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15 March 2011

Online at https://mpra.ub.uni-muenchen.de/38119/
MPRA Paper No. 38119, posted 16 Apr 2012 18:13 UTC

GOVERNING POLICY PROCESSES AND FORESIGHT: Potential Contributions and Inherent Tensions

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presented at aworkshop on
Foresight, Roadmapping and Governance
Budapest University of Technology and Economics, Budapest, 7-8 December 2007

revised in March 2011

published in
G. Banse, A. Grunwald, I. Hronszky & G. Nelson (eds) [2011]: *On Prospective Technology Studies*, pp. 1-18, Karlsruhe: KIT Scientific Publishing

1 INTRODUCTION

The increasing number of foresight programmes suggests that it can be a useful policy tool in rather different national innovation systems. Emerging economies – faced with a number of similar or same challenges when trying to find their new role in the changing international settings, while still characterised by their own distinct level of socio-economic development, set of institutions, behavioural norms and decision-making culture – can also benefit significantly from conducting foresight programmes.

This paper is aimed at discussing the potential and actual role of foresight in governing policy processes, especially in the context of emerging economies in Central and Eastern Europe (CEE). In doing so, first the theoretical underpinnings of this analysis is summarised briefly. Then the rationale of conducting foresight is presented: what policy challenges can be tackled by applying foresight? It is followed by a discussion of a new typology of foresight programmes, distinguishing the ones with an S&T, techno-economic or societal/ socio-economic focus. The concluding section summarises the major lessons, but also presents some policy and methodological dilemmas.

2 THEORETICAL FRAMEWORK

Foresight programmes do not have a single, all-encompassing theory to support them, and thus they rely on a range of – somewhat overlapping – theories and methods, including (i) evolutionary economics of innovation; (ii) sociology of science and technology; (iii) actor - network theories; (iv) political sciences analyses of policy processes; (v) communication, co-operation, and participation theories; (vi) decision-preparatory and future-oriented methods, techniques. This list is far from exhaustive, and most likely disciples of these theories would change the grouping, the order of their own discipline or even the wording used here. That might be an interesting discussion in its own right, indeed, for theoretical purposes. Yet, the intention here is just to indicate the 'eclectic' – and thus complex – nature of foresight programmes, rather than attempting to provide a meticulous, comprehensive treatise of these issues.

This section is concerned with evolutionary economics of innovation[1] because this theory provides useful observations to appreciate the relevance of foresight programmes from different angles. First, foresight (programmes), future, change, innovation and uncertainty are closely interrelated notions – and some of these are the underlying terms of evolutionary economics of innovation. Second, foresight programmes are important policy tools, and thus the nature of policy formation processes and the policy rationale of foresight programmes should be clearly understood (further explored in Section 3):

2.1 The process of innovation and economic theories

Obviously, no comprehensive overview on evolutionary economics of innovation can be provided here: only the main features are highlighted.

Innovation, defined as "the search for, and the discovery, experimentation, development, imitation, and adoption of new products, new production processes and new organisational set-ups" (Dosi, 1988a, p. 222), leads to variety (diversity), and competition. The latter one, in turn, both conducive to innovation and induced by innovation, selects among firms (or organisations, more generally):

In spite of the apparent similarity with biological processes, one should not mistakenly equate evolutionary economics with evolutionary biology. Freeman (1994b) highlights two fundamental differences. First, selection is at least partly conscious in the innovation process as decision-makers can choose between various 'mutations' (that is, new products, processes and organisational forms): Moreover, their expectations, hopes, plans and values also shape the 'evolution' of these 'mutations'. Ethical and social considerations, therefore, play an increasingly important role in the innovation process, notably in the development and utilisation of nuclear energy and biotechnology, as opposed to the process of biological evolution. Second, selection is taking place at a number of levels in the course of competition: among products, firms (organisations), sectors, regions, countries and socio-economic systems. There are some autonomous rules and laws of the selection process at these different levels. Strong interrelations and interdependencies, however, can also be observed. Technological innovations are shaping both their natural and socio-economic environment, while the success of innovations strongly depends on their environment, including the quantity, quality and distribution of accumulated capital in the form of production equipment, roads, railways, communications networks, bridges, etc., as well as policies, attitudes and norms, that is, institutions in short.

While rational agents in the models of neo-classical economics can optimise via calculating *risks* and taking appropriate actions, "innovation involves a fundamental element of *uncertainty*, which is not simply the lack of all the relevant information about the occurrence of known events, but more fundamentally, entails also (a) the existence of techno-economic problems whose solution procedures are unknown, and (b) the impossibility of precisely tracing consequences to actions" (Dosi, 1988a, p. 222 – emphasis added): Thus, the notions of *optimisation* or *maximisation* become meaningless.

Another important implication of uncertainty concerns the scientific and policy relevance of forecasting, based on the extrapolation of (supposedly) known trends. The space of events, in which *forecasting* can be meaningful is strictly limited: the only certain – and thus easily predictable – outcome of innovative activities is that most of the underlying technological and

[1] See, *e.g.*, Dosi, 1988b, Dosi *et al*., 1988, 1994, Dodgson and Bessant, 1996, Dodgson and Rothwell, 1994, Edquist (ed.), 1997, Ergas, 1987, Fagerberg *et al.* (eds), 2005, Freeman, 1994a, Freeman and Soete, 1997, Lundvall (ed.), 1992, Lundvall and Borrás, 1999, Metcalfe and Georghiou, 1998, Nelson (ed.), 1993, 1995, Nelson and Winter, 1982, OECD, 1992, 1997, 1998, 2001, Smith, 2002.

business trends can change quite radically even in the space of 10-15 years.[2] From a policy perspective, therefore, new methods are required, which can take into account uncertainty during a decision-preparatory process. *Foresight* is a prominent one from this point of view, for two reasons. First, it is capable of dealing with uncertainty by devising alternative (qualitatively, or fundamentally different) 'futures' (visions of future, future states or scenarios): Indeed, it is a distinctive feature of foresight to consider alternative futures. Second, foresight processes can reduce uncertainty, too, because participants can align their endeavours once they arrive at a shared vision. To this effect, however, it is a necessary condition to involve the major stakeholders, who can significantly influence the underlying trends by shaping the strategies or policies of their respective organisations (government agencies, businesses, research organisations, NGOs, unions, etc. – depending on the issues in question, as well as the political and decision-making culture of the 'entity' conducting a foresight programme: international organisations or regions, nation states, sub-national regions, business associations, groups or individual firms, cities, etc.)

As opposed to the 'time-less' world of neo-classical economics, "*history counts*: past technological achievements influence future achievements via the specificity of knowledge that they entail, the development of specific infrastructures, the emergence of various sorts of increasing returns and non-convexities in the notional set of technological options" (Dosi, 1992, p. 183): In other words, technological change is a *cumulative*, *path-dependent* process, and hence increasing returns are at least as important as diminishing returns. Closely related notions, also in the heart of evolutionary thinking, are *learning by doing, using, interacting* (Freeman, 1994a) and *comparing* (Lundvall and Tomlinson, 2002):

Mainstream economics is mainly concerned with the availability of *information* (or information asymmetries in its jargon): Both theoretical and empirical studies reflect, however, the growing recognition that the success of firms – regions and nations – depends on their accumulated *knowledge,* both codified and tacit,[3] and *skills*, as well as *learning capabilities*. Information can be simply bought, and hence mainstream economics is comfortable with it. Knowledge – and *a fortiori,* the types of knowledge required for innovation – on the contrary, cannot be mistaken with goods that can be purchased and used instantaneously; one has to go through a learning process to acquire knowledge and skills.[4] It obviously takes time and involves the process and costs of *trial and error*. Thus, the uncertain, cumulative and path-dependent nature of innovation is reinforced.

An important aspect of learning should be underlined here, namely its level. Some analysts and policy-makers highlight network re-alignment and research, technological development and innovation (RTDI) policy updating as key foresight benefits – which are crucial impacts, depending on the 'focus' of a given foresight programme. (see Section 4.2.2 on 'focus') Case studies and anecdotal evidence clearly suggest, however, that there are often overlooked or 'hidden' benefits relating to learning at the level of individuals and

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[2] Obviously, there are certain trends, e.g. demographic ones, which are not directly influenced by innovative activities, on the one hand, and their 'stability' (predictability) extends to a much longer time horizon (in this case around 40-50 years), on the other. Also, the pace and intensity of innovative activities – and hence their impacts on major technological and business trends – vary significantly across time (different historical periods) and countries (socio-economic systems):

[3] For a brief, but highly informative, discussion of codified and tacit knowledge, and the policy relevance of this distinction, see Lundvall and Borrás, 1999 (especially pp. 31-33), as well as the literature they refer to.

[4] Borrowing a sparkling parable of Dosi, 1988b, although there are market conditions of access to information e.g. there is a market for textbooks and economic conditions of access to higher education (the level of tuition fees, the availability or scarcity of grants for students), "in any proper sense of the word, getting a PhD is not simply acquiring information, and it is even less true to say that there is a market for PhDs" (p. 1130):

communities. Actually, it is almost a commonplace among practitioners to refer to foresight as a learning process, although quite often they mean methodological learning. In any case, it might be a fruitful idea to make a clear distinction among the different levels of learning, i.e. not to focus exclusively at the 'macro' level, but give more prominence to individual and community learning when devising or evaluating foresight programmes.

Cumulativeness, path-dependency and learning lead to *heterogeneity* among firms and other organisations. Moreover, sectoral characteristics of the innovation process should also be taken into account while devising strategy or policy.[5]

A vast body of empirical literature has also clearly shown that innovators are not lonely scientists. While some path-breaking scientific or technological ideas might come indeed from individuals, successful innovations can only be generated by a close collaboration of different organisations such as: university departments, government and/or contract research labs, firms and specialised service-providers. Forms of their co-operation can also be varied widely from informal communications through highly formalised R&D contracts to alliances and joint ventures.[6] Thus, conscious network-building efforts of foresight programmes are crucial, indeed – as well as their unintended impacts on networking (in case of the lack of explicit objectives to strengthen existing networks, facilitate the formation of new ones, and more generally, foster communication and co-operation; see Section 4.2 on different types of foresight programmes):

2.2 Implications for RTDI policies

Evolutionary account of the innovation process offers some sobering lessons: in a world of uncertainty, policy cannot bring about the optimum either. The policy-maker is not "a perfectly informed social planner correcting imperfect market signals to guide private decisions toward more desirable outcomes". (Metcalfe and Georghiou, 1998, p. 94) Of course, this conclusion is not easy to accept, especially for those trained in the paradigm of rationality, maximisation and optimisation:

> "For obvious reasons, many economists prefer models that provide precise policy recommendations, even in situations in which the models are inapplicable to the world of our existence. Our own view is that, rather than using neo-classical models that give precise answers that do not apply to situations in which technology is evolving endogenously, it is better to face the reality that there is no optimal policy with respect to technological change." (Lipsey and Carlaw, 1998, p. 48)

Variety, selection and uncertainty also have repercussions on the very nature of policy and strategy formation, and thus decision-makers – either devising public policies or strategies for firms or RTDI organisations – should take into account these features. The relevant and potentially successful policies and strategies *adaptive* ones, relying on, and learning from, feedback from the selection process to the development of further variation. (Metcalfe and Georghiou, 1998) In other words, policy and strategy formation is increasingly becoming a learning process. (Lundvall and Borrás, 1999, Teubal, 1998) This notion underlines the importance of foresight programmes: more 'robust' policies can be devised when (i) alternative futures are considered, and (ii) participants with different background are

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[5] A seminal taxonomy developed in Pavitt, 1984 identifies supplier-dominated sectors, specialised suppliers, scale-intensive and science-based sectors.

[6] Freeman, 1991, 1994a and 1995 provided a thorough literature survey on the importance of networks and the innovation system approach. See also Edquist (ed.), 1997, Lundvall (ed.), 1992, Lundvall and Borrás, 1999, Nelson (ed.), 1993, OECD, 2001, Tidd *et al.*, 1997, as well as the October 1991 and February 2002 issues of *Research Policy* (Vol. 20, No. 5, and Vol. 31, No. 2, respectively):

actively involved in a decision-preparatory process, and thus bringing wide-ranging accumulated knowledge, experience, aspirations, and ideas in.

Some more instructive policy lessons can also be derived from evolutionary theorising: given the characteristics of the innovation process, public policies should be aimed at promoting learning in its widest possible sense, in other words competence building at individual, organisational and inter-organisational levels. Co-operation and networking among a host of actors, including not only researchers and producers but also users is a vital element in generating and disseminating knowledge. A system-approach is required, therefore, in policy-making, whereby "policies recognise the division of labour in the generation of innovation-relevant knowledge, that no individual firm is self-sufficient in its knowledge and skills and that there are corresponding gains from linking firms with the wider matrix of knowledge-generating institutions". (Metcalfe and Georghiou, 1998, p. 84) Indeed, a recent trend in the RTDI policies of advanced countries is to shift from direct research and development (R&D) support to promoting linkages, communication and co-operation among the players in the innovation process and thus building an appropriate organisational and institutional infrastructure. (Dodgson and Bessant, 1996; Lundvall and Borrás, 1999; OECD, 1998); a special issue of *Research Policy* [Vol. 30, No. 6]; country reports on national innovation policies at http://www.proinno-europe.eu)

Certain types of foresight programmes (see Section 4.2) can take into account these broader issues, as opposed to focussing narrowly on advancing scientific research in specific fields of enquiry or developing particular technologies. It, therefore, can be a crucial policy tool, especially if it is explicitly aimed at strengthening – regional, sectoral, national or trans-border – innovation systems. (The network-building aspects of foresight programmes have already been discussed in Section 2.1.)

Another major policy implication of this analytical framework is that conscious, co-ordinated policy efforts are needed to promote knowledge-intensive activities in all sectors, with the explicit goal of upgrading firms' capabilities, and thus improving their overall competitiveness. In other words, despite of the wide-spread believes in the 'magic' and automatic impacts of the so-called high-tech industries on economic growth, policy-makers should be aware of the importance of knowledge-content in the low- and medium-technology (LMT) industries, too.[7]

An EC document also draws the attention of policy-makers to this conclusion in a balanced, succinct way: "The EIS [European Innovation Scoreboard – A.H.] has been designed with a strong focus on innovation in high-tech sectors. Although these sectors are very important engines of technological innovation, they are only a relatively small part of the economy as measured in their contribution to GDP and total employment. The larger share of low and medium-tech sectors in the economy and the fact that these sectors are important users of new technologies merits a closer look at their innovation performance. This could help national policy makers with focusing their innovation strategies on existing strength and overcome areas of weakness." (EC, 2003, p. 20)

Foresight programmes, therefore, need – and should – not be confined to the narrow field of high-tech sectors (or 'advanced' S&T topics):

[7] Just to prevent some potential misinterpretations, it should be stressed that this paper is not intended, of course, to advocate a 'low-tech development path' for emerging economies, or to 'relegate' them to the second or third 'technology division' with low competitiveness, and hence low living standards.

2.3 Foresight, innovation and RTDI policies

To avoid some potential misinterpretation, finally it should be stressed that opting for this theoretical framework does not mean that foresight should be understood as a vehicle to support narrowly defined (technological) innovation processes or RTDI policies. (See more on the policy rationale of the different types of foresight programmes in Section 4.2.) A narrow understanding would exclude, for example a foresight programme to create visions for cancer treatment.[8] Two aspects need clarification: (i) the relationships between foresight and innovation; and (ii) the links between foresight programmes, RTDI and other policies.

First, it might be useful to repeat that innovation should be understood as the introduction (practical application) of new or significantly modified products, production processes, services, as well as organisational and managerial practices (techniques): Thus, visions for new cancer treatments are about innovation, too, following this widely accepted broad definition: we should envisage not only new medicines (product innovations), but also new ways to 'provide services' in the health care system (service, process, organisational and managerial innovations):[9] Moreover, visions generated by a foresight process would certainly encompass prevention, too (concerning diet, drinking and smoking habits, doing sports, reducing stress, etc.): This is also a new approach in terms of addressing an issue, i.e. a policy and organisational innovation at a social level – requiring new habits at an individual level. Also, new cancer treatments are likely to contribute to socio-economic development in several ways. To mention just two of them here: (i) in a narrow economic sense they can be cheaper or more efficient than the old ones, i.e. more patients can be cured faster (losing less time, which can be used for 'productive' purposes) and at lower costs; (ii) more broadly, the quality of life is improved when less people suffer from cancer, and less people should fear of cancer, due to better treatments.

Second, so far it has only been emphasised that foresight is an important innovation policy tool. It should be added that it could be useful in other policy domains, too. The above example clearly shows that health policies also need to deal with – and promote – various types of innovations.[10]

In sum, the subject itself is not a decisive factor for being 'qualified' as a foresight programme; what matters is to meet the three criteria set in Section 4.1.

3 POLICY CHALLENGES: WHY TO CONDUCT FORESIGHT

Foresight (or the use of some other methods to assist future-oriented thinking) offers a number of advantages for decision-makers: it is a tool to (i) recognise and emphasise the possibility of different future*s* (or future states), as opposed to the assumption that there is an already given, pre-determined future, and hence the opportunity of shaping our futures; (ii) enhance flexibility in policy making and implementation; and (iii) broaden perspectives, encourage thinking outside the box ("think of the unthinkable"): A number of major trends

[8] These observations are prompted by a question of Göran Pagels-Fick: "Could we envisage a foresight programme to create visions for cancer treatment practices?"

[9] This is a generally accepted definition of innovation by international organisations, such as the OECD and EU, shared by researchers and policy-makers, too. Quite often, however, other people, e.g. journalists and politicians still use the term in its narrow sense, i.e. they only refer to technological innovations.

[10] Ian Miles is among the pioneers to stress the importance of innovation in service sectors, and he has also written extensively on the role of innovation in services provided by the state, and thus on the need to devise appropriate policies in these fields to promote innovations.

affect all countries and most areas of policy-making, thus a new *culture of future-oriented thinking* is needed.

Foresight programmes have been widely applied, especially since the 1990s. As a growing body of literature analyses this surge, the major factors explaining the diffusion of foresight can be summarised in a telegraphic style:

- Globalisation, coupled with sweeping technological and organisational changes, as well as the ever-increasing importance of learning capabilities and application of knowledge have significantly altered the 'rules of the game'. Thus, policy-makers have to take on new responsibilities (as well as dropping some previous ones), while firms must find new strategies to remain, or become, competitive in this new environment.
- Given the above factors our future cannot be predicted by any sophisticated model. Planning or forecasting of our future becomes more and more ridiculed in light of rapid and fundamental changes. 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 future*s* are inevitable. Diversity is a key word: diversity in scope (in terms of possible futures, differing analyses etc), as well as diversity in solutions or policy options.
- Decision-makers face *complex* challenges: socio-economic and technological factors interact in defining issues of strategic importance, e.g.
  - education and life-long learning (new demands on education systems; new, mainly ICT-based tools and methods for teaching and learning; the growing need for interaction and co-operation with businesses);
  - environmental issues;
  - quality of life (health, education, demographic changes, especially the growing share and special needs of elderly people, living and working environment, social conflicts, crime prevention, etc.);
  - competitiveness (at national and EU-level for attracting talents and capital, at firm level maintaining and increasing market shares nationally and internationally, etc.);
  - regional disparities.
- Most policy problems no longer have 'self-evident' solutions. Governments are forced to make use of 'evidence-based policies', policies based on knowledge/ insight into what works and what does not.
- Policy-makers have to learn to cope with growing complexity and uncertainty of policy issues themselves. Thus, the precautionary principle is of a growing significance.
- New skills and behaviour are required (e.g. problem-solving, communication and co-operation skills in multidisciplinary, multicultural teams meeting more often only "virtually", as well as creativity) if individuals or organisations are to prosper in this new setting. This, in turn, creates new demands on the education and training system (see above):
- Clusters, networks (business – academia, business – business, both at national, international levels) and other forms of co-operation have become a key factor in creating, diffusing and exploiting knowledge and new technologies, and therefore in satisfying social needs and achieving economic success.

- There is a widening gap between the speed of technological changes and the ability to devise appropriate policies (which requires a sound understanding of the underlying causes and mechanisms at work.)
- Given the growing political and economic pressures, governments try hard to balance their budgets: when cutting taxes, 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 expenditures are also subjected to these demands.
- Policy-makers also have to deal with intensifying social concerns about new technologies (mainly ethical and safety concerns in the case of bio- and nano- or nuclear technologies, and fears of unemployment and social exclusion caused by the rapid diffusion of new technologies in general):
- 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.

Besides the above trends, there are other specific, policy-relevant methodological reasons to apply foresight. *First,* it can offer vital input for 'quantum leaps' in policy-making in various domains. Usually policies evolve in a piecemeal way, in incremental, small steps. From time to time, however, a more fundamental rethinking of current policies is needed. In other words, policy-makers occasionally need to ask if current policies can be continued: do they react to signs of changes, block or accommodate future developments?

> 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 does not alerted by the slowly rising temperature. It will boil alive.

Second, foresight can also help in picking up *weak signals*: weak but very important signals 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 seen 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 (EC DG Research, 2002) – offers an essential tool for this endeavour. 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. The foresight process can reduce uncertainty, too, because participants can align their endeavours once they arrive at shared visions. Many governments have already realised the importance of foresight activities, and thus this relatively new, and innovative, policy tool is spreading across continents.[11]

The above general considerations apply in catching-up countries in the CEE region, too. Quite a few pressures – especially the need to change attitudes and norms, develop new skills,

[11] For a detailed and systematic analysis of the rationale for foresight and description of national exercises, see the articles, papers and books listed in the References.

facilitate co-operation, balance budgets – are even stronger than in the case of advanced countries. Moreover, most of these countries also have to cope with additional challenges: the necessity to find new markets; fragile international competitiveness; relatively poor quality of life; and brain drain. These all point to the need to devise a sound, appropriate innovation policy, and even more importantly, to strengthen their respective systems of innovation. Foresight can be an effective tool to embark upon these interrelated issues, too, if used deliberately in this broader context.

Foresight can also contribute to tackle yet another challenge of emerging economies: most of them are struggling with 'burning' short-term issues – such as pressures on various public services, e.g. 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 other words, short- and long-term issues compete for various 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 identify priorities, also in terms of striking a balance between short- and long-term issues.

Further, foresight can offer additional "process benefits" in the CEE region. By debating the various strengths, weaknesses, threats and opportunities of a country posed by the catching-up process, and the role of universities and research institutes in replying to those challenges, the process itself is likely to contribute to realign the S&T system (including the higher education sector) to the new situation. An intense, high profile discussion – in other words, a wide consultation process involving the major stakeholders – can also be used as a means to raise the profile of S&T and innovation issues in politics and formulating economic policies. (Georghoiu, 2002)

To conclude, foresight should not be conducted for its own sake – just because it is becoming "fashionable" throughout the world, and currently being promoted by international organisations. On the contrary, there should be a strong link between foresight, decision preparation and policy-making: foresight should be used as a policy tool to address major socio-economic and political challenges. It is not a panacea, however; it cannot solve all the problems listed above, and cannot solve any of them just on its own. Obviously, other methods and tools are also required, as well as an assiduous implementation of the strategies devised either at national, regional, sector or firm level.

4 A TYPOLOGY OF FORESIGHT PROGRAMMES

4.1. Locating foresight programmes among future-oriented analyses

Decision-makers, experts and laymen in different historical periods and in different socio-economic systems shared at least one desire: to know their future in advance or even to influence it for their advantage. They used very different approaches and methods from spiritual/ religious ones to scientific investigations and various modes of planning.[12] Without going into details here, it is worth recalling some of the major methods/ approaches in order to locate – and distinguish – foresight programmes:

[12] Hence, a special chapter of the history of mankind can be devoted to these different attitudes, methods and approaches towards the future.

- visionary thinking (in ancient times by prophets, more recently mainly by consultants)
- forecasting (at different levels, using different methods, e.g. trend analysis, extrapolation)
- futures studies (for academic purposes)
- prospective analyses (for business or policy purposes, e.g. [technology] roadmapping, list of critical/ strategic/ key technologies)
- strategy formation (at firm, sectoral, regional or national levels)
- scenario planning (at a firm level; see e.g. Godet, 2001)
- indicative national planning
- central planning (at a national level)
- foresight programmes.[13]

Obviously, the above approaches have a number of common characteristics. All of them (a) deal with the future(s) in one way or another; (b) collect and analyse various pieces of information, and (c) can apply a wide range of methods, mainly scientific ones. Three key features can be used to differentiate the above approaches, and thus distinguish foresight programmes from other methods. These approaches can:

- be action-oriented vs. 'contemplative' (passive)
- be participatory vs. non-participatory
- consider alternative futures vs. a single future state (already 'set' by external forces):

Action-oriented endeavours aim at shaping/ influencing/ acting upon the future,[14] while passive ones are 'contemplating' about it (e.g. 'pure' futurologist studies, without any policy implications): In other words, the latter ones merely try to develop a better-informed anticipation of the future, e.g. for being better prepared by having more precise information.

Participatory future-oriented programmes/ projects meet all the three following criteria: they (i) involve participants from at least two different stakeholder groups (e.g. researchers and business people; experts and policy-makers; experts and laymen); (ii) disseminate their preliminary results (e.g. analyses, tentative conclusions and policy proposals) among interested 'non-participants',[15] e.g. face-to-face at workshops, electronically via the internet with free access for everyone, or in the form of printed documents, leaflets, newsletters; and (iii) seek feedback from this wider circle (again, either face-to-face or in a written form): Conversely, if any of these criteria is not met, that activity cannot be regarded a participatory programme or project.

Finally, certain approaches are based on the assumption that the future is not pre-determined yet; and thus the future can evolve in different directions, to some extent depending on the actions of various players and decisions taken 'today'. In other words, there is a certain degree of freedom in choosing among the alternative, feasible futures, and hence increasing the chance of arriving at the preferred (selected) future state. Clearly, there is a

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[13] The term 'foresight programme(s)' is used throughout this paper as an attempt to distinguish individual (personal) foresight and 'collective' foresight programmes, i.e. the ones launched (and sponsored) by an organisation (or several ones), and conducted by a number participants. Moreover, an increasing number of articles published by researchers working in the field of future studies, in which 'foresight' is used as a new label for their work (although still following the 'futures studies' or futurology paradigm), see e.g. the recent issues of *Futures*, especially Vol. 36, No. 2. It does not seem to be a productive, promising dispute trying to establish the 'real' meaning of foresight, and then attempting to 'enforce' it across various communities of practice.

[14] E.g. the slogan of the first UK Foresight Programme was: "Shaping our future".

[15] 'Non-participants' are those persons who have not been members of panels or working groups set up by the programme, and have not been involved directly in any other way, e.g. by answering (Delphi) questionnaires.

close link between being action-oriented and considering alternative futures.[16] Other approaches, on the contrary, can only think of a single future, already 'fixed' by certain factors, and thus the task is to explore (forecast, predict) 'the' future scientifically.[17]

In sum, foresight programmes are action-oriented, participatory and consider alternative futures.

4.2 Focus of foresight programmes

Foresight programmes may have rather dissimilar foci, ranging from the identification of priorities in a strict S&T context to addressing broad societal/ socio-economic challenges.

Georghiou (2001) and (2002) identified three generations of prospective/ strategic technological analyses. This classification is used here as point of departure to develop a typology of foresight programmes to analyse their potential and actual role in policy-making.

The first generation is the classical technological forecasting, aimed at predicting technological developments, based on extrapolation of perceptible trends.[18]

The main aim of a second-generation foresight programme is to improve competitiveness by strengthening academy-industry co-operation, correcting the so-called market failure[19] and trying to extend the usually too short time horizon of businesses.[20]

A third-generation foresight programme tackles broad/er/ socio-economic challenges, and hence besides researchers and business people government officials and social stakeholders are also involved.

Three 'ideal types' of foresight programmes can be defined as major 'reference points'. Identifying 'ideal types' is a long-established practice in social sciences (and somewhat similar to 'models' used in all fields of sciences): "The fact that none of these three ideal types (…) is usually to be found in historical cases in 'pure' form, is naturally not a valid objection to attempting their conceptual formulation is the sharpest possible form."[21] (Weber, 1947, reprinted in Pugh, 1988, p. 16)

Note, however, that all three ideal types of foresight programmes should meet the criteria defined above in Section 4.1: they should be action-oriented, participatory and should consider alternative futures. The underlying difference among them is their focus:

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[16] Some foresight programmes, e.g. the second Swedish Technology Foresight Programme, consider alternative futures with the explicit aim of identifying key choices confronting their 'constituency' or 'target audience', but do not intend to single out any preferred future. In other words, these programmes do not follow a normative approach. (This approach, and the example, has been mentioned by Göran Pagels-Fick among his comments on an earlier draft.)

[17] Cuhls (2003) offers an excellent, comprehensive discussion on the differences between forecasting, prediction, planning and foresight. The possibility of a single future vs. "many" futures is a central element of her analysis.

[18] These predictions are produced by a relatively small group of experts: futurologists and/or technological experts (that is, other types of expertise or actors are not sought after in the process of forecasting): The main objective is to predict which S&T areas are likely to produce exploitable results. Forecast results, in turn, are used in economic planning, either at firm or macro level.

[19] In short, private returns on R&D are smaller than social returns (as firms cannot appropriate all the profits stemming form R&D), and thus firms do not invest into R&D at a sufficient – socially optimal – level.

[20] Accordingly, a different set of actors is involved in these programmes: researchers working on various S&T fields and business people, bringing knowledge on markets into the process. These programmes are organised by following the structure of economic sectors (various industries and services):

[21] It is just a coincidence that Weber also talks of three ideal types when discussing legitimate authority.

- S&T issues: type A foresight programmes
- techno-economic issues: type B foresight programmes
- broad societal/ socio-economic issues: type C foresight programmes.[22]

Their further characteristics, in terms of their aims, rationales and participants, are summarised in Table 1. One would notice immediately that these ideal types are not distinguished by their themes (topics): for example, they all deal with S&T issues, but by doing so, they pursue different aims, and follow different (policy) rationales. In other words, they address different challenges, ask different questions, use different approaches/ ways of thinking,[23] and involve different participants. In other words, these ideal types should not be thought of as "Russian dolls": the biggest one, type C incorporating the middle one, i.e. type B, and, in turn, type B encompassing the smallest one (the 'core'), Type A.

Table 1: Foci of foresight programmes

	S&T focus (type A)	**Techno-economic focus (type B)**	**Societal/ socio-economic focus (type C)**
Aims	Identify S&T priorities (following the logic of scientific discovery)	Identify research topics in S&T, of which results are believed to be useful for businesses	Identify research topics in S&T, of which results are believed to contribute to addressing major societal/ socio-economic challenges Devise other policies – or identify policy domains, which are relevant – to tackle these societal/ socio-economic issues
Rationale	Boost national prestige, achieve S&T excellence; Following the linear model of innovation, socio-economic benefits might also be assumed; implicitly or explicitly	Business logic: improve competitiveness Correct market failures: strengthen academia-industry co-operation, extend the short time horizon of businesses	Improve quality of life (enhance competitiveness as a means for that) Correct systemic failures, strengthen the National Innovation System
Participants	Researchers, policy-makers (e.g. S&T and finance ministries)	Researchers, business people, policy-makers	Researchers, business people, policy-makers, social stakeholders (lay persons?)

Potential users usually constitute a broader group than the actual participants; they might include e.g. funding organisations, other policy implementation bodies and public service providers (including 'quangos' [quasi-NGOs]), professional associations representing the interests of their members (and thus involving them to some extent in strategy and policy

[22] In short, the most important modification compared to the three generations identified by Georghiou is to replace technology forecasting with foresight programmes focussing on S&T issues. Technology forecasting projects usually do not consider alternative futures, and most of them are not participatory either (as defined above in Section 4.1): However, there is no reason to assume that S&T issues cannot be tackled in a participatory manner, considering alternative futures, and aiming at informing and influencing present actions. For example, the recent Turkish Foresight Programme – the Vision 2023 Project – has focussed on S&T issues. (Tümer, 2004)

[23] See section 4.4 for more details on the differences in terms of questions, approaches – when analysing the same theme (technological field):

formation processes in various ways), venture capitalists, trade unions, etc. Depending on the focus of a foresight programme (the types of challenges/ issues considered), as well as the political culture of a given country or region, some of these potential users and stakeholders might become participants, too. In any case, it is not possible to establish a one-to-one relationship between an 'ideal type' of foresight and its participants beyond the 'typical' participants indicated in Table 1. The type and number of participants, the methods, channels and for a used their 'internal' and 'external' dialogues,[24] as well as the intensity, quality and impacts of these dialogues is obviously a question for the individual description, analysis or evaluation of actual foresight programmes.

Types A and B programmes have a longer tradition, and thus in general they are better known. Obvious examples are the Turkish Vision 2023 Project (type A) and the first UK Foresight Programme (Type B): (Tümer, 2004, and Georghiou, 1996, respectively)

Therefore, only type C programmes are explained here in some detail. The shift in focus is reflected in the structure, too: these programmes are organised along major societal/ socio-economic concerns (e.g. health, ageing population, crime prevention in the case of the Hungarian, the first Swedish or the second UK foresight programmes; see Boxes 1-2 in Section 4.3): A new element in the underlying rationale can also be discerned, the so-called systemic failure argument: the existing institutions (written and tacit codes of behaviour, rules and norms) and organisations are not sufficient to improve quality of life and enhance competitiveness, and thus new institutions should be 'designed' by intense communication and co-operation among the participants. In other words, the existing gaps should be bridged by new networks, appropriate policies aimed at correcting systemic failures, and establishing or strengthening relevant organisations. A foresight programme, based on this rationale, can deliver solutions in various forms: by strengthened, re-aligned networks as 'process' results of the programme, as well as by policy recommendations ('products'):

An actual foresight programme is likely to combine certain elements from various types. In most cases, however, one type of rationale would be chosen as a principal one; it thus would underlie the more detailed objectives and structure of a programme, as well as the choice of its participants. Otherwise, it would likely to lead to an incoherent – even chaotic – exercise, characterised by tensions between (a) the various objectives, (b) elements of its structure, (c) the objectives and methods, (d) the participants and objectives, and/or (e) among the participants themselves. A certain level of tension, however, might be quite useful – or even essential – to produce creative, innovative ideas and solutions, of course, but too intense and too frequently occurring – structural, inherent – conflicts would most likely tear a foresight programme apart.

5 COHERENCE OF FORESIGHT PROGRAMMES

5.1 Themes and time horizon

At a first glance, the focus of a foresight programme determines the themes to be discussed/ analysed to a large extent. For instance, as already alluded, typical themes for a technology forecast or a type A foresight programme would be specific fields of science and technology, such as microelectronics, communications, bioinformatics, energy technologies, new

[24] Internal dialogues take place among the participants of a given programme, e.g. among panel members, between panels, between panels and the management team, between the steering group and panels – or any other internal groups of participants in case these ones have not existed. External dialogues are organised among the participants and other stakeholders, clients, target groups, etc., i.e. those, who have not participated in the programme in a direct way.

materials, bio- and nanotechnology. These topics have been dictated to a non-negligible extent by ‘fashion’ or fads, too: earlier much had been written on nuclear and space technologies, then came ICT to yield significance, and more recently the fields denoted by prefixes of ‘bio-’ and ‘nano-’ have taken the centre stage.

The time horizon can be driven by the dynamics of a given discipline or the imagination (agenda) of the futurists. For the latter, perhaps an extreme example is when Molitor (2000) predicts the weight and height of human beings in 3000. He has also published a book entitled *The Next 1000 Years*. It is not uncommon, however, to try to predict major events in a 50-100 years time horizon.

The so-called critical or key technologies method is also concerned with technological fields – as its name clearly indicates – but in this case the time horizon is much shorter, usually 5-10 years, as it is derived from policy-makers’ needs to set mid-term priorities.

A typical type B foresight programme, e.g. the first UK one, deals with economic sectors, such as chemicals, construction, financial services, food and drinks, leisure and learning, retailing and distribution, transport, as well as technological fields, such as aerospace and defence, communications, IT and electronics, life sciences, materials. The time horizon in this case was 15-20 years, similar to a number of other national foresight programmes.

At a national level, only a handful of type C foresight programmes have been conducted so far. As already mentioned, these are concerned with broad societal/ socio-economic issues, such as human resources, health, ageing population, crime prevention, usually with a time horizon of 20-25 years.

Box 1: UK1 and UK2 foresight themes

UK 1st round (1994-99)	**UK 2nd round (1999-2002)**
Science driven sectors:	*Thematic panels*
Chemicals	Ageing population
Defence and aerospace	Crime prevention
Health and life sciences	Manufacturing 2020
Materials	*Sector panels*
Exploitation sectors:	Built environment and transport
Communications	Chemicals
Financial services	Defence aerospace and systems
Food and drink	Energy and natural environment
IT and electronics	Financial services
Policy driven sectors:	Food chain and crops for industry
Agriculture, natural resources and environment	Healthcare
Energy	Information, communications and media
Retailing and distribution	Marine
Transport	Materials
Human resource and management driven sectors:	Retail and consumer services
Construction	
Leisure and learning	
Manufacturing, production and business processes	

Source: http://www.bis.gov.uk/foresight/about-us/history; documents of the first and second rounds of the UK Foresight Programme

Box 2: Hungarian and Swedish foresight themes

TEP, Hungarian Foresight Programme (1998-2000)	**Swedish Foresight Programme (1998-2000)**
Human resources	Health, medicine and care
Health (life sciences, health care system, life style, pharmaceuticals, medical instruments)	Biological natural resources
Natural and built environment	Society's infrastructure
Information technologies, telecommunications, media	Production systems
Manufacturing and business processes (new materials, production processes and management techniques, supplier networks)	Information and communications systems
Agri- and food businesses	Materials and material flows in the community
Transport	Service industries
	Education and learning

Source: documents of the Hungarian and Swedish national foresight programmes; http://www.nih.gov.hu/english/science-technology-and/technology-foresight, and http://www.dimea.se/customers/tfOld/old/eng/index.html, respectively

5.2 Different approaches to the same theme

A premature conclusion from the above examples would suggest a mechanistic link between the focus and themes of a given foresight programme, as well as between themes and time horizons. A more detailed look, however, would reveal there is no strict one-to-one relationship in either case. E.g. information and communication technologies (ICTs) are usually analysed by all sorts of foresight programmes – with important differences, of course:

- in a critical (key) technologies programme the emphasis would be on specific technological terrains of this broad field, usually with a 3-5-year time horizon, and hardly any attention would be devoted to social issues (e.g. exclusion – inclusion of certain social groups; gaps between generations, or regions, cities and villages; e-democracy; regulations on, and incentives for, different types of content; etc.);
- a type A foresight programme would also put the emphasis on – the usually assumed positive – technical aspects (including perhaps also the overall impacts on the society in general, i.e. not differentiated/ elaborated by social strata; but not considering the potential impact the other way around, that is, how socio-economic needs and trends would shape technological developments): These programmes opt, however, usually for a significantly longer time horizon (say, 20-25 years) than the one used in a critical (key) technologies programme.
- a type B foresight programme is likely to focus on broader technological fields – as opposed to specific sub-fields analysed by the critical technologies approach.[25] It would pay much more attention to the economic (market) aspects than the above ones, and perhaps would discuss some social factors, too, as they shape demand, but not much elaboration can be expected on social challenges (either dealing with the new ones caused/ accentuated by ICT or asking how ICT can contribute to tackle existing

[25] Yet, in the first UK programme, IT, electronics and communications were not integrated into a single panel.

social challenges): The usual time horizon is around 10-15 years when this approach is chosen.

- a distinctive feature of a type C foresight programme is the marked, deliberate shift towards precisely to those societal/ socio-economic aspects which are neglected by all the other approaches, and thus mentioned above as "negative examples". Technical aspects, however, are not ignored by this approach, either, but discussed in a different context (also usually in a more integrated way, e.g. ICT and various types of media are understood as a complex, closely inter-related entity): other types of questions are asked, and new drivers and shapers come to the forefront. The time horizon, therefore, is also determined by the socio-economic issues identified by the programme: it would depend on the amount of time required to change the underlying settings, to influence the major shaping factors so as to achieve a certain (desirable) future state. (In other words, the time horizon cannot be shorter than the period of time needed for a change aspired by the programme.)

ICT has been used as an example here because it is – by definition – a technology, and as it is a significant one; thus, it is no surprise at all that various types of technology foresight programmes would deal with this issue. Non-technological topics – such as human resources, crime prevention, etc. – on the contrary, are only addressed by type C programmes as major issues. (This is not to be mistaken with the fact that some socio-economic factors might be included in a type B foresight programme as shapers influencing market dynamics – as mentioned above.)

Finally, it goes without saying that some inherent features of a given topic to be analysed also have repercussions on the time horizon. Usually changes take much more time e.g. in the field of agriculture (classical breeding), environment, education or in demographic trends than in rapidly evolving technologies, such as ICT or biotechnology. These determinants should not be ignored, and various themes/ topics of a given foresight programme, therefore, might have different time horizons.

In sum, although there is a great deal of overlap in terms of broad themes discussed by various types of foresight programmes, a closer look clearly shows that these apparently same topics are dealt with in rather different manners. A different focus means that different approaches are applied when analysing seemingly similar issues: a different set of questions are asked, and hence various – social, technological, economic, environmental and political – factors and values are taken into account to a different degree (some of these factors not at all in certain foresight programmes) by a different set of participants (technology experts, business people, researchers, policy-makers, lay people): The time horizon, in turn, is determined to some extent by the inherent (technical, social, etc.) features of the various themes, but also by the focus (main objectives) of the programme, in which these topics are taken up.

6 CONCLUSIONS

Decision-makers face increasingly complex issues, given that economic, technological environmental – and thus social – challenges are brought to any nation sate rather quickly, due the forces of globalisation, and these challenges are usually inherently inter-linked. Technological changes cause economic, environmental and social threats and opportunities; economic resources are required to finance public policies aimed at tackling these issues (e.g. harnessing technological change, preventing environmental crises, preventing social explosions, etc.); and government policies are under ultimate social control (in democratic

societies through a number of institutions, formal and direct, as well as informal and indirect ways, in other cases by more costly, more radical, yet, less frequently applied mechanisms):

Both theoretical considerations and actual cases clearly show that foresight can be a relevant decision-preparatory tool in a number of policy fields – well beyond science and technology. In other words, it is time to embrace this broader notion of foresight. This paper has attempted to contribute to the diffusion of this new understanding by distinguishing and discussing three different foci of foresight programmes, namely pure S&T, techno-economic and societal/ socio-economic ones.

Foresight processes can assist decision-makers in this complex environment to reduce technological, economic or social uncertainties by identifying various futures and policy options, make better informed decisions by bringing together different communities with their complementary knowledge and experience, obtain public support by improving transparency, and thus improve overall efficiency of public spending.

It is crucial to prove the relevance of foresight for decision-making: its timing and relevance to major issues faced by societies, as well as the quality of its 'products' – reports and policy recommendations – are critical. Only substantive, yet carefully formulated proposals can grab the attention of opinion leaders and decision-makers, and then, in turn, the results are likely to be implemented. Otherwise all the time and efforts of participants put into a programme would be wasted, together with the public money spent to cover organisational and publication cost. The so-called process results – e.g. intensified networking, communication and co-operation among the participants – still might be significant even in this sad case, but they are less visible, and much more difficult to measure. Thus, the chances of a repeated programme – when it would be due again given the changes in the circumstances – are becoming really thin.

Foresight can be relevant even in emerging countries, too, not being in the forefront of technological development but rather in the semi-periphery. A number of factors seem to contradict this conclusion at first glance. Foresight is costly in terms of time and money, but even more so in terms of the participants' time required by meetings, workshops and surveys. Moreover, advanced countries, whose experts, in turn, know more about the leading edge technologies, regularly conduct their foresight programmes, and their 'products' – reports, Delphi-survey results – are readily available. Yet, only a national programme can position a country in the global context and spark a discussion on how to react to major trends. Similarly, SWOT of a given country would not be analysed by others, let alone broad socio-economic issues. Process benefits cannot be achieved without a national programme either. Without these, a country would not be able to improve the quality of life of her population and enhance her international competitiveness.

The current structural changes in the world economy and the emergence of new, global concerns related to environmental, health and demographic issues, imply that the scenario method may be relevant not only in transition economies, per se, but also in countries with long-established, crystallised institutional systems. A growing body of literature suggests that technological and socio-economic changes are intertwined. Scenario workshops, therefore, can contribute to a better understanding of these complex relations, leading to policy proposals, which help in making appropriate choices in an increasingly complex environment. Further, the Delphi-method, taken alone, can facilitate the foresight process only to a limited extent, and thus the process benefits are bound to be limited, too.

Yet, it is important to highlight some dilemmas, too, which are partly to do with policy, and partly methodological in character:

- How to solve the inherent contradiction between the long-term nature of foresight issues (policy recommendations), on the one hand, and the substantially shorter time horizon of politicians (and some policy-makers), on the other?
- What organisational set-up is necessary to ease another inherent contradiction between the need for a strong (but 'reserved') political support (or 'embeddedness') for a foresight programme on the one hand, and for enjoying intellectual, organisational, financial independence from any government agency, on the other?
- How to overcome the departmentalised government structures when policy proposals tackling complex issues (such as health, quality of life, environment, competitiveness, etc.) should be discussed and implemented, i.e. public resources – both financial and intellectual ones – should be pulled together to make a real difference in an efficient, that is, co-ordinated way, yet, they are allocated to different ministries and other government agencies?

International co-operation can enhance the chances of success by sharing lessons, easing the lack of financial and intellectual resources through exploiting synergies and economies of scale. Yet, its more ambitious form, i.e. a joint foresight exercise on trans-border issues also necessitates methodological innovations. International organisations can also facilitate foresight programmes in emerging countries, and more specifically collaboration among them. It is crucial, however, to maintain the commitment of local actors, e.g. in terms of time and funds devoted to the programme, willingness to implement of the results. In other words, the main forms of foreign assistance should be the provision of knowledge-sharing platforms and other fora to exchange experience (among emerging economies as well as with advanced countries), monitoring and evaluating foresight initiatives in the CEE region.

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