel reports were lodged, senior figures in UK science policy concluded that something was going wrong in Foresight. Some of the reports were openly criticised by the Science Minister, and a review rapidly established. This took soundings from various sources, and came to the conclusions that:

"The current objectives were considered to be too broad: Foresight ... should focus on those areas where it can add most value... focus on S&T, to identify new or disruptive technologies that are likely to have major impacts … This should take account of socio-economic factors as part of the environment... Resources should be focussed, to increase the impact ... by targeting fewer areas of activity…. in-depth review ... compelling and convincing messages….move towards a rolling programme, with possibly 3 or 4 projects running at any one time…."

What went wrong? Perhaps the agenda of Foresight was indeed too large. But this should not automatically be seen as a matter of Foresight needing to remain narrowly focused on Technology Foresight. More plausibly, the following elements were involved:

- The wider agenda of Foresight meant that "ownership" by the OST was lost – topics of limited concern to science policy were addressed, there was a lack of clear linkages to policy timetables and levers;
- The lack of common methodology and integrative mechanisms meant that there was no "big bang2 – and that quality control became harder to ensure
- The Knowledge Pool was ahead of its time, oversophisticated for many of the people it was intended to attract, and mechanisms such as Associate Programmes needed other sorts of support.

The decision was made to radically restructure Foresight, and a much scaled-down third cycle was launched in 2002.

➢ Second Cycle Achievements

Most second cycle panels and task forces have completed their work – though there is some feeling that this was cut short by the Foresight review. A few remain active under new ownership. For instance: the DTI. and Ministry of Defence jointly fund a new National Defence and Aerospace Systems Panel, derived from a second cycle Panel, and a Materials Panel is being continued by the Institute of Materials. Another organisation that has the important feature of a reputation for impartiality, the Carbon Trust, is continuing the Energy and Natural Environment Panel (with more of an energy focus). There is also evidence that some Associate Programmes have successor activities (e.g. in a crime and security activity of the Home Office), though we do not have a full tally.

SMEs showed little interest in the first cycle of Foresight, and such intermediaries as trade associations, were encouraged to engage their members in Foresight. The support materials developed for this purpose were extended in the second cycle, with a Foresight Toolkit for use with SMEs and, in 2001, five Foresight Training Centres appointed to train facilitators and to monitor quality in delivery. **Regional Foresight Co-ordinators** were initially set up to enable Foresight Panel recommendations to be integrated into regional innovation, economic and cluster strategies. (Though OST funding for these posts was ended in 2002, five Co-ordinators continue to be supported by their local Regional Development Agency or equivalent, and other Agencies have incorporated Foresight activities into their work on innovation.)

The **Young Foresight** initiative is aimed at giving students direct experience in skills needed to create a successful product or service: from conceptualisation, to design, to adaptability in the market place. It encourages students to anticipate future trends and consumer behaviour and design products that will perform well in a world that hasn't yet arrived. The project has been a partnership between the Department for Education and Science and OST Foresight, and involves companies working alongside schools. Much of the early work has taken place in the North East of England, where fifty teacher / mentor partnerships are in place.

5. The Third Cycle

The aim of Foresight is now seen as being "to increase UK exploitation of science".[6] Recognising that such opportunities may come from (to put it crudely) science-push or demand-pull, the aim s that at any time there will be three or four projects underway, at different stages of development, and balancing the two types of challenge. Thus the starting point for a project is either a key issue where science holds the promise of solutions; or an area of cutting edge science where the potential applications and technologies have yet to be considered and/or articulated more broadly. The first two projects, launched in 2002, were flood and coastal defence and cognitive systems, and two more were launched in 2003.

Each project has a dedicated project team in the Foresight Directorate, which is assisted by scientific experts (a criticism of earlier cycles was the limited resources for acquiring expert inputs). These OST teams are skilled in futures techniques and can draw on inputs and insights from a network of external experts. The projects are expected to evolve in different ways, reflecting the different types of problem they deal with. Thus there is not a common organisational model. Each project should deliver analysis about relevant developments in science and technology in the UK and the world, and deliver recommendations for action – by research funding agencies, business, Government and others. The projects do not span more than a small range of topics, of course, and thus they cannot offer overall priority-setting. Their focus on identifying actions in specific areas is to be complemented by the creation of networks of relevant actors – again the details will vary by project type.

While it is too early to provide an assessment of the first two projects, they can be briefly outlined (mainly drawing on material on the website at http://www.foresight.gov.uk):

- **Project 1: Cognitive Systems**

  Cognitive systems are defined as both biological and artificial systems that "respond to their environment, learn, reason, and make their own decisions". As this implies, there are strands of research coming from life sciences (neurology, cognitive studies,

[6] Quotations are reproduced from unpublished OST documentation that I was kindly allowed to examine in preparing this note.

etc.) and from IT and physical sciences (learning systems, speech recognition, etc.) Experts have prepared state of the art summaries on the future prospects for various themes here.

The project aims "to provide a vision of future developments of cognitive systems through an exploration of recent advances in life sciences, physical science and related fields and their potential for interaction". Specifically, its objectives are to:

- Examine recent progress in these two major areas of research, encourage those active in these fields and their applications to network together and develop a common language.
- Scope likely developments in these fields over the next 10-20 years (in particular progress in capabilities to build artificial cognitive systems), and prepare forward looking documents.
- Articulate significant conclusions to a wider audience.
- "help create the political, regulatory and business environment that will best position the UK to take advantage of developments in this area".

The Director General of the Research Councils (DGRC) is responsible for this project, with two senior professors supplying access to the scientific communities and a science writer helping to prepare documentation. The Minister for Science runs an advisory stakeholder group. Various workshops are currently underway, with a major conference planned for September 2003 before the final report is published.

◆ Project 2: Flood and Coastal Defence

It is estimated that some 1.7 million homes in England and Wales are potentially at risk of flooding, and over £200 billion of assets are at risk from flooding and coastal erosion. This project aims to produce "a long term vision for the future of flood and coastal defence to inform policy" here…"to assess how big the future problem of flooding might be; assess if existing policies can cope; and consider new and radical responses to meet the future challenge". It is chaired by the government's Chief Scientific Advisor.

The project began by drawing together leading scientists to advise on the factors that may impact on future levels of flooding (e.g. changes in land use, demographic shifts, climate change, science and technology…), which will need to be combined to produce a set of flooding scenarios for the UK up to 100 years into the future. An analytical framework has been developed and key policy stakeholders brought on board. (Reflecting the nature of the problem, the project works with a very large number of stakeholders in industry, regional and central government, NGOs, and so on.) The coming phases of work will involve further analysis of the key factors that impact on flood risk; identification of the implications of the scenarios and consider the responses to flood risk; communication of results in a final report and other forms, and mobilising stakeholders to implement recommendations.

Two more projects were launched in spring 2003. The projects are defined through a process of consultation with "the science base, government departments, research councils, devolved administrations and others". The 2003 round reportedly involved

"the largest ever scientific horizon scanning exercise in the UK". 12 ideas were generated during an intensive workshop with senior scientists, and these were used in Web consultation and in meetings with scientific institutes and SF authors. The 2003 topics were finalised, and consultations are continuing with a further tranche of shortlisted projects already being considered. The two new projects involve, again, one focusing more on looking for solutions to a problem, and one looking for uses of emerging scientific knowledge:

- **Project 3: Cyber Trust and Crime Prevention**

  This aims to explore the application and implications of next generation IT in areas such as identity and authenticity, surveillance, system robustness, security and information assurance and the basis for effective interaction and trust between people and machines. As well as producing reviews of the state-of-the-art in relevant areas of science, and providing futures studies (visions of alternative futures, analyses of drivers, opportunities, threats, barriers, models for decision-making), the project aims to establish networks of scientists, business people and policy makers who can influence the future in the light of key challenges and potentials identified in these studies.

- **Project 4: Exploiting the Electromagnetic Spectrum**

  Focussed cross-disciplinary efforts are expected to lead to new applications of the spectrum well beyond those we are now familiar with. The aim here is to provoke new thinking and insights and locate key fields for progress. This means providing a vision for the future exploitation of the electromagnetic spectrum. Again, state of the art reviews, visions for the future; and steps to that future are to be produced, for the key areas.

The Website

At the time of writing, documentation on these projects on the Foresight website is rather sparse, but it is hoped that this position will soon change. The website is now visually a more modest affair than that of the second cycle. Much of the material available before still remains on site, and can be located fairly readily – earlier Panel reports, etc. Meeting notes and similar material are now removed, however – and the scenarios that are available are actually ones developed with a specific environmental agenda in mind. While we know that they have proved very useful in environment-related activities, it is less obvious that they should be appropriate to many other situations where scenario analysis is required.

6. Beyond the National Programme - Foresight in the UK

The OST Foresight Programme, in its third cycle, continues to be an important and illuminating exercise. It continues to provide the wider community with a useful body

of documents and experience on Foresight in various fields. But it is less ambitious that Fully-Fledged Foresight, as developed in the earlier cycles of the exercise and whose characteristics we sought to outline earlier. The third cycle has reduced the networking elements of the earlier exercises to a considerable extent, and is focusing on specific areas of technological opportunity rather than seeking to establish priorities across the board.

It might be thought that the "wave" of Foresight is passing, that other policy fashions are going to replace it. Indeed, in some quarters we find the term "Foresight" to have become unpopular[7] - though in some locations (e.g. the regions, where regional Foresight seems to be taking off in the UK) it remains influential). But Foresight practice is actually continuing to diffuse and develop in the UK. There are several reasons for this:

- First of all, the three cycles of the UK Foresight Programme have generated much wider awareness of the aims, methods, and utility of various forms of strategic analysis and action. Whereas "futures studies" was always a very marginal activity, Foresight of one form or another seems to be well embedded in much of the UK system. There are academics, as well as consultants, who are applying the lessons of Foresight to companies and government organisations.

- Various parts of the UK government system are promoting long-term thinking – notably the Strategy Unit of the Cabinet Office.[8] This Unit has prepared and published studies of best practice in the field. It is promoting this sort of strategic analysis widely across the political system. For example, it has convened recent workshops on the future of local government. All government departments have been asked to adopt long-term strategic perspectives.[9] More generally in government, there has been a (highly uneven) institutionalisation of the notions of "evidence-based policy", and of more deliberative and participatory modes of governance, and much emphasis on strategic partnerships between public, private and voluntary agents. These developments reinforce and are reinforced by Foresight approaches.

- European Union interest in Foresight means that projects on regional Foresight and IT-related Foresight, for example, are extended into the UK (in some cases helping to network UK actors who were isolated from each other as well as more generally).[10]

[7] One of the authors has just been cautioned against using the term in a government agency which is examining options for its development and use of long-term strategic perspectives, for example.

[8] See the website at: http://www.strategy.gov.uk/ .

[9] The DTI's own futures work outside of the OST seems to have been wound down, though a physical facility - *FutureFocus@DTI* - is now maintained in the main offices, as a site at which visionary thinking can be cultivated. It features an "Immersive Theatre", an "Interactive Society" area, and a "Creativity Lab" - and has a very different "feel" from most government facilities. See http://www.futurefocusdti.org.uk/ .

[10] The European Commission's DG Research features a Directorate on Technology Foresight and Socio-economic Research which has funded numerous projects, networks, and workshops here. For one output, see http://foren.jrc.es and for a brief account of relevant activities see http://www.cordis.lu/itt/itt-en/02-1/ire06.htm.

The result is that elements of Foresight practice are now used commonly by Government ministries and agencies, Regional Development Agencies, learned societies, and industry associations. Some of this is very remotely connected to Technology Foresight, but several lines of work are highly technology-focused. The examples below are drawn from public sector work of this sort – there is also a good deal of activity underway in many private companies, but this is not well documented.

- **Horizon Scanning and Foresight in Food and Environmental Affairs**

The Department of the Environment, Food and Rural Affairs (DEFRA) has been involved in Foresight-related activities at least since the first cycle of OST foresight. Apart from being involved in the Agriculture, Natural Resources and Environment Panel of that cycle (and being consulted and lobbied by other Panels in connection with environment-related issues, such as the Clear Zone strategy of the Transport Panel), the Department acquired particular responsibilities because of the fact that responsibility for the construction industry lies with it, rather than with the DTI. As the Panel work in Foresight grappled with a perceived resistance to change of the sector, so the Department took a lead role in initiating CRISP, a forum for innovation and long term-related work in the industry. This is one of the enduring activities from the first cycle.

Another initiative is a direct response by DEFRA to external drivers such as the Office of Science and Technology's Scientific Advice and Policy Making Guidelines (2000), and to a Strategy Unit report on risk and uncertainty. It is designed to support the Chief Scientific Advisor's role in Science in DEFRA. It also reflects the deep unease generated by the BSE crisis and subsequent Inquiry into the policy failures here, that demonstrated how easily government can be caught off guard by emerging developments, and be unable to rapidly mobilise and adequately use relevant expertise. "Horizon scanning" is intended to improve DEFRA's capacity to assess the importance of a wide variety of developments and trends to its science and policy – to enhance anticipatory capabilities, and guide the Department in shaping "the day after tomorrow". The activity goes beyond trend-watching, and uses internal and external resources to undertake new research, the establishment of systems for evidence-based policy, SWOT-type analyses at DEFRA, aims to identify both risks and opportunities. The three main activities currently undertaken[11] are:

1. Supporting scientific horizon scanning research and activities, e.g. with scanning publications, "what if" scenarios, interviews;
2. Building capability for horizon scanning within DEFRA and its partners;
3. Using networks to communicate and support horizon scanning, both nationally and internationally, e.g. website consultation, workshops, liaison with parallel activities from other jurisdictions.

This may be called "horizon scanning", but the stated aims are close to those of Foresight. Other initiatives are also undertaken by, for example, the Environment Agency, which is the body with responsibilities for pollution control, water quality, flood defence, etc. This is of course associated with the relevant Panel of the third cycle of Foresight, but key staff were also active in the first and second cycles, having a

[11] At the time of writing, invitations to tender are out for extensions of this work.

considerable impact on the scenario development work undertaken then. These scenarios have been used constructively by the Agency in its dealings with the now-privatised Water Companies, allowing it to examine the robustness of their projections against different trends. The Agency runs a centre for Risk and Forecasting whose work is centrally concerned with long-term, sometimes very long term, analyses. For example, there is work on modelling the impacts of changes in agricultural practices on water quality. The Agency is currently examining how further to develop its production and use of scenarios, internally and in liaison with other parties.

➢ **Scenario Analyses oriented to Generic Technologies**

In the last few years several significant applications of scenario workshops have been made to informing decisions in the UK:

- The ESRC (Economic and Social Research Council) commissioned CRIC and the Institute for Alternative Futures to run a workshop in January 2002, to inform its decision-making process concerning priorities for social research on genomics, and the selection of a centre to conduct such research. The methods used were fairly familiar ones in the business futures field, supported by computer groupware that "captured" a good deal of material in real time. The results are written up in an issue of Foresight, as well as being available online;[12] they went beyond the stated aim of priority-setting, to influence ESRC decision-making so that a new structure for the work on genomics was created, as well as the content of existing structures being elaborated.

- Earlier, in 2000, the ESRC responded to a request from the DGRC (Director General of Research Councils) for work on biotechnology and IT prospects for the UK. Accordingly, CRIC and PREST organised a pair of scenario workshops on these themes, with the aim of informing decisions about public expenditure on these areas – and not least to justify expenditure to the Treasury. A "success scenario" methodology was developed that allowed for the workshops to elaborate a vision of a desirable and feasible aspirational scenario, and to identify targets, action points, and other elements to manage the movement toward such a scenario.[13]

- In the autumn of 2001, the OST (again working effectively for the DGRC) commissioned CRIC, together with the National Physics Laboratory and the Institute of Nanotechnology, to run a similar "success scenario" workshop on UK prospects and potentials in the field of nanotechnology, The output of this workshop, with very little additional elaboration, forms the core of the DTI's policy document in the field, **New Dimensions for Manufacturing: A UK Strategy for Nanotechnology,**[14] and is believed to have informed policy statements before this.

[12] Full reports of the workshop are provided on the CRIC (http://les1.man.ac.uk/cric) and IAF (http://www.altfutures.com) websites. See Bezold and Miles (2002) and other articles in the same journal issue.
[13] The ICT and biotechnology scenario reports are reported on the CRIC (http://les1.man.ac.uk/cric) and DTI (http://www.ost.gov.uk/policy/futures/ict/intro.htm websites.
[14] Available at http://www.dti.gov.uk/innovation/nanotechnologyreport.pdf

These activities are Foresight in all but name, with one qualification. The scenario development in these workshops has typically examined 5-10 year scenarios (the genomics workshop is an exception here). But if the long-term focus is slightly less, the links to policy have been very strong.

7. Conclusions

Foresight is embedded in the UK as never before. It looks to be an enduring feature of the political and industrial, the scientific and cultural landscapes. We have outlined only a few examples of Technology-related Foresight-type activities above: the full range of activities constitutes a very rich and diverse environment. But it is an environment that is no longer dominated by the towering national OST Programme. Different activities of a Foresightful nature are underway on a very wide basis, even if many do not employ the term "Foresight". And not everything labelled Foresight is Fully-Fledged Foresight.

We can expect considerable ferment as a result of all this activity. One result is liable to be much more "codification" of the methods and approaches of futures studies, turning the crafts here into something more reproducible and subject to quality control. The results of application of such methods are likely to become more widely available – which may lead to some interesting political debates as very different visions are contrasted. (To date the mass media have regularly failed to recognise scenarios as tools for testing policy robustness, and instead portrayed them as secret and usually scandalous government plans…) There is liable to be much development of various sorts of computer and communications systems which can support development, visualisation, and interactivity, and probably also consensus-building and prioritisation techniques. Foresight professions and specialisms, and possibly new institutions, are liable to arise. New challenges associated with, for example, security, hazards, social innovations, are liable to arise and be taken on board. Foresight about Foresight is a very underdeveloped field, so these should be taken as informed speculations, and no more! It is even possible that the Foresight wave really will subside… but for now two traditional sayings would seem to sum up the scene:

- "All that glisters is not gold"
- "The King is dead! Long live the King!"

What we really lack, however, now that the national programme has narrowed its focus, is any substantial effort to track what is going on, to evaluate the continuing influence of the earlier cycles of national Foresight, or to record the various steps in the evolution of the programme and its spin-offs. This paper is a modest effort towards capturing some of the key events and process in the ten years of Foresight to date. But the range of activities and impacts is huge, and we have really only scratched the surface. It is remarkable how limited the analysis has been of such a dramatic policy initiative - and it is likely that this restricts the scope for policy learning to an extent that is hard to reconcile with claims that we have entered a knowledge-based society in which evidence-based policies are becoming the norm.

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