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Technologies in transition, policies in transition: foresight in the risk society

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Abstract

The emergence of formal Foresight programmes in science policy across Europe is examined in terms of government's response to the changes in, and especially the uncertainties of, contemporary innovation. The paper explores this through deploying Beck's notion of the "risk society", asking how far Foresight can be construed as the management of new technologies by the transition towards the "negotiation state". It shows how, through a discussion of the social management of new health technologies, a tension arises between the priorities and regimes of the new "negotiation" and those of the former "provident" (or welfare) state. The emergence of new technologies will be shaped by the institutional assumptions and processes operating within the different policy regimes. © 1999 Elsevier Science Ltd. All rights reserved.

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1. Introduction

Technologies today are often said to be undergoing a radical shift in the way they are configured, in the way they embody high levels of intellectual density as "knowledge-based", in the way they cut through conventional biological and physical barriers and demand new forms of engineering and design skills, in the way they are increasingly interactive and interdependent on other technologies for their very survival as working machines, devices, kits, databases, and so on. Technologies are said to be information rich, where knowledge resides in and depends upon the orchestration of large *in silica* forms of data—as in the human genome project. New forms of science and technology—such as bioinformatics or molecular genetics—become new forms of information science as do communications technologies relying on the digitisation of communications systems. Information units in binary code—to which genetic or telecomms lines are often reduced—become powerful drivers of an increasing range of technological systems.

Yet, paradoxically, the arrival of informated-innovation as a common-denominator shaping the design and production of new technology has not been accompanied by an increasing sense of control over the sort of technologies this innovation produces. On the contrary, the economic value, environmental impact and social utility of these new technologies are more likely to generate more not less uncertainty among those who confront them, have to manage them and have to think about their development 10 to 20 years from now. Those of a rationalist, scientistic persuasion will put down such doubts and feelings of insecurity to ignorance or mis-understanding, but even the rationalist will at times experience the sense of being simultaneously overloaded with information, short of the right information, and burdened with obsolescent information. No wonder there is so much attention given to the need for knowledge brokers who can filter, evaluate and distribute what are regarded as most relevant forms of knowledge within organisations.

The emergence of the paradox of knowledge-based uncertainty has, of course, been associated with wider changes in late modernity, as Beck's (1995) account of "reflexive modernisation" has argued, and, in this paper, I want to draw on some of the insights Beck offers in relation to the social management of uncertainty to interrogate the Technology Foresight programme, for, in its way, it is a very explicit response made by what Beck calls the "negotiation state" to the demands posed by the risk society. At the substantive level, I shall do this

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through considering one of the main areas of Foresight, health.

2. The risk society and its implications for science policy

The future is, of course, always shot through with uncertainty, and always has been. As Bell (1996) says, "There is no knowledge of the future… Although there are past facts, present options and future possibilities, there are no past possibilities and no future facts". However, there is a sense today that our futures are in some sense *more* uncertain than they were in the past, or more accurately, that we experience a different *type* of uncertainty than before. This may be because the capacity to shape future agendas is more widely distributed than before, and that therefore a much wider range of futures are up for debate; it also reflects a view that it is increasingly difficult to evaluate the impact—and risks—of new science and technology, which are always two-edged, whose unintended effects are a creation of the very science itself—such as antibiotic-resistant superbugs.

Over recent years Ulrich Beck has made a major contribution to understanding the nature of risks we face today. He has produced a series of texts that describe and explain his concept of "the risk society" which he believes best characterises the condition of late modern states today (see, e.g. Beck, 1991, 1995, 1996, 1998). Beck has argued that science and technology are a combination of promise and threat, of being able to meet our needs—such as for food, warmth, and transport—but doing so in such a way as to threaten the very basis of our collective, global survival. Beck's work on "the risk society" is, therefore, about this fundamental contradiction of science in late modernity.

He argues that there has been a major shift since the enlightenment in the way science and technology relate to risks in society: until recently science and technology were regarded as the means through which our dependency on and vulnerability towards nature could be overcome; today (within the past two decades) science and technology must respond to the risks that they *themselves* create. The state no longer is able to act as guarantor of safety of freedom from risk because, "in contrast to early industrial risks, nuclear, chemical, ecological and genetic engineering risks (a) can be limited neither in time nor place and (b) are not accountable according to established rules of causality, blame and liability and cannot be compensated or insured against" (Beck, 1996, p. 31). There are, in other words, significant changes in the capacity of the state and the wider political system to manage these developments: during the period of the welfare—or "provident"—state, political institutions acted to oversee and reduce the hazards, both social and economic, of industrial society.

It should be clear from this that Beck's belief in a dramatic change in the state's capacity to manage science goes beyond the conventional notion that scientific and technological development are always shot through with uncertainties and unintended effects. Such a position can be found in much science policy writing, notably, for example, in the seminal contributions by Collingridge (1984, 1986). Collingridge was one of the first to argue against the view dominant in the post-war period that policy-making for science was the end-result of a rational decision-making process. He argued on the contrary, that the political management of technologies can never, in principle or practice, be based on claims to know their outcome in advance. Instead uncertainty should be a welcome guest at the science policy table. Instead of policy acting in some rational, strategic way, it is full of contingency and as a result science policy makers continually need to engage in "repair work". In a similar vein, Rip (1990) argues that scenarios about future technology developments can only, at best, be understood to be "story-telling [about the future] which conveys some intelligence", rather than conveying any sense of certainty or clear, optimal choices.

In contrast to (though in some ways complementing) these commentaries, Beck's argument is that contemporary techno-economic development is qualitatively different in its effects and influence on society from anything that has gone before. This is precisely because of the character of the innovations themselves—as in genetic engineering—whose uncertain outcomes as a field of innovation are unknown not only in terms of their unintended effects, but even in terms of those that are intended: the effects which *are* anticipated are still in themselves experimental and as such inherently uncertain in their outcomes beyond a limited range of predictability.

Today, political institutions that are supposed to manage new science find they cannot keep up with the pace of "techno-economic development". Indeed, the force of this development is such that it *itself* has the capacity to structure society, where, for example, "microelectronics permits us to change the social constitution of the employment system" (Beck, 1991, p. 190). The former provident state becomes disempowered and its political institutions "…become the administrators of a development they neither have planned for nor are they able to structure, but nevertheless must somehow justify" (pp. 186–7). Indeed, the locus for the development and social management of new technologies shifts to a new *sub-political* arena, outside of parliament or political party:

> The structuring of the future is taking place indirectly and unrecognisably in research laboratories and executive suites, not in parliament… Everyone else-…more or less lives off the crumbs of information

> that fall from the planning tables of technological sub-politics (Beck, 1991, p. 223).

So extensive is this region of sub-politics that are out-with the institutional structures of the state that Beck has described this as tantamount to the "re-invention of politics". To ensure it retains some sort of legitimacy the state now must entertain and facilitate a more complex and institutionally problematic form of "governance": "the authoritarian decision and action state gives way to the negotiation state". In these circumstances the state must redefine its position in relation to techno-economic development and the risks it creates, adopting a more circumspect and limited capacity in regard to the control and direction of techno-economic innovation.

If Beck's account of the risk society can be accepted, it is perhaps not surprising, then, that we see a mush-rooming of "futures" analysis, of horizon-scanning, of scenario thinking about the development of new technologies, precisely because of the desire to try to tie things down, to reduce uncertainties and risks—or at least to be seen to be doing so—as much as possible. This often involves a glossing over of the risks of technology itself: uncertainty is presented as lying less with the technology per se and more with the social and economic circumstances within which it is to be deployed (see Miles, 1997). Such technocratic arguments are often closely associated with the deficit model of the "public (mis)understanding of science".

While its discourse (at least in face of the public) may often appear technocratic, this futures analysis is typically associated with and expressed through both the transitory and more long-lasting socio-technical networks that help to construct and reconstruct the future agenda for technologies. This can of course mean that any technocratic line is difficult to secure, especially in new areas of innovation where embryonic networks generate competing rather than singular agendas: since there are many new networks coming together in what we might call "times of Foresight", the stories of the future unfold in many different, competing directions. As de Laat and Laredo (1998) observe,

> …a foresight exercise is a forum where actors put forward their anticipations and postulate not only "technological options" but, often implicitly, also the scripts and scenarios that correspond to these options. Moreover, it is a hybrid forum since in most of the cases it appears that no absolute criterion (shared by all actors) have yet been constructed that would allow for comparison between scripts and selection of techno-economic networks (p. 157).

This hybrid forum finds its most formal expression in the Technology Foresight programmes now found in most "late modern" states. These programmes seek to identify technological options yet, in principle, keep options open: if there is no "absolute criterion" for evaluating—and subsequently managing—technologies in transition, the "negotiation state" can use this particular science policy instrument to negotiate its way round the maze of technological futures.

At the same time, the "re-invention of politics" means that contemporary negotiation states will develop an approach to its new policies (such as Foresight) which is quite distinct from the past. A defining characteristic of the contemporary state is its tendency to alter the terms on which it has responsibility for whole areas of policy-making. Typically, there is a tendency to devolve responsibility to local or regional levels and to new (non-traditional) political actors. The privatisation and deregulation of state agencies—such as research institutes, railway systems, powerplants—means that, while their activities may be subject to both national and international conventions and directives, they are shaped by competing localised interests not subject to any single form of governance or accountability since what it is to be "accountable" is now itself subject to negotiation. This movement towards a localised, subnational policy regime creates what Beck might call "forms of organised irresponsibility" (Beck, 1998, p. 15): while the negotiation state might provide the general steer and strategy for policy, the state does not set the terms on which subnational policy regimes must executed. This separation between strategy and execution is a defining feature of contemporary politics, and has, of course, raised considerable debate over contemporary forms of "governance" (Rhoades, 1997; Kooiman, 1993). It also is a defining feature of the shift from the provident to the negotiation state, since in the former policies—such as employment, welfare, health policies—were centrally driven.

In light of this, we might expect to find that institutions created by the provident state have some difficulty in responding to the technology futures opened up by the negotiation state's Foresight programme. This may be particularly true of institutions which are heavily dependent on new technologies—such as national health care systems. As the progeny of the provident state, these institutions have sought to reduce the uncertainties and risks of modern life. The provident (welfare) state is, or at least was, based on a set of assumptions that certain needs—such as health care—can be collectively defined and so provided on a rational, albeit rationed, basis. The ambiguities of the risk society cast doubt on what these needs are, precisely because of the technological innovation—such as genetic therapy or xeno-transplantation—that is associated with it. How, in other words, are the *modern* institutions of the provident state—such as the British National Health Service—to respond to the uncertainties—technological, organisational and jurisdictional—created by the contemporary

policy regime (see Rip and van der Meulen, 1996) and prevailing within the negotiation state? And how do they respond to the technological scripts of the future written by socio-technical networks directly associated with Foresight itself? But before we discuss this, it is necessary to provide some brief contextualisation within which Foresight has developed.

3. The move to Foresight

The momentum behind current Foresight programmes in both public (government) and private sectors can be said to be derived from the need to confront, take stock of and engage with the risks and uncertainties of the innovation system, which according to Beck's analysis are quite distinct from the past. Contemporary innovation poses new problems for science policy regimes (Edquist, 1997) including:

- the need for institutional flexibility in response to future demands;
- the enabling of organisational and managerial change;
- the encouragement of new types of network
- the effective and appropriate selection of socio-technologies for the future;
- the effective and appropriate management of knowledge flows within and between innovation actors.

Not only, then, are we seeing a transition to new types of (information-dependent) technologies, we are also witnessing changes in the social context in which they are to be developed, a socio-technical transition. In principle, Foresight programmes are supposed to be able to meet some if not all of the demands that this transition throws up through building a consensus on priorities, encouraging an anticipatory culture, providing a means through which to determine optimum selection of technology development through a careful evaluation of innovative capacity, and defusing the tensions associated with uncertainty by redefining uncertainty as a positive rather than negative feature of the planning process, typically by recasting this as "vision", or even as a process "visioning". In general Foresight involves four processes:

- deriving a list of "critical" or "generic" technologies which can underpin several different areas of innovation;
- a consensus-driven consultation exercise (firmly located in Beck's "sub-political" arena) that tries to identify possible developments in science and technology which may help meet societal needs over the next 30 years;
- a priority-setting process for the science and engineering base;
- the identification and encouragement of fields of "technological fusion" which might otherwise be marginalised by conventional disciplinary and institutional structures.

These aspirations create a political discourse which legitimates the new role of the negotiation state. A series of rhetorical claims are made on behalf of the Foresight programmes. In the UK, the exercise is credited with the creation of a new cultural configuration, or as the Office of Science and Technology calls it "a foresight culture". Innovation actors are encouraged to become instilled with a future-oriented gaze fixed on long term health and wealth creation. This also involves encouraging the *generic conditions* within which *innovation competencies* can prosper rather than "picking winners". Here it marks itself off from the predictive forecasting of the 1970s. In addition, the programme seeks to promote aggregation of ideas and initiative across newly formed networks through encouraging informal links; "go out and network" has become the clarion call of the UK's Department of Trade and Industry at all its sponsored workshops.

Networking is of course only as good as the networks that it produces and typically networks self-organise themselves into relatively closed relationships of like-minded actors, sharing similar socio-economic and political interests, though in the fast-moving innovation environment such networks can come and go quite quickly once they have served their purpose (Gibbons et al., 1995). Perhaps in response to the criticism often directed at British policy-makers that decisions merely reflect an "old-boys' network", the UK programme has claimed that it has as one of its primary objectives the broadening of participation in the priority setting process by increasing representation from as wide a range of constituencies as possible; this in turn is said to ensure the social accountability of the programme.

Finally, the long term prospective anticipation of distant policy conditions—a culture of forward looking—is seen to be an essential driver behind the whole programme. Indeed it is the programme's primary rationale since it is premised on the belief that one can endeavour to reduce the uncertainties of the future by responding in advance to the conditions that create them. A prominent proponent of Foresight programmes describes them as "systematic attempts to look into the longer-term future of science, technology, the economy, the environment and society with a view to identifying the emerging generic technologies and the underpinning areas of strategic research likely to yield the greatest economic and strategic benefit" (Martin, 1995).

Technology Foresight in the UK itself originates from the 1993 White Paper, Realising Our Potential (OST, 1993). Established in 1994, the TF programme was seen as a way of managing science and technology capacity and prioritising research. It was meant to be less a means

of making detailed predictions about markets and technical advances than as a way of looking at a range of possible future scenarios which would be influenced by policy decisions made today.

The UK programme was organised into 15 (later 16) sectoral panels with an overall Steering Group. As part of the process, Foresight included a variety of means of consulting research and industry, such as regional workshops and the use of Delphi surveys. Delphi involves successive rounds of questionnaires directed at key individuals seen as representative of their sector. With each round, interviewees are asked to revise their prioritisations in the light of the other respondents' recommendations. In the UK's case, over 3000 respondents were included. Delphi is a good example of the state deploying transitory, non-institutionalised mechanisms in an attempt to construct a consensus on and legitimacy for its actions: it is the negotiation state going about its business outside of formal political processes.

The first set of priorities published by the Panels and Steering Group in 1995 attempted to identify those areas of strategic research likely to yield the greatest economic and social benefit in 10–20 years. As the name implies, "Technology Foresight" was supposed to primarily concern itself with the identification of future technological opportunities which had market potential, rather than giving prime attention to developments in basic science. As the OST commented, "the Steering Group decided to follow a largely market-driven approach by first identifying future markets and then the technologies, and related scientific research, which underpin them" (OST, 1995, p. 22).

The 1993 White Paper declared that Foresight would inform the decisions of individual firms and research organisations of future technologies and markets, it would help inform the policy-making process, increase communication between interested parties and help the government's own decisions about and priorities for the science base. The process of consultation with scientists, business representatives, government officials was not only supposed to help derive a set of recommendations for setting priorities but also to improve understanding between the scientific community, industry and government in turbulent times. In every respect the Foresight Programme represented an unprecedented degree of emphasis upon the importance of the execution of policy options at the local level, on terms which public and private actors set at the local level, something quite distinct from the previous high level UK planning in science and technology (Elliot, 1996). In short, the epitome of the "negotiation state" at work.

4. Foresight in more than one country

The UK Foresight programme is just one of a number of national Foresight programmes (see Gavigan and Cahill, 1997; Hetman and Kamata, 1996; OECD, 1996), such as those in Germany (Grupp, 1994) and The Netherlands (van der Meulen, 1996), and new Programmes are currently being considered in various countries such as Sweden and Hungary (Balazs, 1998). These programmes differ in the specific strategy they deploy.

As history shows, radical or revolutionary ideas often spread from one country to another: while its "revolutionary" credentials may be questionable, Foresight has become one of the most successful policy manifestos of recent years, and is found now throughout the world—a sort of Foresight domino-effect (Hetman and Kamata, 1996). Programmes exist currently in Japan, the USA, The Netherlands, Germany, France, the UK, Italy and Australia. These have varying pedigrees, but a real momentum to them all has come over the past 6 years. Although they vary in terms of the particular processes that are used to fashion a Foresight agenda—Japan favours Delphi while the UK puts more weight on sectoral Panels—not surprisingly, the Foresight agendas that eventually appear are strikingly similar. As the POST (1997) report notes, "all clearly recognise the importance of information technology, communications, biological and other "core" technologies" (p. 34). This convergence of innovation frameworks reflects the internationalisation of R&D in many sectors, driven by global research networks (such as the HGP[1]), international specifications that set the standards for new technology, and international regimes of governance that shape the terms of which new technology is to be developed, deployed or commercialised (such as the GATT/TRIPs agreement). The convergence is so strong, that reading tables that provide comparative lists of who is pursuing what where becomes (because it is so repetitive) a rather tedious task.

Along the way, of course, many items have been squeezed off the list, presumably because they are regarded as too parochial, demand too many resources, lack the stability of existing R&D infrastructures, and favour groups other than industry or academia, the programmes' principal agenda-setters. Had these other interests come through, it is quite likely that Foresight would be a much more diverse set of "story-telling" than the one currently on offer. Negotiations seem always to have similar outcomes presumably because they favour some, rather than other socio-technical networks championing particular techno-economic agendas.

Despite the convergent agendas, the programmes do differ across countries in important respects. Variation is evident not only through examining the way in which Foresight consultations have been conducted; it is also shown by the ways in which expert panels within different countries gave differing weight to particular types of

[1] The Human Genome Project

constraint on future technological developments identified through the Foresight surveys (Cameron et al., 1996). Experts were typically asked to consider whether technical, economic or social and ethical constraints were more or less likely to act as obstacles to the achievement of technological priorities. It is noticeable that over a wide range of technology fields, Japanese panels gave, in general, a higher rating to *technical* constraints than did similar panels in other countries (Gavigan, 1997; Kuwahara, 1996). While this might reflect a need for more basic research in key fields in Japan, it may also point, in Beck's terms, to a less reflexive science policy culture, one still more firmly rooted in an industrial society culture where the state is still committed to a strong executive—and not merely steering—role in setting technological futures. The Japanese case also suggests that there may be forms of Foresight which can prevail outside of the negotiation state. This in turn suggests that we may be able to differentiate Foresight practices along a provident state—negotiation state spectrum. But this is beyond the ambitions of this paper.

5. Tensions in foresight

Whatever specific national Foresight programme one is considering, most seem to carry a number of tensions that are difficult to resolve.

First, there is a tension between a reflexive, post-modern (Rip and van der Meulen, 1996) strategy towards building a future innovation agenda through a rolling programme of non-linear, *aggregative* co-ordination (epitomised by consensus conferences, Delphi, scenarios etc.), and a linear, *dirigiste* approach where innovation strategy is steered from the centre (epitomised by national plans, agreed lists of "critical technologies" and a selection of priorities to be pursued). The tendency, of course, is for the latter to take precedence once "lists" are in place, generating both a technology and a policy path-dependency that become self-confirming. For example, as a recent review of Foresight has observed, "when [Japan's] Science and Technology Agency study of 1971 predicted liquid crystal displays as a successor to the cathode ray tube, it was far from clear that this was the right technical assessment, but the resulting weight of Japanese investment in LCD production actually brought that forecast about…" (POST, 1997, Annex B, p. 12).

Second, there is a tension between the requirement to facilitate new *networks* on the one hand and, on the other, the need to use the available mechanisms (both public and private) that comprise the infrastructure of the national research system—Research Councils, Departments, universities, corporate labs etc. In these circumstances, the novelty of networks might be much more limited than the programme managers would hope, and the agendas that are pursued merely extrapolations of network members' existing R&D activities. While this may reduce one potential source of uncertainty—indeterminate and unstable networking—it is likely to mean that the programme would make a very limited contribution to the innovations system's requirement for diverse and flexible institutional relationships between organisations in the R&D infrastructure.

Third, if it is to have any significant impact Foresight has to be able to facilitate the translation of innovation agendas and needs across different *time-frames*, that are derived from the different priorities of R&D actors in the innovation system. Foresight tends to assume a 10- to 20-year time frame in determining the technology options to be pursued (in some cases, such as Germany and Japan, 30 years), whereas few actors in the R&D system work on such time lines. There are considerable differences in technology sectors in relation to the time taken for new product development. One new pharmacological compound may take 8 years to bring to market, during which time four generations of IT software have come and gone. Public sector organisations tied into the innovation system, such as a country's national health care system—may be required to plan on an annualised budgetary basis, even in areas which relate to R&D. The vagaries of time impact on the programme itself: the rolling Foresight exercise can push the future into the future where new developments are seen to require further time, or into the past, where promising options are dropped. The tensions between time frames that can slip, or are discordant with each other, mean that "the horizon" is more kaleidoscopic than unitary.

These three features of TF programmes relating to forms of control, the fostering of transitory networks and the alignment of different timeframes means that Foresight cuts across conventional, institutionalised structures and processes relating to the co-ordination and management of R&D. In doing so, it sets in train new relationships not only technically-based but also of an organisational and ultimately political nature which are more difficult to co-ordinate than conventional R&D domains and which require new "stages" and new types of "conversations" among the players. A recent example, drawn from the UK's programme, is the establishing in September 1998 of a new Virtual Informatics Institute, which has (virtually) brought together academic, industrial and public health groups. This initiative has been taken by a number of actors who are trying to develop a new techno-economic network, with a new script and future scenario, in the area of health informatics, bringing foresight stories into the forum of health and medical research. Which raises the question: how will these scripts fare in the institutional networks that make up the NHS, networks premised on the risk-reducing "provident

state" whose political career, according to Beck is now "waning"?

6. Foresight, risk and the NHS

What, then, is the relation between the UK's Technology Foresight programme and one of the country's most important institutions heavily involved in researching and deploying new technologies, the National Health Service? As suggested above, there may well be some dis-alignment between the two as a result of tensions between the emergent practices of the "negotiation state" as expressed via Foresight and the long-established practices of the provident state upon which the NHS has depended.

The UK Foresight programme's Health and Life Sciences Panel produced a large number of core priorities for future RTD in basic and clinical health science. For example, priority has been given to neurosciences, molecular genetics, rDNA technologies, health informatics (such as telemedicine) and the impact of new demographic shifts, such as ageing, on medical delivery and research. Much of this agenda might be regarded as searching for answers to the "problems" (risks) caused by modern, scientific medicine: as Beck (and many others) notes, the success of medicine this century has been to eject people out of acute sickness into long term chronic illness for which there is no obvious remedy, but associated with which is an increasing aged population making higher demands on health care. The TF agenda—in its emphasis on neurosciences and genetics seeks answers to these problems by encouraging R&D on the source of chronic illness and disease in order to prevent and/or more effectively manage it.

The Health and Life Sciences Panel has, since its inception, been shaped by the academic research constituency within health and life sciences along with the RTD agendas of larger (primarily pharmaceutical) firms, reflecting the well-established academic-industry complex in this field in the UK. It has produced a range of initiatives, sought to develop new networks and established various Working Groups to develop specific strands within the programme. As a result the level of alignment among these actors has grown and the *localised* agendas associated with the original expert groups have been gradually opened up and decontextualised such that other health and life science RTD actors are not only able to participate but, in some cases—such as public agencies expected to respond to government initiatives—required to do so.

However, as van Lente and Rip (1997) say, "the key phenomenon is the way in which actors position themselves and others in relation to a future technology" (p. 244). This positioning will reflect actors' localised priorities and the activities they engage in to manage local RTD agendas and the knowledge-based needs these produce. As such, actors within the NHS R&D Executive have a range of localised practices that will shape their response to the recommendations and initiatives generated by the TF programme, a response that is driven primarily by the demands of clinical delivery. The innovative and ambitious agendas of Foresight become translated into the more prosaic agendas and language of health provision: as one NHS officer associated with the DoH Health Technology Assessment programme has observed:

> You see, if you say to people in the health service "We've got to deal with this ageing population", that's too hard. It needs breaking down into what you need to think about is fractured femurs[2]

While the Health and Life Sciences TF programme is mobilised around an innovation-led agenda with a 10 to 15-year timeframe, the NHS R&D Executive has to develop its RTD strategy with a much closer (3-year) horizon and with priority given to supporting a Health Technology Assessment programme whose broad aim is to reduce the costs of new technologies, a concern that can be found in many other health delivery systems.

Patient *need* and *equity* across all health care needs are portrayed as the proper basis for allocating resources within the NHS, even if what this means in practice is far from straightforward. Following the restructuring of 1991 and the subsequent reforms towards "evidence-based research", the NHS Executive through its Research and Development Directorate is trying to source and select existing and new clinically-related research which can best meet NHS needs. These needs are prioritised in terms of effectiveness and "consumer" (patient) requirements. How this is to be done was first outlined in the document Research for Health (DoH, 1992). This was a major departure from previous practice, and has led to the identification of 21 priority areas which the Health Service's Central Research and Development Committee agree carry the best potential to meet its future requirements.

The language of "equity" and "patient need" are clearly derived from the lexicon of the provident state on which the NHS was built. The normative and institutional practices this generates are difficult to align with the timeframe, costs, uncertainties and risks of the innovation agenda inspired by Foresight. The position of NHS actors to future technology is likely, thereby, to be quite different. At the same time, we should not romanticise the degree to which the NHS in practice has been able to meet patient "needs".

[2] Data from fieldwork associated with "Knowledge Sourcing and Foresight" project, SATSU, 1998.

A *modernist* social management of risk, rather than a reflexive embracing of uncertainty characterises the way in which health risks are handled within the NHS, both by the formal procedures deployed by the Health Technology Assessment committees at national and regional level, and by the informal clinical procedures adopted at the point of delivery in primary and secondary care. The language and discourse of "risk" have, in fact, occupied a prominent place in the policy lexicon of the NHS (and related social services) in recent years. But this should not be seen as a grasping of the Beckian script but, on the contrary, a rationing-driven move to redefine "needs assessment" to "risk assessment" in order to use cash-limited budgets as effectively as possible: patient needs can then be more easily defined as within or outside of the responsibility of the Service. As Higgs (1998) has argued:

> Assessment forms would distinguish between needs that were not important enough to warrant intervention and those that could result in harm if no action was taken (p. 184).

Those deemed to be "at risk" can be "surveyed" and "kept safe", suggesting that "the utilisation of a risk discourse…has flowed from a modernist belief in the control of nature and social phenomena" (p. 185). In short, it is the *prevention* of risk rather than its embrace which is to be the order of the day.

Yet, if Beck's risk society *is* upon us, it would seem that the NHS itself has to respond to the new uncertainties which it brings. Indeed, although the assessment of new technologies is driven by cash-limited budgets and the need for "evidence-based research", we can see the NHS taking up—at least in form if not substance—some of the future scripts which foresight story-telling encourages. This has been primarily in terms of the growing popularity of "horizon scanning" and "scenario building" among UK Health Authorities and within the NHS at a national level, such as the so-called "Madingley Scenarios" (Ling, 1998). This latter document reflects the concern within the NHS over the transition from a stable provident state support for health care to a much more uncertain future, as is clear when it declares that "its primary purpose is to stimulate debate within the NHS about how best to respond to changes in the healthcare environment which are, to a large extent, not only beyond the control of the NHS itself but also *beyond the control of governments*" (emphasis added). Nevertheless, even here, we can see that such scenarios are rather different than the prospective future options mapped out by Foresight inasmuch as they are premised on a range of explicit socio-political conditions against which various technological futures are to be compared. One of these, for example, presupposes the maintenance, as much as is possible, of socialised health care; another, in direct contrast, the privatisation and individualisation of health care provision. This explicit contextualisation of future technologies according to counterposing scenarios forces those involved to consider how much of the provident state is "up for negotiation", dismantling and replacement by new innovation, new providers and new health care networks. This forces those involved in scenario work in the NHS to consider the interests and boundaries of the constituency to be served. While the current UK Foresight programme makes much play of its emphasis on the "quality of life" it has no *natural* constituency within which to bring this phrase to life: its constituency is everyone and no-one precisely because it occupies a place in Beck's sub-political arena.

7. Conclusion

I have tried to show in this paper how Beck's concept of the risk society can be used to interrogate the emergence of Foresight within the science policy regimes of late modern—"negotiation"—states. I have argued that Foresight can be seen to express the attempt by the state to socially manage the uncertainties generated by the transition of technologies within the contemporary innovation system while fostering the heterogeneity and risk-laden nature of this system. I have suggested, however, that the insertion of Foresight visions and practices within the interstices of modern institutions is highly problematic, and indicates a dis-alignment between the modernist provident state and the late-modern negotiation state, illustrating this through a brief discussion of the distinct priorities, timeframes and, crucially, languages of risk that separate the scripts and scenarios of Foresight from those of health innovation and delivery in the NHS. Ultimately, therefore, the risk society is one which produces innovation policies such as Foresight which, as Giddens (1998) would say, "manufacture" risk, while simultaneously, fosters practices on the ground which attempt to prevent it. New technologies, and their associated techno-economic networks, are caught between these two, and can only hope to innovate successfully when they achieve a degree of socio-technical alignment between them.

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