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The impact of foresight on innovation policy-making: recent experiences and future perspectives

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Foresight has evolved as a distinct prospective analytical tool: it considers alternative futures of various S&T fields or socio-economic systems by bringing together the perspectives of various stakeholder groups, and thus assists the decision-making processes at different levels. However, in order to avoid hypes — and subsequent disappointments — about what foresight can deliver, the potential contributions to decision-making processes by foresight should be clearly understood. The article puts foresight into this broader context of policy-making processes, with a particular emphasis on innovation policy. It describes the evolution of different policy rationales since the 1960s, develops a framework to classify the impacts of various types of prospective analyses, and reviews the evaluation results of several national foresight programmes by using this framework. On that basis, future directions of how foresight might evolve are considered to spur discussions.

THE EVOLUTION OF foresight since its inception in Europe in the 1990s is a success story in several respects. It has acquired prominence as a process aiming to support forward-looking thinking in decision-making, for both public policies and businesses. This is reflected, for instance, in the wide range of applications to which the initial national technology foresight approach has been transferred over the past few years: multi-country and regional levels; as well as sectoral perspectives; and various policy domains, beyond science, technology and innovation (STI) policies.

In spite of this apparent success, the perspectives for the future use and impacts of foresight are far from clear. The notion of 'hype–disappointment cycles', originally developed to describe the patterns of attention paid to emerging technologies, might be applicable to foresight, too: initial enthusiasm has already given way to a significant deal of scepticism in several countries. Clearly, a strong need is emerging for a more realistic assessment of the strengths and the weaknesses of various types of prospective analyses.

There are two main reasons for this approach:

1. Embedding foresight in the decision-making processes is a far from trivial task; and
2. The requirements from the new application domains where foresight is used are not only challenging, but also different from science, technology and innovation policies.

In this article, we look specifically at one of the policy domains where foresight has become more prominent: innovation policy. The article proceeds along four main steps. First, we position foresight in the context of policy-making and implementation processes. Second, we analyse links between foresight and innovation policy. Third, we summarise the insights into the actual and expected impact of foresight gained from several evaluation exercises, with a particular emphasis on policy impacts. We conclude with some exploratory thoughts on how the role of foresight in policy-making might evolve in the future.

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Policy challenges: why to conduct foresight

A number of technological, economic, societal, political and environmental trends and developments affect all countries as well as most policy domains. In order to deal with the challenges associated to these developments, a new *culture of future-oriented thinking* is needed. This applies also to policy-making processes, which can be assisted by foresight in various ways. Foresight stresses the possibility of different futures (or future states) to emerge, as opposed to the assumption that there is an already given, predetermined future, and hence highlights the opportunity of shaping our futures.[1] Further, it can enhance flexibility in policy-making and implementation, broaden perspectives, and encourage thinking outside the box ('think of the unthinkable').

The increasing number of foresight programmes suggests that foresight can be a useful policy tool in rather different innovation systems. As a large body of literature analyses this surge,[2] the major factors explaining the diffusion of foresight can be summarised here in a telegraphic style:

- Given the significance of globalisation, sweeping technological and organisational changes, as well as the ever-increasing importance of learning capabilities and application of knowledge, our future cannot be predicted by any sophisticated model in a sufficiently reliable way. History also teaches us valuable lessons about the (im)possibilities of planning and predicting the future. Therefore, flexibility, open minds for, and awareness of, possible futures are inevitable. Diversity is crucial in terms of possible futures, differentiating analyses, as well as diversity in searching for solutions and identifying policy options.
- More attention is required to develop a number of skills, relapsed by Fordist mass production paradigms and large bureaucratic machineries, such as creativity, problem-solving, communication and co-operation skills in multidisciplinary, multicultural teams. New forms of co-operation (e.g. clusters, innovation networks) have become a key factor in creating, diffusing and exploiting knowledge and new technologies, and therefore in satisfying social needs and achieving economic success.
- As for policy-making itself, there is a widening gap between the speed, complexity and uncertainty of technological and socio-economic changes, on the one hand, and of the ability to devise appropriate policies, on the other. Under these circumstances, the precautionary principle and longer-term considerations are bound to gain a growing attention in guiding policy-making processes.
- Given the growing political and economic pressures, governments try hard to balance their budgets, while cutting taxes. Hence, they need to reduce public spending relative to GDP. In the meantime, accountability — why to spend taxpayers' money, on what — has become even more important in democratic societies. Public R&D and innovation expenditures are also subject to these demands.
- Policy-makers also have to deal with intensifying social concerns about new technologies. This is the case, for instance, for ethical and safety concerns related to biotech or nuclear technologies, and fears of unemployment and social exclusion caused by the rapid diffusion of other new technologies, e.g. information and communications technologies.
- Even the credibility of science is somewhat fading. Scientific research no longer stands for 'true' in itself. The 'objectiveness' of policies based on scientific research is questioned (by citizens, interest groups, etc.) as scientists themselves are known to have different opinions and come to different conclusions on the same issue.

Beside the above trends, there are other specific, policy-relevant, methodological reasons to apply foresight. It can offer a vital input for 'quantum leaps' in policy-making in various domains. Usually policies evolve in a piecemeal way, in incremental, small steps, without paying sufficient attention to changes in the environment.

The parable of the boiling frog illustrates this point 'vividly': put a frog in a cooking pot with cold water, and start heating the water. The frog will not jump out, because it is not alerted by the slowly rising temperature: it boils alive.

From time to time, however, a more fundamental rethinking of policies is needed: policy-makers occasionally need to ask if current policies can be continued. Do they correctly realise and react to trends, and hence are they blocking or slowing down negative trends and accommodating favourable future developments? Foresight can help in picking up *weak signals*: weak but very important hints that a fundamental re-assessment and re-alignment of current policies are needed. In other words, foresight can serve as a crucial part of an *early warning* system, and it can be used as an instrument for an adaptive, 'learning society'.

In sum, participative, transparent, forward-looking methods are needed when decision-makers are trying to find solutions for the above challenges. Foresight — as a systematic, participatory process, collecting future intelligence and building medium-to-long-term visions, aimed at influencing present-day decisions and mobilising joint actions — offers an essential tool for this endeavour (Gavigan *et al*, 2001). It helps in making choices in an ever more complex situation by discussing alternative options, bringing together different communities with their complementary knowledge and experience. In doing so, and discussing the various visions with a wide range of stakeholders, it also leads to a more transparent decision-making process, and hence provides

a way to obtain public support, and makes the implementation of policies smoother.

From technology foresight to integrated policy strategies

In the 1960s, government policies in relation to research and technology had predominantly been inspired by an approach that is often labelled today as 'picking winners': promising sectors and large players had been selected as being of particular public or strategic interest and been thus favoured by financial and other types of support. With the recognition of the limitations of governments' ability to actively plan and shape future developments in an efficient and fully informed manner, the late 1970s saw the emergence of a new paradigm in research, technology and — then also — innovation policies, which were characterised by a focus on shaping framework conditions that are conducive to innovation. This 'hands off' approach has subsequently evolved into what is nowadays called the systems approach to R&D and innovation (RTDI), which not only deals with framework conditions, but also with the institutional and structural settings of innovation systems (Dosi, 1988; Edquist, 1997; Freeman, 1991, 2002; Fagerberg *et al*, 2005). In line with these concepts, the 1990s were also characterised by a great reluctance of governments to prioritise research themes and select technologies in a top-down manner.

In recent years, we can observe a shift in policy-making practices from shaping framework conditions and structural settings towards strategic decision-making: STI policies give again the thematic portfolio of a country or region a greater weight and pay more attention to long-term perspectives. However, the growing complexity of innovation processes is also recognised, by stressing the bottom-up component of networking and clustering as important instruments for enhancing the innovative performance in emerging areas of specialisation (OECD, 2002).

Similar to this shift in approaches to innovation processes, there has been a shift in the conceptual understanding of policy processes. Taking into account insights from strategic planning and complex social systems thinking, recent developments in policy-making processes are stressing interactions, learning, and the decentralised and networked character of political decision-making and implementation (Smits, 2002; Smits and Kuhlmann, 2004). Initially, the prevailing technocratic and *linear process models* of policy-making (e.g. in terms of 'formulation–implementation–evaluation' phases) had been replaced by *cycle models*, where evaluations are supposed to feed back into the policy formulation and implementation phases. Already in these cycle models**,** *policy-learning* is seen as an essential ingredient of policy governance. However, in view of the complexity and the ever-changing character of the object of policy — which strongly applies in the case of innovation policy — it is now widely recognised that there is neither a clear-cut recipe for nor an overarching theory of policy-making (OECD, 2005). From a different angle, we should acknowledge a fervent need for continuous adaptation and re-adjustment of policies and related instruments. (Carlsson *et al*, 2006)

More recently, it has been recognised that the effectiveness of policy depends also on the involvement of a broader range of actors than those formally in charge of policy decisions. The concept of *distributed policy-making and intelligence* (Kuhlmann, 2001) draws our attention to various policy practices relying extensively on the knowledge, experience and competence of stakeholders. From this network perspective, policy-making is not just about government, but also about the joint impact of public and private decision-making on society's course of change and the interactions that precede formal decision-making. For government policies to be effective, this implies a need for the *participation of stakeholders*. Further, the role of government is shifting from being a central steering entity to that of a moderator of collective decision-making processes.

With such an open and distributed model of policy-making in mind, it is now increasingly recognised that an opening of political processes is necessary to ensure the robustness and the effectiveness of its outcomes. This is also reflected in the EC's White Paper on Governance (EC, 2001), stressing *five principles of good governance*: participation, accountability, openness, effectiveness, and coherence.

The aforementioned shift of policy-making approaches is reflected in the evolving practices of foresight. Foresight processes bring together not only experts, but also decision-makers from research, industry, policy-making and representatives of the affected social groups. Thus, a shared understanding of current problems, goals and development options can be expected to emerge among those actors that have an important role to play in shaping the future. This converging understanding of the

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issues at play is likely to contribute to an improved coherence of the distributed decisions of these actors, in line with the shared mental framework developed jointly during a foresight process. In other words, the future is being shaped by aligning expectations and thus 'creating' a self-fulfilling prophecy. These so-called process outputs are often regarded as more important than the actual substantive (or tangible) outputs like reports, list of priorities and recommendations.[3]

Most recently, we can observe an increasing interest in foresight activities that aim at *supporting strategy formation both at collective level and at the level of individual organisations*, for example, 'adaptive foresight' (Eriksson and Weber, 2008), or 'sustainability foresight' (Truffer *et al*, 2008). This interest is fuelled by the recognition that there is a 'translation problem' apparent in foresight approaches that predominantly rely on broad participatory processes, namely the translation of shared collective problem perceptions and visions into actual decisions of individual actors and organisations. From this perspective, foresight can be interpreted as an integral element of networked and distributed policy-making by providing three crucial functions (Da Costa *et al*, 2008; Eriksson and Weber, 2008; Weber, 2006), which — in line with the network-type distributed model of policy-making processes — are provided simultaneously rather than in distinct phases:

- *Policy-informing* by generating codified information and consolidated findings concerning the dynamics of change, future challenges and options, and transmitting these to policy-makers as inputs into policy conceptualisation and design. The inclusion of a high variety of stakeholders into the discourse, their linking among each other and the inducement of individual learning and interpretation processes play an important role here. This function is an important motivation for policy-makers to initiate a foresight programme.
- *Policy advisory function (strategic policy counselling)*, supporting the definition of policies by merging the insights generated in the foresight process with perceptions of the strategic positioning and options of individual actors in the policy-making context and transmit them into new policy concepts. In other words, beyond providing information, policy advisory work aims at interpreting these pieces of information against the background of the strategies of individual policy-making entities, and at translating them into new policies.
- *Policy-facilitating* relates to the function of a foresight exercise as a *systemic instrument* (Smits and Kuhlmann, 2004), that is, an instrument that complements traditional steering approaches. Collective learning processes take place through the provision of learning interfaces, by stimulating the development of common visions and by supporting the establishment of a specific infrastructure of distributed intelligence. Hence, foresight may facilitate policy implementation in increasing the responsiveness of the system to certain policies (Da Costa *et al*, 2008: 373), current dynamics and future developments as well as creating new networks and visions among stakeholders.

Against this background, it is now possible to summarise the potential policy impacts of foresight, by drawing first of all on the three main functions of foresight in relation to policy-making processes (Figure 1), second on the range of impacts that have been assigned to foresight in the corresponding literature, and third on the time lag, at which an impact occurs[4] (Table 1).

Innovation policy and foresight

Similar to foresight, innovation is a horizontal, cross-cutting policy matter that affects developments and performance in many other policy domains,

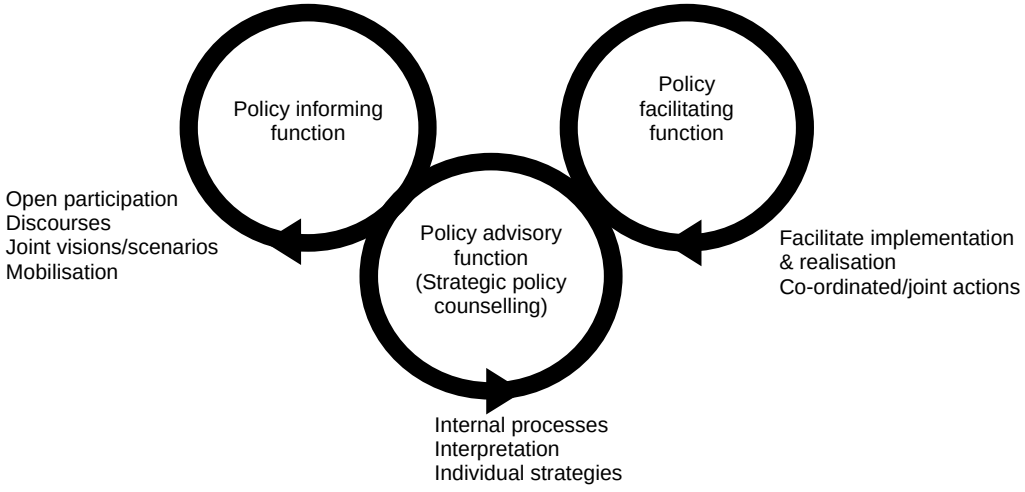

Figure 1. Policy-related functions of foresight
Source: adapted from Eriksson and Weber (2008)

Table 1. A framework to classify the impacts of foresight activities

Function	Time lag	Targeted and/or unintended impact
Informing	Immediate	• Increased recognition of a topic area • Individual learning: awareness of science, technology and innovation options among players, fostering debate • Context and views of other stakeholders become clearer • Foresight skills are developed in a wider circle • New network options through dialogues in new combinations of experts and stakeholders, shared understanding (knowledge network)
	Intermediate	• Realisation and continuation of established common understanding
	Ultimate	• Integrating able new actors and their views and inputs into the community that is shaping an area of concern
Advisory	Immediate	• Making hidden agendas and objectives explicit • Effective actions taken
	Intermediate	• Devising recommendations and identifying options for action • Activating and supporting fast policy-learning and policy-unlearning processes • Identify hidden obstacles to the introduction of more informed, transparent, open participatory processes to governance
	Ultimate	• Influence on (research/ policy) agendas of actors, both public and private (as revealed, for instance, in strategies and policy programmes) • Formulation and implementation of new policies • Incorporating forward-looking elements in organisations' internal procedures
Facilitating	Immediate	• Initiating collective learning processes • Articulation of common visions of the future, establishing longer-term perspectives • Awareness of systemic character of change process
	Intermediate	• Formation of action networks • Creation of follow-up activities • Development of new projects
	Ultimate	• Adoption of foresight results in the research and teaching agenda of organisations as well as in various disciplinary matters • Increasing the coherence of policies • Cultural changes towards longer-term and systemic thinking

Source: AIT, building on Cassingena Harper and Georghiou (2005); ForSociety (2007); and PREST (2006)

most notably energy, environment, transport, regional development, industrial change, health, and education. These policies, in turn, can have significant impacts on innovation processes and innovation performance, too. This implies that the requirements of these policy domains need to be taken into account in innovation policy and vice-versa. The growing interdependence of policy areas is one of the motivations for stressing the need for better policy co-ordination with respect to innovation-related issues (OECD, 2005), and it has been one of the drivers behind the emphasis put on systemic innovation policy instruments in order to complement classical policy instruments for fostering innovation (such as direct R&D subsidies) by less conventional ones (such as regulation, public procurement as well as measures to strengthen knowledge diffusion). Systemic instruments are meant to enhance the capability of innovation systems for self-organisation.

These insights also contributed over the past two decades to the emergence of a more 'humble' perception of what policies can actually deliver with respect to innovation:

1. Policy-makers cannot be seen as perfectly informed social planners, but at best as mediators and initiators of collectively negotiated decisions; and
2. The formation of policy strategies must be seen as a continuous, interactive learning process (Metcalfe and Georghiou, 1998).

From this perspective, foresight on innovation policy issues can be interpreted as a systemic co-ordination mechanism that mediates not only between policy actors and different stakeholder communities, but also between different policies (and their respective stakeholders) affecting innovation. In other words, foresight activities contribute to an infrastructure of distributed intelligence that is enabling the whole system to better address future challenges, and especially also link RTDI processes more closely to socio-economic needs by offering a forum for exchange between RTDI demand and RTDI supply perspectives. It is also reckoned that foresight actors develop a stronger inclination towards long-term thinking and obtain relevant knowledge for their internal strategic planning. As a consequence, combining foresight with the establishment of other strategic intelligence instruments helps ensure the tight embedding of forward-thinking into processes of policy-learning.

These observations stress the potential for synergies between innovation policy and foresight, but the actual effectiveness of foresight for innovation policy depends to a significant extent on its neat

embedding in the innovation system and the wider policy context. Subsequently, four important dimensions of this 'contextualisation' shall be briefly discussed: governance culture, policy attention, socio-economic dynamics, and resource availability.

Governance culture

In countries that already have a set of well-elaborated innovation policies in place, these tend to be underpinned by an array of strategic intelligence instruments, ranging from innovation research, project- and programme-monitoring to impact assessments and evaluations. Within this portfolio, foresight often acquires a special role to inform discussions, support strategy formation and facilitate the implementation of policies, but its influence on innovation policy depends on the role and 'weight' of the other instruments in innovation policy intelligence and learning. This kind of situation is characteristic of most Western European countries, where more or less differentiated governance mechanisms have been established to develop, monitor and re-orient public policies. In countries where the innovation policy culture is less developed, such as in most transition economies, in developing and/or industrialising countries, foresight as a participatory approach can be much more disruptive and visible in contributing to the co-ordination of policies and actors, not the least due to the absence of other intelligence tools.

Obvious examples for such countries are most of the Central and Eastern European (CEE) countries, newly independent states (NIS) and a number of developing countries. Foresight seems to have the potential to structure catching-up processes, to assemble new actors, integrate them into consensus-oriented dialogues and thereby effectively support policy-learning and 'unlearning' processes. Moreover, it provides the ground for setting up and exploiting the potential of other intelligence tools by contributing to the shaping of an innovation and strategy culture.

Foresight can also contribute to tackling another governance challenge of emerging economies: most of them are struggling with 'burning' short-term issues — such as pressures on various public services, for example, health care, education, pensions and thus severe budget deficit; imbalances in current accounts and foreign trade; unemployment; etc. — while faced with a compelling need for fundamental organisational and institutional changes in their governance systems. Short- and long-term issues compete for the same resources: capabilities (intellectual resources for problem-solving); attention of politicians and policy-makers who decide on the allocation of financial funds; and attention of opinion-leaders who can set the agenda (and thus influence discussions and decisions on the allocation of funds). These intellectual and financial resources are always limited, thus choices have to be made. A thorough, well-designed foresight process can help in striking a balance between short- and long-term issues.

Policy attention

Still, the governance culture alone does not explain major differences in the effectiveness of foresight. In countries with a highly developed innovation policy culture, the importance of foresight as compared to other instruments depends very much on its positioning and the support obtained from high-ranking policy-makers. The impacts of the first British foresight programme were not least due to the high-level of policy attention it received, and to the close link to the responsible minister's office. In Sweden, the existence of a range of other, well-developed policy support mechanisms made foresight just one instrument among others, and without gaining priority, foresight had much less room for impact. The innovation policy foresight by the City of Vienna was closely tied to a process of repositioning its STI policy, even if this close link may not have been intended right from the outset (Weber *et al*, 2009). However, one should also note the risks involved in a close link with, and attention of, policy-makers. Policy attention is often closely tied to issues that are high on the policy agendas; a situation that may give rise to 're-interpretation' of foresight results in order to make them fit political purposes rather than an open-minded discourse about future challenges and options. The framing of a foresight programme, for example, in terms of time horizon, objectives and ownership, is crucial to ensure the right balance between attention and openness.

Policy attention in emerging economies means the introduction of a new decision-making culture, along with a new way of thinking, with more emphasis on communication, co-operation, consensus among the major stakeholders, and in the end joint commitments to take action and determined implementation of policy recommendations.

Socio-economic dynamics

The timing of a foresight exercise is also very important for the contribution it can make to innovation policy. In countries that are facing major structural changes and expecting new developments to emerge in the coming years, the need for orientation and forward-looking information is much more pressing than in countries that are in a comparatively stable economic and social development phase. The transition economies in CEE countries are examples (Havas, 2003; Havas and Keenan, 2008), as well as many industrialising countries (Johnston and Sripaipan, 2008; Popper and Medina, 2008). However, also in the so-called advanced countries, characterised by apparently stable socio-economic structures, foresight can be highly relevant to discuss alternative futures. In the light of

strong pressures stemming from globalisation and major social and techno-economic forces, quite fundamental structural changes are required (in terms of business practices, economic structures and incentive mechanisms, skills development, attitudes, etc.), but are difficult to introduce due to strong path-dependencies inherent in the dominant techno-economic regimes.

Resource availability

Closely related to the dimension of socio-economic dynamics, the availability of resources can reinforce the interest in, and the impact of, foresight. Economic standstill or recession tends to lead to resistance to change and makes it very difficult to allocate resources to future-oriented activities. Yet, even under such unfavourable circumstances, shared visions can reduce uncertainty, facilitate priority-setting or at least the acceptance of the need for priority-setting, and thus lead to a more effective use and exploitation of scarce public money. Moreover, foresight can also contribute to finding ways out of the recession by identifying new opportunities.

Foresight is costly in terms of time and money in general, and this can be a decisive factor for emerging economies, in particular. Further, advanced countries regularly conduct foresight programmes, and their reports, Delphi-survey results, etc. are readily available. Yet, this should not prevent emerging economies from conducting their own foresight programme; on the contrary, it can be a very useful tool for these countries, too. Only a national programme can position a country in the global context and stir dialogues on how to react to major S&T, business, societal and environmental trends. Similarly, strengths and weaknesses of a given country would not be discussed by others' programmes, let alone broad socio-economic issues. Process benefits cannot be achieved without a national programme, either.

The horizontal nature of both innovation (policy) and foresight, and the embedding of foresight in its wider socio-economic and political context as captured by the above four dimensions are key aspects to be taken into account when discussing the impact of foresight, and its likely future(s).

The impact of foresight on policy

Assessing the impact of foresight in the context of innovation policy

The assessment of impacts of foresight must rely on a consolidated understanding of the policy processes it is embedded in, taking into consideration the three functions outlined above. The policy-informing function has been highly stressed among foresight experts. However, the first attempts to grasp not only the direct but also the indirect impacts of foresight exercises on government policies have been made only relatively recently (Amanatidou and Guy, 2008; Da Costa *et al*, 2008; Georghiou *et al*, 2008). The empirical basis on which to draw is thus rather scarce. The analysis can only be based on the evaluation of four recent foresight exercises (see Table 2), namely the second rounds of the UK and Swedish foresight exercises, the eFORESEE project in Malta, and the experience with the Hungarian foresight exercise (TEP), with a fifth evaluation — the one of the German Futur process — not being publicly available.[5]

As regards the various functions of foresight, little is known so far in terms of impact assessment. While the policy-informing function is generally acknowledged (though little hard evidence provided), the policy-counselling and -facilitating functions are still comparatively novel concepts, and have thus not yet been subject to deeper investigations.

In this article, we rely on several evaluation reports when analysing the impacts foresight programmes with respect to the three main functions of foresight: policy-informing, policy-counselling, and policy-facilitating. Some key issues resulting from this analysis of assessment results are discussed thereafter; first from a country-specific and then from a cross-cutting perspective, to highlight those contextual factors that strongly influence the likelihood of having an impact on policy (or not).

Assessment of the policy-informing function

In a 'textbook' case, foresight programmes produce codified information and knowledge in the form of reports and recommendations, which can be implemented immediately. These provide a 'reservoir of

Table 2. International foresight activities and their evaluations

Country	Dates of foresight process	Date of evaluation report/analysis	Years in between	Public R&D expenditures (2003, % of GDP)
Hungary	1997–2001	2004	3	0.62
Malta	2002–04	2005	1	0.19
Sweden	2002–04	2005	1	1.02
UK	2002–now	2006	0	0.68

Source: AIT, public R&D expenditures from the European Innovation Scoreboard 2005 <http://trendchart.cordis.lu/scoreboards/scoreboard2005/docs/EIS2005_database.xls>

knowledge', available for policy-makers for several years. The contents of these reservoirs irregularly find their way as active inputs in the political discourse, either through personal networks or simply because there are conclusive findings directly available when policies are being conceptualised (Georghiou *et al*, 2004: 5).

The quality of the reports produced during the foresight exercise is crucial. Trust in the reports, and thus their legitimacy as foundation for policy decision, increases if:

1. High-level independent experts are involved and carry the exercise (e.g. in the UK);
2. The exercise is highly inclusive in terms of participation, that is, a large number of interested and informed people is integrated (e.g. Malta). In order to achieve this, foresight may need to be done in parallel at different levels, with different customers (Arnold *et al*, 2005: 33).
3. If reports are based on panel discussions, the choice of the panel members, which consequently strongly determines the outcomes of the entire foresight programme, has to be transparent.
4. The information provided in the reports must not be perceived as party-political or partial, as this clearly impairs the confidence in their quality.

The informing function also manifests itself in individual learning processes induced by the foresight exercise. These are adaptations of mind-sets through a better understanding of the contexts and conducts of other stakeholders in the foresight process. Individual learning processes take place at the interface of various communities with different cultures, vocabularies, processes and time-scales. To isolate the contributions of a foresight process to individual perception and interpretation is not realistic. Radical adaptations of mind-sets may be reproduced, the sum of marginal realisations throughout the process are barely noticeable and not measurable (see also Da Costa *et al*, 2008: 371).

Assessment of the policy advisory function (strategic policy counselling)

There are obvious difficulties in assessing the policy advisory function as the transmission of personal realisations and conclusions derived through a foresight process to the conceptualisation and implementation of policies is clearly marked by frictions. Therefore, the evaluation of impacts of foresight exercises on the formulation of policies is difficult. The most obvious difficulty is the time lag between the foresight exercise and the emergence of results in the form of policy decisions. The impacts of foresight activities on policy-making are likely to occur and become visible only some time after the foresight process for several reasons. First, it often takes time to absorb new knowledge (ways of thinking, approaches and solutions to policy problems, etc.), and thus these results tend to shape decisions only with some delay — although there are exceptions from this general tendency, such as the case of Technology Foresight Ireland (ICSTI, 1999). Second, the negotiation and bargaining processes associated with policy formation, interpretation, and implementation also take their time and lead to a decelerated perception of actual foresight impacts (PREST, 2006: 17). This holds for both the products and the process benefits of foresight.

The situation is slightly different in those cases where foresight elements are closely linked to policy-formation processes, such as in the context of the Dutch Transition Management experiences (Kemp and Rotmans, 2005), or the review of the technology and innovation policy strategy of the Austrian Federal Ministry for Transport, Innovation and Technology (BMVIT, 2006). In these cases, the impact on policy formation is quite immediate, but they require a balance between open participatory phases and closed internal phases of strategy formation.

Assessment of the policy-facilitating function

Other impacts from foresight exercises, which can be subsumed under the policy-facilitating function, are the initiation of collective learning processes, the formation of (action) networks or the development of new projects.

However, very little is known about how participants of a foresight process adapt to each others' views and backgrounds because of the foresight process and to what extent their awareness of interlinkages of systems increases (Wilhelmer *et al*, 2010). Furthermore, there is little knowledge about the continuing contact of stakeholders after the end of a foresight project.

> In Sweden, at the individual level nearly everyone enjoyed participating in TF2 and considered it a great learning experience … Personal networks were greatly expanded, in a number of cases participants also argued that this would boost their careers. (Arnold *et al*, 2005: 30)

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The adherence of distinct networks on the whole, formed during the foresight process, seems to depend to a great extent on financial support provided after the end of foresight exercise; see for example the UK case.

Special features of the evaluation of recent foresight exercises

The second foresight round in the UK The evaluation report of the second UK Foresight round, launched in 2002, has identified two major immediate effects: the increased recognition for the topic area, and new combinations of experts and stakeholders brought together. Both may be attributed to the policy informing function (PREST, 2006: 17–19).

Intermediate effects have included the articulation of visions of the future, as well as recommendations and options for action. These have been achieved through the reports generated by the various projects sponsored by the 2002 UK foresight round and may be mentioned under the policy-informing and -advisory function. A third intermediate effect is the formation of action networks, pointing towards impacts in terms of the policy-facilitating function.

Ultimate effects have included influence on research agendas of both public (the UK Research Councils, UK government policy) and private actors (industry), and may be observed in particular in terms of the policy advisory function. Impacts of the foresight exercise on the public domain are evident in the stimulation of new areas of work within existing programmes, rather than the formulation of whole new programmes. Ultimate effects are a lot more difficult to trace in the private sector than in the public sector for two reasons. First, the private sector features less prominently in the 2002 round of the UK foresight. Second, foresight impacts on industry do not manifest themselves in publicly accessible documentation. What remains is anecdotal evidence of participants from industry that foresight activities are perceived as successful and interesting events (PREST, 2006: 18–19).

eFORESEE in Malta The 2002–2004 foresight exercise in Malta was conducted in the context of a political system undergoing fast changes in the critical phase of pre-accession to the European Union. The assessment of the exercise revealed that the particularly visible impacts are related to Malta's Knowledge Futures in ICT and Education Pilot. The main targeted output in this case was a vision of Malta in 2010. Furthermore, the pilot used five well-identified success criteria as objectives and measures of achievement.

In the domain of *policy-informing*, the objectives were to develop high-quality scenarios worthy of publication and the involvement of new actors beyond the established players in the field. Concerning *policy-advisory work*, the objectives were to identify textual modifications or inputs in the National Development Plan (NDP), a specific reference and follow-up activities in the NDP, resulting from the foresight exercise. With respect to *policy facilitating*, the objectives were, first, the development of thorough action plans, bringing to the table the main visionaries and strategic planners in Malta in the form of a 'core group', and second, the formation of new public–private partnerships that would take action on business opportunities identified via this exercise.

A process analysis has concluded that the objectives have been met, the main policy development being the launch of an updated RTDI Strategy (2003–2006) and its implementing tool, the RTDI programme. The foresight exercise has been instrumental in identifying the key weaknesses in the national system of innovation, which, in turn, have been targeted by the RTDI programme (Cassingena Harper and Georghiou, 2005: 94–97).

Box 1. A selective overview of policy impacts in the UK

The second round of foresight in the UK was organised in different projects, which vary considerably in their impacts on policy-making. This can be shown by drawing on the diversity of experiences made in the different exercises:

- The foresight project on *cognitive systems* (CS) was not intended to directly exert influence on policy (other than research policy, by offering funds for cross-disciplinary proposals building on the CS project) (PREST, 2006: 37).
- The *flood and coastal defence* project was used heavily to inform the sponsoring ministry's (Defra) long-term strategy on flooding. As a result, it has provided to be a map for Defra to use in policy development and decision-making. Furthermore, HM Treasury stressed the important contributions of the project for the Spending Review (SR) 2004, which ensured the high level of funding for flood management allocated in SR 2002 (PREST, 2006: 43–45).
- The project on *cyber trust and crime prevention* (CTCP) has impacted on government policy-making in various ways: a workshop has been organised relying on the scenarios of CTCP; the project has contributed to the definition of fraud and to the Cabinet Office's Strategy for Information Assurance. The Department of Trade and Industry (DTI) Innovation Group's recent priority on cyber security presumably relies to a large part on CTCP. However, some interviews suggest that the policy impacts of CTCT may be limited or delayed due to factors outside CTCP e.g. the turnover of the responsible minister (PREST, 2006: 49–51).
- The foresight project on *exploiting the electromagnetic spectrum* (EEMS) has assessed this research field in terms of possible commercialisation. It has exerted some influence on the calls of the research councils and of the DTI's technology programmes, but foresight in general is just one of the many inputs DTI uses to identify areas to support. Yet, the response from the community to the calls has been below expectation, suggesting that it is an area not yet ready for commercialisation (PREST, 2006: 56–58).
- The project on *brain science, addiction and drugs* (BSAD) had identified contradictions in the current policy, with repercussions on possible future developments. The responsible ministry has already used the outputs.

Several major unforeseen impacts that came to the fore during the implementation phase have also been identified (Cassingena Harper and Georghiou, 2005: 99–101):

- Activation and support of fast policy-learning and policy-unlearning processes.
- Engaging able new actors and integrating them in a consensus-oriented dialogue.
- Identification of hidden obstacles to the introduction of more informed, transparent, open, participatory processes to governance.
- A shift from the original, formal set of objectives to the informal or societal goals, which also formed part of the task. The shift was made when it became clear that in order to achieve the original objectives socio-cultural goals had also to be addressed.
- Increased awareness of science, technology and innovation policy concerns among local players. This impact was accelerated as the exercise was highly inclusive and sought to engage actors at all levels (strategic players, politicians and policy-makers as well as experts in the fields of social and natural sciences).
- Increased awareness has been generated of the need for consensus-building approaches in long-term vision-setting exercises if the policies are to prove sustainable.
- Spin-off foresight activities in various fields, as some of the panel members responded proactively to the issues under discussion and embarked on their own foresight activities. (e.g. FutureChild, theatre foresight, and tourism foresight).
- Investments in foresight training in order to ensure the quality of foresight processes and results.
- The adoption of foresight contents in the research and teaching agenda of the University of Malta.

The Technology Foresight Programme in Hungary The Hungarian Technology Foresight Programme (TEP) proceeded from 1997 to 2001, as the first experience of a full-scale national foresight activity in a transition economy. The steering group and the seven thematic panels assessed the current situation, outlined different visions for the future, and devised policy proposals. The thematic panels analysed the key aspects of the following areas: human resources; health and life sciences; information technology, telecommunications and the media; natural and built environments; manufacturing and business processes; agribusiness and the food industry; transport. Their main concern was to identify major tools to improve the quality of life and enhance international competitiveness, and thus they emphasised the significance of both knowledge generation and exploitation.

TEP was evaluated by an international panel in 2004 (Georghiou *et al*, 2004). A major tool of the evaluation was a survey which produced 62 responses. According to the survey respondents, the most important effects mainly concerned cultural changes: establishing longer-term perspectives and introducing greater inter-disciplinarity were the effects, which stood out in their rating of importance. Both effects may be interpreted as part of the *policy-informing* function, the first effect also as part of the *policy-facilitating* function. However, the effects achieved in terms of the original objectives were seen as quite weak, particularly influencing the research directions of industry or the public sector. It also had an effect on the climate of thought as it introduced longer-term holistic thinking in a period when the country was dominated by a short-term agenda (partly because of economic challenges but also as an opposition to central planning in the past) (Georghiou *et al*, 2004: 4–7).

With respect to *policy advisory work*, the effects of the Hungarian foresight on public policy are apparent now, but they took much longer than expected to materialise (Havas, 2003). The process behind this materialisation was a 'slow and non-linear process' (Georghiou *et al*, 2004: 5). In various policy domains (e.g. strategic documents by the Prime Minister's Office, transport policy, the national health programme, environmental policy, IT policy) statements, recommendations, sometimes exact passages, reflect the exploitation of TEP results. It seems that the 'reservoir of knowledge' created by TEP unevenly entered the policy-making processes, either through personal networks or simply because there was a conclusive text available when policies were being conceptualised (Georghiou *et al*, 2004: 5).

A few more impacts can be observed since the evaluation exercise was conducted. The broad visions presented in the first National Development Plan (2004–2006) have relied heavily on the so-called macro visions published in the TEP steering group report. Furthermore, the first ever STI policy strategy, approved by the government in March 2007, is also making explicit reference to these macro visions.

The Second Technology Foresight Programme in Sweden (TF2) In Sweden, the foresight process took place in 2002 to 2004, and it was evaluated by an international team in 2005. The evaluation report states that organisations (research organisations, consulting agencies, and foundations) appear to be the main winners and users of the results (Arnold *et al*, 2005). There is little sign of direct influence at the decision-making or political level (in our terminology: the *policy advisory* function). However, there has been a considerable overlap between various undertakings in the domain of research and innovation policy: TF2, the Research Bill and the national innovation strategy, *Innovativa Sverige*, were all devised at the same time (Arnold *et al*, 2005: 23). Interviewed civil servants have argued that the results of TF2 had not been well marketed in the policy-making system, and that the synthesis report had been produced in too late a phase, that is,

after the 'window of opportunity' to influence the Research Bill. Concerning the *policy-informing* function, the synthesis report had been perceived to be party-political, which undermined its credibility (Arnold *et al*, 2005: 28). The most obvious impact of TF2 has been the organisation of a series of fora for young people to debate the future.

Critical issues

As an overall assessment of its impact, foresight is a useful decision-preparatory tool, as suggested by its widespread use across continents, as well as by theoretical considerations. Foresight can assist decision-makers in tackling a number of complex challenges: it can reduce technological, economic or social uncertainties by identifying various futures and policy options; it can induce better-informed decisions by bringing together different communities of practice with their complementary knowledge and experience, obtain public support by improving transparency, and thus enhance overall efficiency of public spending (Havas, 2006).

The results of the evaluation exercises conducted so far also indicate that there are a number of key issues that can either significantly enhance the impact on policy-making, or hamper foresight from being influential.

Enrolment of able new actors and formation of actor networks The added-value of foresight increases when it is possible to overcome traditional sectoral or disciplinary barriers and to succeed in engaging able new actors beyond the established and well-known players in the field. This forges novel linkages within the innovation system and increases the recognition of the foresight topic area among the various players. The importance of these network-building effects, in particular as compared to the tangible results, has been confirmed by participants of many foresight processes.

Interested customers with absorptive capacities A key problem experienced in several cases has been the linkage between a particular foresight process and its clients. Interested customers with absorptive capacity are a precondition, if foresight is to affect policy. In the UK, the responsible minister was personally involved, which provided a focus and a clear indication of priority and importance of the exercise, and quite likely this factor increased the time devoted by civil servants to the absorption of the results (PREST, 2006: 19). In Sweden, however, foresight results seemed to have difficulty in competing with the abundance of other reports, as civil servants do not have the resources to work themselves through piles of (seemingly similar) documents (Arnold *et al*, 2005).

The dilemma of political support On the one hand, close attention and support from some key politicians enhances the absorption of foresight results in the ministries concerned, and therefore enhances the likelihood of consequent actions taken. On the other hand, close political support endangers the intellectual independence of the whole foresight process. It may therefore entail the risk of not taking foresight results seriously because they are perceived as party politics. Bearing this in mind, it follows that political support for foresight processes should be 'strong' and 'distant' at the same time — to strike this balance is likely to be a difficult task, and certainly a context-specific one (Havas, 2003).

Ownership of results in departmentalised government structures The more path-breaking and revolutionary the results of the foresight process are, the more likely their implementation is to interfere with the decision-making competences of several ministries. This seems often to be the reason why recommendations derived from foresight processes lack commitment to acting upon them. In Hungary, TEP had produced a long list of recommendations, which have been sparsely implemented (Georghiou *et al*, 2004: 4–5). In Sweden, implications of the synthesis report have been so wide-ranging that they surpassed the scope of single units or even entire ministries (Arnold *et al*, 2005: 28).

In general, departmentalised government structures tend to impair political action in complex issues (health, quality of life, environment, competitiveness, etc.). As foresight processes are mostly launched to tackle such complex issues, the subsequent implementation of the results is often outside anyone's decision-making competence, and therefore doomed to fail. Hence, already the design of a foresight process should provide for an effective co-ordination of public resources — both intellectual and financial — in order to achieve the comprehensive use of the foresight results (Havas, 2003).

Time horizon A time horizon slightly beyond the concerns of even strategic policy decisions allows more 'out-of-the-box' thinking and creativity in exploring various future states and their implications. There is obviously a trade-off between creative, long-term thinking and the likelihood of having an immediate impact on decision-making. There is an innate tension, therefore, between the long-term nature of foresight issues and the substantially shorter time horizon of politicians.

The congruence of actors in foresight and political advice The actors, individuals and groups, who inform and advise ministries, are often the same who take the lead in foresight processes. This makes it especially hard to assess the impacts of foresight activities, even if political programmes and resolutions obviously reflect foresight results. In the extreme, this leads to the conclusion of the US Office of Science and Technology about the UK foresight activities that 'in the absence of Foresight, some or

all of the successful outcomes might very well have transpired in part or at a later date' (Keenan, 2000). This argument presupposes that the ideas expressed in the foresight exercises 'have been around' anyway. Yet, there is a difference between ideas of visionary individuals that somehow find their way into opinion-forming or decision-making processes and the development of a vision in a foresight exercise, a vision that has been created jointly and that is shared by a broader constituency. This difference has major implications concerning the ownership of results, and thus with respect to the likelihood, efficiency and efficacy of implementation.

Future directions of foresight

Foresight should not be conducted for its own sake or just because it is currently 'fashionable' throughout the world and being promoted by international organisations. It is crucial to prove the impact of foresight on decision-making. This impact is dependent on the relevance to major issues faced by society, but also its timing and the quality of its 'products' — reports and recommendations — are crucial. Only substantive, carefully formulated proposals can grab the attention of opinion-leaders and decision-makers and are thus likely to be implemented. Otherwise all the time and effort that participants put into a foresight programme would be wasted, together with the public money spent to cover organisation and publication costs. The pro cess results, in terms of new and intensified networking, communication and enhanced cooperation among participants, may still be significant even in this sad case, but they are less visible and more difficult to measure, and may not be sufficient to ensure the continuation of a programme.

In this article, recent insights into the impacts of foresight processes as well as key contextual factors and determinants of impacts have been analysed against the background of a process model of embedding foresight into policy-making processes. These findings shall now serve as the starting point for exploring how foresight might evolve in the future, and the impacts it is likely to have on policy-making.

In the light of the arguments raised in this article, four different directions for the future of foresight can be outlined. These are not mutually exclusive scenarios, but rather complementary perspectives on how foresight might be used, each of them stressing different types of impact, depending on the contextual factors that characterise these particular perspectives.

Foresight as a sophisticated policy informing tool

This variant reflects a comparatively conservative future of foresight, where foresight will be mainly restricted to underpinning the policy-informing phase. Being of an exploratory nature, it serves the purpose of thinking ahead in order to be prepared for the unexpected or unusual developments. Participation would be restricted to experts, but from a wide range of domains. As these projects are not participatory in their nature, they should be called prospective analyses, rather than foresight, *stricto sensu*.

As for contextualisation, this model is based on the conviction that policy-making processes should be clearly separated from foresight activities, in response to the criticism that foresight undermines the formal, constitutional channels of decision-making. Among other indications, the latest generation of the British foresight seems to lend itself to a stronger emphasis on the policy-informing function, putting a strong emphasis on the role of specialised expertise.

Foresight as an integral part of policy processes

In this model, foresight becomes an integral part of the policy-making process, fulfilling key roles with respect to informing, counselling and facilitating. It is driven by the need for forward-looking, strategic support in policy-making processes and the need for better co-ordination of distributed policy-making, with foresight playing a major role in both respects. This is a model likely to emerge in those countries that already have a highly differentiated system of policy intelligence in place. Foresight could play a very prominent and visible role in such a context, for example, by integrating different inputs into policy formation, but longer-term, foresight-type approaches could equally turn into a standard element of reflexivity in decision-making processes, in permanent competition with other tools of policy intelligence.

This variant would imply that foresight not only is applied in individual policy areas and at individual policy levels ('operational foresight'), but also fulfils a cross-cutting, policy co-ordinating or at least policy-orientating function ('meta-level foresight'), very much in line with the cross-cutting role of innovation policy. It is also compatible with a widespread involvement in, and use of, foresight by other actors in economy and society ('distributed foresight'). And finally, this interpretation of foresight would imply its widespread use in internal processes of strategy formation of individual organisations in parallel with open participatory processes.

Foresight as a pacemaker for building up reflexivity

In this model, foresight acquires the role of a pacemaker for building up reflexivity in the policy-making system. As a first initiative of policy intelligence, it can serve several purposes simultaneously, ranging from raising awareness and providing orientation to capacity-building for policy intelligence. It can thus serve as a precursor for the establishment of other mechanisms, organisations and instruments needed to support reflexive policy-making. The

participatory element of foresight is of high relevance in this respect.

This model seems to be particularly suited for emerging economies or, more generally speaking, for countries that are facing fundamental changes and where a differentiated system and culture of innovation policy intelligence has not yet been established. In fact, foresight could be particularly interesting as a tool to pave the way for building up a sophisticated system of policy intelligence around those issues that are perceived as crucial for a country's future development path, that is, industrial development policy in view of catching up, or enhancing growth and innovation on the way towards a knowledge-intensive economy, etc.

Foresight as a tool for impact assessment

In line with more technocratic approaches for dealing with decision options, very much driven by the current hype of (*ex-ante*) impact assessment, especially in the European Union context, foresight could turn into an instrument for making impact assessments more realistic in the sense of accepting the inherent openness of the future and by stressing the qualitative nature of future changes and impacts.

This may not be the preferred model for foresight experts, but it is built on the assumption that the technocratic assessment culture that currently permeates public administration turns into the dominant mode of decision-making and decision support. Key elements of foresight as it is understood today could still play a significant role in such a context, but the participatory and qualitative notions associated with foresight would probably have to be complemented by other quantitative methods (e.g. real options methods in the context of scenario development) that are more compatible with the prevailing policy assessment mode.

These four future directions of foresight are not mutually exclusive, and the actual mix of foresight elements used as part of policy intelligence will depend on the respective context, in which foresight shall be used. Hence, they are meant as 'food for thought' regarding not only foresight as such, but also the context in which foresight is applied.

Notes

1. It had been the slogan of the first UK TF Programme.
2. Given the size of this literature, only a few examples can be mentioned here: Georghiou *et al*. (2008); OECD (1996); special issues of *Technological Forecasting and Social Change*, **60** (1999); *Journal of Forecasting*, **22**(2–3) (2003); *International Journal of Foresight and Innovation Policy*, **1**(3–4) (2004). The reader is also kindly referred to various reports posted at the EU foresight website: <http://cordis.europa.eu/foresight//home.html>.
3. Obviously, there are also certain types of foresight exercises that have a less pro-active intention by concentrating on the identification of future challenges and issues only, rather than aiming at solutions.
4. See the study on methods and dimensions of impact assessment by Rhomberg *et al* (2006) and in particular the self-evaluation tool for foresight developed by the ForSociety ERA-Net (ForSociety, 2007).
5. An evaluation of the German Futur process has been conducted, but not published. A short account can be found in Cuhls and Georghiou (2004).

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