European Foundation for the Improvement of Living and Working Conditions

Handbook of Knowledge Society Foresight

This handbook is available in electronic format only

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Contents

Executive summary

The executive summary is a guide to the contents of the handbook. Given the nature of the handbook, it is not appropriate to seek to provide an abstract of the key points. The handbook sets out methods and approaches, and draws a host of conclusions about these, rather than presenting one major argument with a core set of results.

To the extent that there is an underpinning argument, however, this is to do with the importance of foresight as a tool in policy analysis, and the importance of recognising that foresight encompasses a wide spectrum of methods and approaches – even if these are united by some common principles.

The handbook tackles the major questions that have to be considered in embarking upon knowledge society foresight. It does so largely in a question-and-answer format. Some of the questions are focused on conceptual issues (e.g. on the content of terms such as 'knowledge society' and 'foresight'), while others focus on matters of principles and objectives (e.g. why should one undertake knowledge society foresight?). Many of the questions are practical and methodological (e.g. which methods are appropriate for achieving particular goals? How does this method work?).

It is vital to recognise that the methods and approaches employed in knowledge society foresight depend very much on the rationale of the work, even though the principles of knowledge society foresight are general. It is also vital to understand that these methods are not only the tools and techniques of futures studies. Foresight is often seen as futures studies or, worse, as forecasting. In reality, it encompasses a wider range of approaches used in planning, networking and the management of group processes, and organisational learning. Foresight is about shaping the future, not predicting it.

The handbook is neither an essay on knowledge society foresight nor is it simply a toolkit of ways to think about long-term futures. It is a guide to foresight and to making decisions to undertake activity in the field. It is illustrated with some examples drawn from relevant activities around the world, while a series of annexes provide more discussion, essays and resource materials for those wishing to pursue matters more deeply.

The introductory chapter outlines the structure of the handbook and its aims. The second chapter considers questions arising in the context of the knowledge society, and the relevance and scope for foresight work in this context. It supplies definitions of, and perspectives on, 'knowledge society' and 'foresight'.

Chapter three examines the practical issues involved in preparing for knowledge society foresight, explaining what major decisions will need to be made and what methods can be brought to bear.

Chapter four outlines the forecasting methods that may be used in knowledge society foresight, both those based on eliciting evidence from experts and those more reliant on statistical or mathematical analysis.

Forecasting is only one element of foresight, however, and chapter five examines a broader set of approaches to generating strategic intelligence, focusing especially on the work of panels, expert groups and workshops, and the resources required to support these.

Chapter six examines in detail the set of approaches of multiple scenario analysis and scenario workshops.

These approaches to generating foresight need to be tied to action, and chapter seven looks at the outputs and deliverables that knowledge society foresight should yield, and the ways these can inform decision-making.

Chapter eight builds on the further steps in evaluating and institutionalising knowledge society foresight, while the final chapter makes concluding remarks.

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List of knowledge society foresight workshops and meetings:

- Impacts of knowledge society on living and working conditions and industrial relations workshop 13-14 July 2000.
- The knowledge society and European foresight workshop 12-13 December, 2001.
- European knowledge society foresight – Towards a framework of the project and a handbook on foresight methodology workshop 6-7 March 2002.

Introduction 1

1.1 Who and what is this handbook for?

The handbook has been produced for the European Foundation for the Improvement of Living and Working Conditions. As befits its name, the Foundation has longstanding interests in the areas of living conditions, working conditions and industrial relations. The Foundation has undertaken a four-year programme, *Analysing and anticipating change to support socio-economic progress 2001-2004*, within which the notion of European knowledge society foresight is important. (The next chapter of this handbook discusses the meaning of 'knowledge society' and 'foresight'.) The Foundation has stated that the purpose of this is to:

> *increase understanding of the drivers of the knowledge society and anticipate impacts of the knowledge society on living conditions, working conditions and industrial relations, in order to identify and to support paths to positive transformation while avoiding unsatisfactory development paths.*

The aim is to provide improved information about the implications of those contemporary changes that lead to commentators speaking of a 'knowledge society', especially for working life and living conditions. Additionally, as shall be seen, foresight can play a role in building new networks between those who possess various sorts of information and knowledge relevant to understanding the dynamics and outcomes of change. It can help in finding ways of intervening in and seizing opportunities provided by these developments.

The activity is of use to a wide range of actors – managers and policymakers, trade unionists and voluntary organisations. The information provided by foresight activity can be widely used and it can inform decision-making in many ways. Additionally, the new networks that foresight may help forge can provide ways of accessing intelligence to help deal with emerging challenges and to build initiatives around new strategies, and directions of change.

It is important to stress that participation in foresight processes is able to give actors a much better grasp of the issues and a more informed orientation to the social networks. Thus the handbook should be useful for anyone thinking about the long-term prospects for living conditions, working conditions and industrial relations. It is not a synthesis of results of foresight into the knowledge society; rather it outlines how such foresight can be cultivated.

1.2 What is the structure of the handbook?

The table of contents outlines the structure of the handbook. There are nine chapters (including this one). The second chapter provides a more detailed analysis of the terms 'knowledge society' and 'foresight', and discusses the nature of knowledge society foresight. The following six chapters discuss the issues arising in the course of foresight exercises, including what has to be done in preparing for, conducting, using and building upon such foresight. A final chapter makes some concluding points, and a set of annexes provide more elaboration on a number of key themes.

The main chapters are structured in a question-and-answer framework, as is used in this chapter. It has proved to be useful for other handbooks. Additionally, a number of highlighted boxes provide examples of the ways in which the answers to the questions have been tackled in various concrete circumstances.

1.3 What additional resources are available?

Many sources of material deal with foresight activities, and much research and discussion takes place concerning the knowledge society. Useful material is available on the Web (along with numerous consultancies trying to sell their expertise). However, it is important to be aware that much of the material on foresight involves far more restricted

notions of what this means than those used in this handbook. The popularity of the term 'foresight' has made it into a bandwagon and all sorts of forecasting, environmental scanning, and technology watch activities are now being described as foresight that do not really warrant this term.

The handbook is modelled partly on the FOREN Networks' *Practical guide to regional foresight*, published in December 2001. This handbook is able to draw on the content of that guide in answering some of the questions posed here, though the foci of knowledge society and regional foresight only overlap in part. (Thanks are in order to the authors of the Practical Guide, from whose experience and formulations this text draws.)

The Practical Guide has been further revised by some of the original authors (who are among the group responsible for this handbook) and translated from English into other major European languages; material has been added to make it more useful for specific countries. The guides to literature and national data and expertise that it provides could be very helpful for users of the present handbook. The resources and annexes sections of this handbook attempt to provide guidance as to some of the literature and advice on the subjects covered here. But the handbook also has an accompanying online bibliography, which is regularly updated. This can be found at http://les.man.ac.uk/PREST/euforia.

Foresight in the knowledge society 2

2.0 Introduction

In this chapter a set of questions and answers outline perspectives on the knowledge society, on foresight and why the knowledge society can be an appropriate topic for foresight on living and working conditions and industrial relations. It thus introduces general principles of knowledge society foresight, which form the necessary background to the practical discussions in subsequent chapters.

2.1 The knowledge society

2.1.1 What is the knowledge society?

'Knowledge society' is one term that has been introduced in attempts to characterise some of the main developments in industrial societies in the late twentieth and early twenty-first centuries. Some commentators dislike these terms for various reasons. They believe that the terms imply that current changes are revolutionary, whereas they should be thought of more as evolutionary trends. Some argue that, since all human societies have relied upon knowledge and information, the terms are implicitly discounting the capabilities of earlier societies and privileging the sorts of knowledge and information that our societies particularly prioritise. These criticisms have some force, but one might suggest that a useful way of thinking about knowledge society is that it involves the intersection of several related trends. These are:

- The development of information societies based on the large-scale diffusion and utilisation of new information technologies (IT), which have allowed for unprecedented capabilities in 'capturing', processing, storing, and communicating data and information.
- More generally than just in the IT case, the increasing importance of innovation (especially technological, but also organisational) as an element in corporate and national competitiveness, and in strategies to increase the efficiency and effectiveness of organisations of all types.
- The development of service economies. The bulk of economic activity, employment and output is taking place in service sectors of the economy. 'Service' is an important management principle in organisations in all sectors, and specialised services (especially knowledge-intensive business services) provide critical inputs to organisations in all sectors on a vastly increased scale.
- Knowledge management arises as a specific issue, as organisations seek to apply formal techniques and new information systems to help them make more effective use of their data resources (e.g. data mining), information assets (e.g. enterprise resource systems) and expertise (e.g. human resource development, groupware and collaborative systems).
- Other important developments, related to the points above, include globalisation, changes in demographic structures and in cultural practices, and environmental affairs.

The handbook provides only highly summarised accounts of developments where there have been many disputes about their nature, and the interrelationships between the different elements. The issues are complex and these disputes create certain specific problems for foresight in this field, to which this handbook will turn later.

2.1.2 How does it relate to the information society?

The information society is one of the components of the knowledge society – not surprisingly, since information is one of the components of knowledge (sometimes defined as organised information, sometimes as the ability to utilise information effectively). The question arises as to what is distinctive about the present epoch. Just as human societies throughout history have accumulated and applied knowledge of various sorts, so they have also produced and processed

a wide range of information. However, several arguments have suggested that it makes sense to think of the industrial world as moving into an information society – or a series of different information societies.

Some commentators have drawn attention to socio-economic changes that have made information-processing an increasingly visible and important activity. Thus the statistical growth of specialists in information activities can be traced in the workforce. Such 'symbol processing' occupations are preponderant in most established industrial societies, with office workers in all sectors, including workers in specialised information sectors like media, posts and telecommunications.

Alternatively, there can be an approach that stresses socio-technical changes associated with information technologies (IT) and the increase in the power, and decreases in the costs, of information-processing. These new capabilities can be applied to most work, so the information society is not just a matter of specialised information work.

In this latter view, the development of information societies is based on the large-scale diffusion and utilisation of IT, which have allowed unprecedented capabilities in 'capturing', processing, storing, and communicating data and information. IT is a relatively discontinuous phenomenon. The information society, seen in these terms, is a historical epoch much like the steam or electrical eras, and can be dated back to the late 1970s. Despite this, the information society has arguably already passed through a number of distinctive phases. For example, computers were large and remote, used only for large-scale number-crunching applications, but now they are ubiquitous and based on stand-alone personal computers. (Computers also appeared in machinery such as machine tools and industrial robots.) In the current phase the diffusion of IT capabilities has extended still further – into items of workplace and domestic equipment – and networking is important. Already the contours of the next phase can be discerned, with commentators talking about ubiquitous computing or 'ambient intelligence'.

Just as industrial societies (or even welfare states) take various forms around the world, with very different political and cultural arrangements, so it is likely that there will be a wide range of information societies. However, globalisation does raise the possibility that diversity within national societies may become an issue alongside the question of how far national cultural identities need to be protected. IT permits global communication enabling subcultures and interest communities to form irrespective of national boundaries. The expansion of firms into global markets and the migration of labour (and students) adds further to the diffusion. Elements of different cultures are being transferred around the world on an unprecedented scale – though some elements are favoured (e.g. global pop culture). Information societies may be internally heterogeneous and share many subcultures, as well as having many distinctive elements.

The knowledge society, then, depends upon the information society for its infrastructure. However, some information societies would be content simply to use new technologies to distribute entertainment products or even to engage in 1984-type political surveillance, rather than applying them to create a generally better-informed populace, more active democracy and more creative business environment. An information society is a necessary but not sufficient condition for a knowledge society, which requires more than just the active implementation of new technologies.

2.1.3 How does technological innovation feature?

IT is a revolutionary technology applicable to all types of economic activity. All human activities involve information processing. This can be enhanced by use of the new technologies.

Other technologies of extremely wide scope are becoming available in the twenty-first century. Furthermore, increasingly complex societies create social and industrial demands for new products and processes. Thus, today's consumer goods may incorporate technical capabilities that were the preserve of the affluent few or of the most

demanding firms a few decades ago; sometimes they were not even available in research laboratories. New consumer demands and lifestyle choices emerge all the time.

These developments underpin the increasing importance of innovation as an element in corporate and national competitiveness. Use of new processes enables firms (and public sector organisations) to operate at lower cost and higher quality. Development of new products allows them to capture new markets (or better meet social needs). Innovative capacity is seen as differentiating between successful and unsuccessful firms, regions and systems. The knowledge society is seen as bringing innovative capacity to the fore.

Innovation is more than a matter of being able to generate scientific knowledge. Since successful innovation requires that new products and processes are suitable for their social contexts, it also involves the capacity to identify social and market trends, and the opportunities that these establish for applying new knowledge or new combinations of established knowledge. People in a knowledge society are liable to be well informed and to seek to make their views known as consumers, users of innovations, or citizens concerned with the ethical, social and environmental implications of technological change.

The recognition of innovation as central to the knowledge society has led to increased emphasis on investment in innovation; this is reflected in investment in research and development (R&D) and in a range of associated activities. These include, for example, efforts to create innovative (or innovation-receptive) labour forces, and efforts to secure intellectual property rights over innovations. There are even efforts to create innovative consumers (for example, in awareness programmes about the benefits of computer networking or e-commerce).

Many commentators stress the role of scientific and technological (S&T) knowledge in innovation in a knowledge society. Evidently, the volume of such knowledge is increasing, but also the complexity of innovations, in terms of their drawing on very diverse bodies of knowledge, is growing. Such an increase in complexity has wide-ranging implications. For example, companies have to collaborate to access knowledge. Interdisciplinarity becomes more important. This is one of the reasons for a knowledge society requiring foresight as a method of identifying where different bodies of knowledge, different professions, disciplines and stakeholders need to be drawn together.

See Annex C for discussion of technological determinism.

2.1.4 What about non-technological innovations?

S&T are not the only basis for innovation; knowledge of markets and user requirements is vital. Also, innovators need to know about regulations, access to finance, organisational change and many other matters. Some innovators invest heavily in trying to understand the social context of innovation, using foresight and futures methods as one of the tools for doing so, alongside more conventional market research.

Some innovations are not S&T-based but can involve doing new things that involve aesthetic, cultural, social or organisational elements. Examples of these include: new aesthetic designs in clothing or new forms of music; new styles of teaching or of communication of medical information; new types of leisure activity like eco-tourism or theme parks; new organisational forms like the ombudsman or consensus conferences. This has considerable implications for knowledge society foresight.

Innovation in social affairs may often stem from knowledge gained through practical experience rather than from research as conventionally understood. One reflection of knowledge society trends is that many government organisations are seeking to be more systematic in the way in which they develop and assess policies. They seek to become learning organisations, using more ‘evidence-based’ mechanisms in policy design and implementation.

Methods such as evaluation studies are being employed to determine what works and what does not, and how policies may better meet their objectives. Such methods are used too by some large charities and voluntary organisations. Consultants are employed to provide services such as benchmarking, providing intelligence about how the practice of one organisation compares to those of similar ones elsewhere. Such methods may suggest policy innovations, or, more often, incremental change in policies and their management.

However, many organisations make little use of such methods and, especially where innovation stems from the grass roots, it is only loosely related to conventional research. In a knowledge society, however, knowledge of social innovation can be widely diffused through the information networks, which are effectively global in reach. There is much more scope for the research community to find out about, and critically engage with, social innovation in the knowledge society. This should be borne in mind when confronting the foresight literature with its preponderantly technological bias.

2.1.5 What does the development of the service economy say about the knowledge society?

The development of service economies is a longstanding trend in industrial societies. In most western societies, the majority of employment is concentrated in services (and market services at that). Services are now major sources of economic output. For some commentators, the dominance of service firms and sectors is sufficient to warrant the term 'service economy'. Others stress that in all sectors 'service' is an important management principle and increasingly the value-added element is composed of design, marketing, and so on, and not from the manufacturing process itself. Some erstwhile manufacturing firms are actually selling services to a great extent: computer firms sell software and systems integration services, aero engine firms are leasing their engines and actually selling performance rather than hardware.

The knowledge-intensity of production is growing in the knowledge society. An increasing proportion of staff perform service operations rather than physical production in manufacturing (and other) firms. The firms also spend more of their resources on acquiring inputs from business services, as opposed to raw materials. This is another important element of the 'service economy' aspect of the knowledge society. Specialised services (especially knowledge-intensive business services) provide critical inputs to organisations in all sectors on a vastly increased scale. Even activities like R&D are often contracted out to specialist services, which are also important in helping organisations assimilate new technologies (and to cope with changing regulations, e.g. on environmental issues). There has certainly been a trend in management philosophy towards achieving 'leaner', 'more agile' firms, that outsource more functions to services and subcontractors of other kinds. But some of the growth of these specialised services reflects demands on firms to access new forms of specialist knowledge – software, telecommunications, environmental issues – which they do not possess sufficient in-house capability to master.

The service economy thus involves change in relations between business and consumers (greater emphasis on customer relationships, and shifts in demand toward more leisure and experience products), and a growing requirement for specialised knowledge (and thus expert knowledge workers). It means changes in the nature of work (growing white-collar and professional work, more interpersonal interaction), and changes in lifestyle (e.g. some substitution of traditional services such as laundries by new 'self-service' outlets, and the growth of 'modernised' services like fast food).

2.1.6 What about knowledge itself?

Knowledge is a term that attracts considerable controversy and argument. The literature on the knowledge society contains several quite distinct lines of analysis. Many commentators follow Polanyi with his distinction between tacit and codified knowledge, the former being poorly articulated in words but expressed in all sorts of practice (the classic example being riding a bicycle), and the latter being formalised in texts and other representations.

Others argue that what is codified is information, and that knowledge is possessed by knowing agents (human beings, until such time as true artificial intelligence is developed or other intelligence is discovered). In this perspective, information is organised data, while knowledge is the ability to use information effectively, to give it meaning within cognitive structures that are able to guide action.

Many knowledge society trends clearly demonstrate the growth of information resources in the modern world, and this information is produced on an ever-increasing scale and distributed more widely than ever before. The growth of knowledge is implied by the effort put into research, by the documentation of the achievements of research in effecting more understanding through its codified outputs, and through the large numbers of people undertaking advanced training and achieving professional and scientific qualifications.

Cultural critics argue that the production of ever-expanding volumes of information does not mean that it is a better-informed society. There is the danger of suffering information overload, making it harder to find the valuable information, as attention-grabbing trivia tends to drive out more serious material. Some argue that the growing numbers of qualified specialists also involves a high degree of compartmentalisation of knowledge, so that much expertise concentrates on very narrow topics and is poorly related to broader concerns. Different knowledge societies may indeed be characterised by different patterns of media activity, informed public opinion, socially responsible experts, and generalist capabilities.

These debates are reflected, for example, in arguments about the purpose and functioning of educational systems, mass media and the governance of freedom of information.

The issue of knowledge management has arisen in the knowledge society. Organisations seek to apply formal techniques and new information systems to help them make more effective use of their data resources (e.g. data mining), information assets (e.g. enterprise resource systems) and expertise (e.g. groupware and collaborative systems). Organisational learning and emphasis on human resources and intangible assets have also become more of a central concern, with management tools being developed to help effective choice and improvement of systems.

See Annex B for more on knowledge management.

2.1.7 Do other aspects of social change need to be taken into account?

Many important developments may be related to the points above. For example, the globalisation of economies is facilitated by IT, and in turn stimulates more innovation-based competition. It promotes demand for better understanding of diverse cultures and regulatory systems, and allows for new avenues of learning from the experience of other organisations and countries.

Social change is also intimately related to the emergence of the knowledge society. Demography has serious implications for education, working life, health and consumption patterns, as western populations grow older. One of the major issues in the near future concerns the extent to which migration is used as a solution to demographic imbalance and how the vigour and diversity associated with population movement can be maximised in the face of social strains and xenophobic sentiment from some quarters.

Other important social changes are associated with social attitudes and cultural practices. One set of trends that has been related to the knowledge society involves ‘post-modernism’. This covers not just developments in arts and architecture, but is also used to point to the associated fragmentation of subcultures and of discourses, and especially the critique of received wisdom in science and technology (as well as in the world of aesthetics).

Arguably related to these post-modern attitudes is the rise of a 'risk society'. People are more inclined to relate negative events to human agency, rather than seeing them as acts of God or nature. This underlies public attitudes to environmental and technological issues as well as facilitating the trend to litigation and a 'blame culture'. Such developments will not be at the centre of the present analysis, but knowledge society foresight activities can address these issues.

Finally, the same point can be made about environmental circumstances. There is considerable uncertainty about the extent and effects of anthropogenic climate change in particular. The consensus of scientific opinion tends to support quite dramatic change and thus to suggest that major social adaptations will be necessitated in the future. Numerous studies have examined the prospects of long-term environmental change, and a few have tried to grapple systematically with the social dimensions of this.

2.1.8 Can knowledge society developments be measured?

A great deal of attention has been paid to measuring information society developments. There have been many efforts to develop new statistics and systems of indicators to measure the diffusion of new IT in business and the community, and to examine levels of use and even styles of use (for example, more or less active ways of implementing e-commerce). These efforts are ongoing and provide valuable material with which to compare different countries and regions, and even social groups and industrial sectors. There have also been many efforts to measure 'information activities', ranging from simple headcounts of information occupations to much more elaborate maps of information industries.

Other features of the knowledge society have also attracted a great deal of attention. In some respects, these are less challenging than assessing developments connected with new technologies, because official statistics are always going to lag behind innovations, and statistics are more likely to capture simple diffusion and expenditures, rather than actual usage patterns. However, developments involving service activities have also long been neglected relative to those in manufacturing industry and tangible production processes. The level of detail available on services is much more limited than for manufacturing, be it in the economic sector or occupations. Despite much effort to improve the statistical base, much of the most interesting activity in services is classified in 'not elsewhere specified' and similar categories.

If one looks at the major reports on the 'knowledge economy', numerous indicators feature. They are usually introduced as evidence for the emergence of the knowledge society, and sometimes for purposes of international benchmarking. Such indicators are often cited as:

- data on availability of and access to telecommunications and the internet
- data on use of PCs and the Web by businesses of various types for e-business and e-commerce
- data on educational qualifications
- patterns of work, employment and skills
- use of new technologies in e-government and public services such as health.

The following box illustrates one approach to developing and using such indicators.

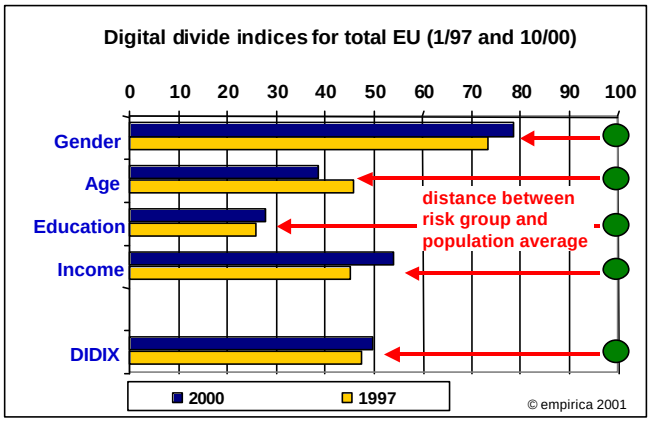
Box 2.1.8: *Indicators of knowledge society developed in the SIBIS project*

In the context of work on information technology adoption, in particular, SIBIS has developed three indicators:

- The digital divide index (DIDIX),
- The adaptability of work index (AWAI):
- The (e-Europe) e-commerce index.

The figure below presents SIBIS results on the 'digital divide', focusing on the proportion of various 'risk groups' that are ICT-illiterate.

Compound digital divide indices at EU level (1997 / 2000)



This provides an EU-wide picture. Comparisons between countries can also be developed (see the discussion on benchmarking below). Source: http://info.empirica.com

In terms of adaptability for work, SIBIS uses a set of indicators reproduced in the figure below.

Indicators for Measuring Change and Adaptability

Dimension	Indicator	Definition	Year	Source
Time	Voluntary part-time working	Voluntary part-time workers in % of total labour force	1999	Eurostat (LFS)
Time	Temporal autonomy in job	% of total labour force with discretion over start/finish of working time	1999	Empirica ECaTT
Place	Teleworking	All teleworkers in % of labour force	1999	Empirica ECaTT
Place	Tele-cooperation	Workers who tele-cooperate as % of all workers	1999	Empirica ECaTT
Contract	Increase in self-employment	Increase in the share of self-employed in % of total employment 1989-1999	1988/1998	Eurostat (LFS); IAB
Contract	Employment protection legislation	Employment Protection Legislation Indicator by OECD	1998	OECD
Applied skills	Managerial responsibility	Workers with managerial responsibility in work in % of total labour force	1999	Empirica ECaTT
Applied skills	Lifelong learning of employees	Percentage of employees, aged 30-39, who have participated in training over the 4 weeks prior to the survey.	1999	Eurostat (LFS)

Finally, the following figure reproduces information on indicators for e-commerce use and potential use (comparison of actual and potential use is, of course, interesting).

E-Commerce Potential and Use Indices

Variables used for construction of e-Europe E-COMMERCE INDEX

Usage Index	Potential Index
1. Internet infrastructure:	1. Personal preferences:
- Internet hosts	- turnover in mail order shopping
2. Internet access:	- credit card use
- Internet use in establishments	- TV consumption
- Internet presence of establishments	2. media competence / qualification/ education:
- private use of Internet in households	- PC penetration
3. E-Commerce offer/supply:	- Knowledge of English language
- establishments practising marketing via Internet	- Percentage of population with higher school education
- online sales by establishments	3. economic structure:
- online data exchange with suppliers etc.	- share of employees in business services
4. E-Commerce demand:	- transport volumes / GDP
- online purchasing by establishments	- export rate
- online shopping by population	4. Technical infrastructure:
- online banking by population	- investment in telecommunications
	- broadband access by households
	- ISDN in households
	5. Conditions for delivery of goods:
	- level of urbanisation
	- service quality of postal services

12-13 DEC 2001 European Foundation Workshop, Dublin

2.1.9 How does the knowledge society relate to social change?

The various features of the knowledge society outlined above have considerable implications for the shape of our future societies. Consider first the information society issues. New IT is diffusing into businesses and everyday life (into peoples' homes and – in the cases of mobile phones and personal organisers – their pockets). New technologies offer new capabilities; people and organisations use these capabilities in different ways to achieve their goals. They may allow for existing practices to be conducted more efficiently and effectively, or the result may be the development of quite new practices. A new technology may substitute an old one (e.g. CD players for vinyl record players), or people may develop novel ways of living and working round the use of new capabilities (making new friends through the Internet, teleworking).

IT is pervasive. Because information processing is involved in all social activities, IT can in theory be applied effectively everywhere. This has the potential to change a vast range of social activities. This handbook would caution against seeing such changes as the 'impacts' of new IT. Rather, the changes seen are the result of people's choices about using the new technological capabilities (which also depend on their access to and understandings of these capabilities), and their reactions to other peoples' choices.

In terms of other dimensions of the knowledge society, one can expect social change to be the subject of considerable attention from specialised knowledge activities. (Of course, these are often facilitated by the application of new IT.) Many specialised services attempt to monitor and affect social change. Market research, marketing, and public relations, for instance, are utilised by commercial firms, public services or voluntary organisations. They try to measure or change attitudes and behaviours. In addition, social scientific activities take place and, of course, the knowledge development by public services such as police, education, employment and health services. The knowledge yielded by such activities informs organisational practice, and may influence the quality of life of those who interact with the organisations.

Additionally, the shifts in demand for skills and the rise of new occupational categories and working practices may be expected to have widespread effects on working life and training, and on the balance between employment and leisure time/family life. These changes also imply shifts in the demands put upon the social partners in the industrial relations system, with new challenges, opportunities and strategies emerging.

Major social changes are underway that will shape the forms of knowledge society that will be experienced. The ageing of the population, for example, will have cultural impacts – as well as challenging systems of social welfare and provision. Migration across the world and within Europe (and the enlargement of the EU), shifting values, and a range of other social developments will be responded to and incorporated into the knowledge society. Strategies for the knowledge society, and thus foresight exercises, will need to cast their nets wide in examining social, environmental and other trends. This is further elaborated in the discussion of STEEPV later on. (STEEPV is an acronym for six fields in which futures thinking takes place, namely social, technological, economic, ecological, political and human values.)

2.1.10 What are the implications for working conditions?

Employment levels and work quality were an early concern with the development of new IT. It was believed that the automation of office work could lead to displacement of white collar workers and deskilling of work. On the whole, the current consensus is that new skills tend to be required to create and introduce new IT-base applications, while the preponderance of work around such applications is relatively higher skilled than previous jobs.

Two reservations should be entered against assuming that this can be uncritically assumed to apply into the future. First, new technologies are not all alike, and it is by no means guaranteed that the virtuous circles between product and process innovation, skill requirements and demand growth will continue to be sustained.

Second, the implications of technological change – and of knowledge society developments more generally – are as much a matter of institutional structures and social choices as they are a result of the features of new technologies. It could be that the 'productivity paradox' of new IT and the low impacts on employment both reflect the tendency to fit technology into established structures, rather than to develop completely new business processes that make fuller use of the new technological potentials.

But structures can themselves be innovated, and firms' interest in new forms of organisation has been growing. The implications of de-layered and hollow corporations, of telework and other forms of distance working and of coordination by means of telecommunications rather than proximity, have yet to become clear: they may reinforce or conflict with accepted trends. Some commentators have, for example, suggested that polarisation of the workforce may be happening, or that middle-level jobs (and the opportunities for upward mobility they offer) are diminishing.

Related concerns have often been raised concerning the growth of the service economy. Service jobs have often been viewed as low-skilled and routine work. While there has been substantial expansion in some types of service work of this kind (e.g. in the fast food sector), on balance, service sector and white-collar jobs again appear to have higher skill requirements than did those in declining sectors. Again, the trend results from complex interrelations between job design, market demand, and organisational strategies, and cannot be assumed to automatically extend into the future.

This handbook could go on to make similar points about other features of knowledge society: research-intensive and innovating sectors demand skilled workforces and employees capable of assimilating change and accepting new responsibilities, for example. The real issues for thinking about the implications of knowledge society for working conditions are not so much a matter of extrapolating trends, but of understanding what has given rise to such trends and examining whether these conditions will continue to apply. One study that examined such developments was FLEXCOT. A classification of new modes of work organisation used in that study is in the following box.

Box 2.1.10: *Flexible working in the knowledge society*

The FLEXCOT project examined the following types of change in working practice associated with new communications technologies and other knowledge society developments.

Flexible work time	Flexible work location
Part-time working	Remote office working
Weekend working	Mobile working
Flexi-time working	Hot desking / hotelling
Twilight-shift working	Home working
Night-time working	Telecommuting
Overtime working (including unpaid overtime)	Telecottaging
Term-time working	Remote computer supported teamwork
Split shift working	
Flexible contracts	**Outsourcing**
Fixed-term working	Employed by agency
Job sharing	Self-employed contractor
Specified hours contracts	Employed by third party supplier
Annualised hours	Work contract transferred to third party supplier
Zero-hours	**Functional flexibility**
On-call working	Horizontal and vertical de-demarcation
Piece Work/Performance related pay	Multi-skilling / job widening
Individualised contracts	Team working

Source: *Vendramin et al (2000), Flexible work practices and communication technology (FLEXCOT). Final report of project SOE1-CT97-1064. Funded under the targeted socio-economic research programme (TSER), Directorate General for Science, Research and Development, European Commission.*

Available at: http://www.ftu-namur.org/publications/publi-3.html

In addition to the matters of skill and responsibility mentioned above, the issues to be explored include such factors as:

- Health and safety issues at work. Although new technologies are generally less physically demanding and dangerous than many industrial technologies, there may be unanticipated problems such as those associated with chemical or radiation emissions from new equipment, repetitive strain injuries, etc. Some groups of workers may be particularly at threat here.
- Stress at work. This may be associated with new responsibilities (for example those associated with the 'de-layering' of organisations), with work intensification, with the challenges of coping with changing technologies and work practices.
- Issues connected with privacy, surveillance and civil liberties. New technologies have allowed for new patterns of communication, and organisations have been challenged to adopt appropriate rules governing the content of e-mails and Web access, the confidentiality of information, and the like. With increased scope for monitoring employee behaviour, location, etc., there is also the possibility of tighter control over how the working day is organised.

- New working practices may impose conditions that are stressful, not only on the employees, but also on the family. Mobile working may keep family members apart; home-based working may create conflicts in the use of personal space. Beyond the family, they may disrupt the social relations that characterised traditional workplaces, leaving the employee with reduced social contacts and work-based friendships, and isolated from the social networking so important for career development and organisational learning. These forms of work may also effectively shift responsibility for maintaining healthy working conditions from the management to the individual employees; and they may create costs for employees under some rules for matters such as financing and taxing domestic arrangements.

2.1.11 What are the implications for industrial relations?

Changes in living and working conditions almost by necessity imply changes in industrial relations. While the specifics will vary considerably from country to country and time to time, a number of common features of knowledge society developments are liable to have considerable implications for industrial relations. Among these are:

- Changes in the workforce composition. Among the key elements here are (1) the growth of professional work and white-collar work in general; (2) the decline in traditional manual blue-collar work, especially but not only the unskilled labour in manufacturing establishments; (3) the growth in some categories of low-skill service employment. Traditional manual work was the core of much traditional trade unionism (together with other diminishing groups such as coalminers and seafarers). Professional workers have often banded together in professional associations rather than trade unions. Trade unions at professional level are most prevalent in the public sector.
- Changes in the workplace. There has been some decline in establishment size (in manufacturing if not necessarily in areas like retail), which reduces the prospects of bringing large numbers of employees together. This affects, for example, both the substance of industrial agreements and the forms that union meetings (or consultations with management) can take.
- Changes in forms of work. Developments like home-based telework and mobile working reduce the scope for face-to-face contact between workers, on the one hand, and employers and union representatives, on the other.
- Contractual changes. Developments like outsourcing can sometimes mean that ex-employees become self-employed people carrying out a very similar job for the firm that originally employed them. It may become harder to determine who is the employer and who is the representative of individual workers. It is not unknown for workers to be employees of several different organisations working on the same site, whether it be one of the UK's privatised railway lines, or one of the world's major airport construction sites.
- New areas for negotiation. Organisational change has meant that different issues have arisen in the agenda for negotiation between employers and employees. In the 1980s, it was new technology agreements; in the 1990s, it was flexibility in terms of work arrangements and responsibilities. Current controversies include the privacy of e-mails, ownership of intellectual assets generated at work, and ways of coping with the move to lifelong learning.
- The use of new IT by managers, employees and unions – and by other stakeholders such as community and consumer groups – to communicate issues of importance, to put over their positions, share concerns, attempt to shape actions and decisions.

The following box lists some of the challenges posed for trade unions by the growth in atypical work, as identified by the FLEXCOT project. Such topics are illustrative ones, and the knowledge society has implications for industrial relations that need to be explored in foresight studies. There is, of course, a wider background to this to take into account. Various policy developments, such as regulations about works councils and working time, could change the industrial relations landscape. The interaction between industrial relations and other social and political relations, for example, environmental or consumer campaigning, may also be of considerable significance.

Box 2.1.11: *New challenges for trade unions identified in the FLEXCOT project*

In one report, the FLEXCOT team suggested that the expansion of atypical work forms challenges the basic values of the trade union movement:

1. Solidarity. [A]typical work forms lead to the decline of the principle of uniform collective interests of all the workers. The concept of solidarity must be reconstructed on new bases. Some authors suggest that 'differentiated solidarity' should replace the principle 'actions resulting from a common agreement' with 'actions that do not damage the others'. Differentiated demands and actions related to atypical workers could rely on this principle that differentiated interests may be promoted and defended to the extent that they do not threaten any other category of workers. This concept is closer to the ethical concept of 'social responsibility' than to the classic working class solidarity.

2. Personal autonomy. Today's workers (not only the atypical ones) wish both more self-determination in the organisation of their professional life and a new approach to stable social rights. Personal autonomy is a new matter in collective agreements. According to some authors, it is the only way that allows the trade unions to reach new publics among atypical workers, high-tech professionals, young workers, etc… In order to achieve the compromise between personal autonomy and security, the concept of 'civil rights in employment' is put forward by some researchers in industrial relations.

3. Participation. Classical structures of workers' representation (union delegations, workers councils, etc.) are not easily accessible for atypical workers, so they are under-represented in the structures of social dialogue at all levels. But the employee participation in organisational change (EPOC) survey suggests that their involvement in 'informal' consultation processes (working groups, quality circles) is better.

4. Internal democracy. What is true for participation at enterprise level is also valid for internal union democracy. Some experiences already use the potential of information technology (mainly the Internet) in order to implement new union services (social or legal information) or new forums designed for atypical workers. But internal democracy is not only a question of access to services and participation in debates; it also concerns the fact that interests of minorities have to be taken into account, and not only the positions of the majority.

5. Concept of work. To consider that full-time permanent employment is no longer the single model is like a Copernican revolution for some trade unions. Up to now, the only future they envisaged for atypical workers was to allow them to become typical workers. Within the trade unions, the debate can only be organised at the level of national or regional confederations. The sectoral unions are less sensitive to the problems of the lower segment of the labour market, which is the most confronted with atypical work forms.

Note: *some bibliographic references removed.*
Source: *Valenduc et al, Technology-induced atypical workforms, Working Document for the STOA Panel, Luxembourg, May 1999 PE 167.794/Fin.St.*
Available at: http://www.ftu-namur.org/publications/publi-3.html

2.1.12 What are the implications for living conditions?

The implications of technological and organisational change can be substantial for living conditions. As already noted, it is anticipated that changes in working life are liable to place new demands on family life. Examples include the use of the home for teleworking, or the need to define a new 'work-life balance'.

Additional new technologies may influence living conditions, whether used for work or as consumer products. Widespread use of motorcars and lorries has changed the levels of noise and pollution in urban environments and, in many locations, changed parents' views of the safety of streets as a place for children to play. The mobility offered by the car has enabled new ways of life to be developed: for instance, there has been more suburban living, and the emergence of out-of-town shopping centres (and decline of high street facilities) in many countries. Furthermore, 'privatisation' of transport activity has had impacts on many public train and bus services, and, arguably, has contributed to social exclusion. Television is another twentieth century technology that facilitated major changes in the use of leisure time and in family activities. These innovations can be controversial, with strong proponents and detractors.

Many commentators doubt that consumer IT could be as important as motorcars and television. But there is certainly scope for a vast range of new consumer products to continue to emerge, and it is risky to assume that the capabilities they offer will not in some cases lead to changing patterns of behaviour. Mobile telephony and Internet access may already be used in such ways. Both have given rise to concerns about the use of new freedoms for pornography and criminal activity, as well as for education, entertainment and teleshopping. Other consumer applications are emerging in health and lifestyle monitoring and advice (from digital thermometers to home security systems), and in providing aids to domestic work (through home automation systems). There could be challenges to many established public services as medical, psychological and educational aids are provided online.

Box 2.1.12 lists some of the major areas of social change that are commonly focused on, and provides a summary of one author's view.

Among the concerns most frequently raised concerning changes in living conditions are:

- the possibility that time pressures are growing for people in their everyday lives, as well as at work, perhaps because of increasing demands on time via mobile phones, etc., or because leisure time is so full of competing activities and possibilities;
- privacy issues: some of these concern unauthorised access to personal data, whether this is collected by public agencies or appropriated from individuals' own IT systems; other issues arise around the increasing surveillance of public spaces by CCTV security cameras, etc;
- social fragmentation: new media may foster the growth of subcultures who talk only to themselves. If individuals pursue their own interests in isolation from others, they may lose social skills and the social networks and socialisation resulting from shared activities. On the other hand, new social movements and interest groups, using new media for contact, mobilisation, and lobbying may emerge. It is not yet clear what this will mean for the democratic process, or how 'e-government' will fit into living conditions, or the implications of the knowledge society for participation with a more informed citizenry;
- the problems of information inequalities and digital divides: some groups – typically poorer people, older people, specific ethnic groups, people away from metropolitan centres, and women in some regions – are socially excluded from the new capabilities. As new technologies and services develop and expand to a wider user base, these inequalities may diminish. However, continuing innovation means that there are always new products to be excluded from. Some of these new products may confer significant social advantages, beyond being mere status symbols. They may provide means to improve education, health or living conditions. Inequalities may thus continue to be at issue.

Box 2.1.12: *Social trends in Europe*

In the study, *Mosaic Living*, Richard Scase discussed social trends likely to characterise a future Europe (the next two decades, in particular). He projects a scenario where emerging lifestyles are characterised by greater mobility, diversity and change. The executive summary of his report outlines the main themes as follows:

1. Demographics The population will become older with an increasing proportion dependent upon the productive capacity of those of working age. This will affect the demand for care and health services as well as patterns of personal consumption. The retired population will enjoy greater diversity in life style and leisure pursuits. An increasing number can expect to enjoy at least twenty years of retirement. This will have implications for policies towards pensions.

2. Families and households Families will become smaller with an increase in single person households. There will be greater variety of household forms with higher rates of divorce. This rate will decline in the future, however, reflecting the fall in marriage rates. Personal relationships will be more varied than in the past.

3. Work and employment The growth in the information and service sectors of Europe will affect work cultures and labour mobility. There will be an increase in the number of women who are professionally, academically and technically qualified. This will allow them to lead more independent life styles and have higher patterns of personal consumption. There will also be growth in entrepreneurship, small business ownership and self-employment. There will be growth in non-standard employment, e.g. part-time and flexi-hours as well as a greater incidence of job changes both within and between companies. Increasingly, those entering the labour market will need to develop 'independent' career strategies in order to cope with the greater uncertainties of labour market trends.

4. Education and learning There will be an increase in the proportion of the population enjoying tertiary education. This will be particularly the case for the over 25s. Lifelong learning will also be more significant, with much of this becoming available through distance learning methodologies made possible by information and communication technologies.

5. Leisure, life style and consumption Changing demographics, education and work opportunities will drive these. There will continue to be a diversity among the countries of Europe but there will also be some common themes in future trends. Spending on food will continue to decline while more will be spent on health and medical products. The single person household will be a key factor driving future retailing trends. So, too, will be developments in information and communication technologies (ICT).

6. Information and communication technologies The explosion in the use of mobile telephony is an appropriate indicator of changing work and leisure patterns as well as of changing personal life styles. This will continue in the future as people become more mobile in their daily work (e.g., 'hot desking') and their jobs require them to be in immediate contact with both colleagues and customers. The growth of self-employment and entrepreneurship are further forces behind the demand for instant communication. The growth in the proportion of households 'on-line' will be a key driver shaping the future of retailing as well as of corporate marketing and selling strategies.

Summary

The future of Europe will be one with a very different demographic profile to that which prevails today. This is likely to be reinforced by further enlargement, which will add to the diversity of future lifestyles and patterns of personal relationships. In the first decade of the twenty-first century, there will be forces for convergence as well as for divergence, both within as well as between the different countries of an enlarged Europe. Although information and communication technologies will play a key role in shaping these future patterns, these will be affected to a far greater extent by socio-demographic and cultural factors. As in the past, it is these that will largely determine the utilisation of new technologies and, therefore, work patterns and life styles. If the direction of some of these is uncertain, what is certain is that peoples' lives in the future will be characterised by greater mobility, job change and diversity in personal relations. It will be a shift to 'mosaic living'.

Source: *Executive Summary from Richard Scase, Demographic and social trends Issue Paper: Mosaic Living, IPTS Futures Project, Issue paper 07, Seville; EUR 18969 EN September 1999*. Available from: http://www.jrc.es/f-publications.html

2.1.13 Why might knowledge society foresight be needed?

Two things are immediately apparent from the discussion above:

1. The social changes that are liable to be associated with the evolution of knowledge society are extremely wide-ranging and potentially very profound.
2. There is considerable uncertainty about what is likely to happen – not just in terms of precise timings and details, but also even more generally in terms of the fundamental directions of change.

These are circumstances that call for more systematic and reasoned examination of the longer-term future. The issues are of such significance that such examination is of widespread interest. The range of issues addressed and the complexity of relationships between different themes are such that it will be necessary to involve a diverse set of people in the examination. There will also be considerable scope for shaping the knowledge society and its social implications. The involvement of a wide social participation in 'visioning' alternative possibilities and defining the steps needed to get to more desirable outcomes is extremely important.

This set of requirements suggests that various types of foresight process are required to help European knowledge societies to attain high quality of life, and to reconcile environmental and social sustainability with wealth creation. The next chapter of this handbook will explore the nature of foresight processes, and suggest what some of the options might be.

2.1.14 Further resources on the knowledge society

The following references provide some background to the knowledge society. Further references are provided in Annex B.

G Beckmann, B-J Krings and Rader, M. (ed), *Across the divide: work, organisation and social exclusion in the European information society*, Frankfurt: Campus Frankfurt/M, 2002.

Boden, M. and Miles, I. (ed), *Services, innovation and the knowledge economy*, London, Continuum, 2000.

Cowan R., and van de Paal, G., *Innovation in a knowledge-based economy*, A merit study commissioned by the European Commission Enterprise Directorate General, Publication no. EUR 17023, June 2000.

Dutton, W. (ed), *Society on the line: information politics in the digital age*, Oxford University Press, London, 1999.

Dutton, W. (ed), *Information and communications technologies: visions and realities*, Oxford University Press, 1995.

Lundvall, B.A. and Borras, S., *The globalising learning economy: implications for innovation policy*, report prepared for the TSER programme, European Commission, Brussels, (1997). Available online at: http://www.cordis.lu/tser/src/globec.htm

Senge, P., *The fifth discipline: the art and practice of the learning organization.* Doubleday, New York, 1990.

2.2 Foresight

2.2.1 What is foresight?

Efforts have always been made to improve decision-making and public debate by thinking about longer-term trends and the long-term implications of short-term decisions. Efforts to envisage desirable futures and directions of social development go back several centuries, though earlier utopias were usually located in far-off lands or on other worlds. Yet these efforts were usually one-off exercises. In the early nineteenth century, the classical political economists argued at great length about the future of capitalist economies but, as the industrial revolution was consolidated, social sciences tended to become fragmented and more focused on the short term.

A series of major developments in social and technological forecasting, and subsequently in futures studies, occurred in the decades before and after the Second World War. By the 1930s, many of the principles of trend extrapolation and social indicators were established and, by the 1960s, methods of expert analysis such as Delphi and cross-impact, and the first computer simulation studies, were beginning to be well-known.

'Futures studies' was established – not without some resistance from traditional disciplines – as a more holistic set of methods than most forecasting exercises. Futures work seeks to connect together various driving forces, trends, and conditioning factors in order to envisage alternative futures (rather than predict the future). Futures studies have waxed and waned in terms of fashions in methods and popularity, and have been strongly influenced by the rise of issues such as environmental problems and new technologies. They have often found influential proponents in the military and large corporations, both of whom have interests in strategic analysis across a wide spectrum of problems, as well as in government and academia.

The term 'foresight' has been used increasingly in a specific way since the late 1980s. The term refers to approaches to informing decision-making, by improving inputs concerning the longer-term future and by drawing on wider social networks than has been the case in much 'futures studies' or long-range planning. Box 2.2.1 captures the essence of this approach.

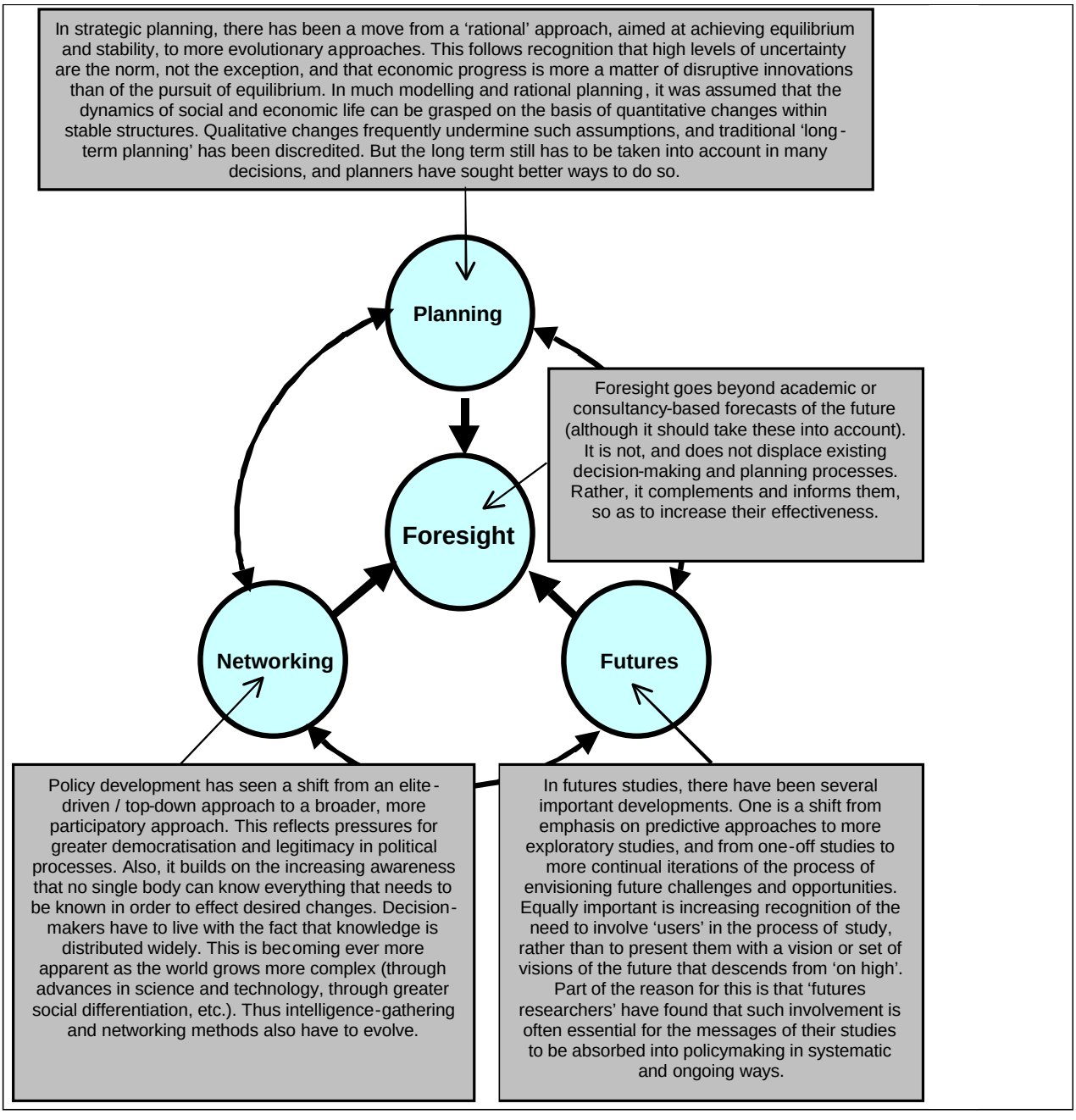
With the success of a number of foresight exercises, it has become common for the term 'foresight' to be used to cover all sorts of activities. There has been much re-branding of technology watch, environmental scanning, forecasting and similar activities as foresight. One can use the term 'fully-fledged foresight' to describe those approaches that go beyond these more narrow methods. These approaches have the following aims:

- To bring together key agents of change and sources of knowledge. This is likely to involve a wide variety of stakeholders, often going well beyond the narrow sets of experts employed in many traditional futures studies and planning exercises.
- These agents are brought together to develop strategic visions and anticipatory intelligence. Structured approaches are employed to focus on long-term social, economic and technological developments and the challenges they pose; feasible and desirable options are explored. The methods of analysis are interactive and participative.
- One set of outputs of this process is results that can help policymaking and priority setting, relating these strategic visions to present-day decisions. The formal results may include such outputs as scenarios, action plans, priority lists. The guiding strategic visions are fundamental to this, however; the foresight process, especially in its networking of people, should have helped to establish a shared sense of commitment to these. (In other words, there will be not only understanding of the issues, but 'ownership' of the analysis as to what is feasible and desirable.) This shared vision is not a utopia: feasibility and desirability have to be combined. There has to be explicit recognition and explication of the implications for present day decisions and actions.
- Another type of output is more informal, but can equally be part of the explicit objectives of foresight. It involves the establishment of networks among the agents concerned. These networks should allow for members to share awareness

of each other's knowledge resources, strategic orientations, and visions of the future. They should provide new knowledge communities that can act to deal with long-term challenges. Some foresight programmes use networks merely to help develop and disseminate their formal results. Others take network establishment to be an equally, or even more, important achievement in its own right. The aim may be, for example, to establish better linkages between people who are active in various areas of social innovation, so as to enable them to share and understand each other's orientation towards longer-term perspectives.

Fully-fledged foresight places emphasis on policy networking as well as on longer-term analyses to inform present-day decisions. Not everything that is called foresight does this, however, whether in companies or in a national programme. In practice, foresight exercises may be more limited – at a cost.

Box 2.2.1: *A perspective on fully-fledged foresight* (from the *Practical guide to regional foresight*, v2)



2.2.2 How does it relate to the knowledge society?

Foresight can be seen as a policy response to the emergence of the knowledge society. Thus it is reflexive to apply foresight to issues of the knowledge society, using knowledge society tools to examine the knowledge society itself.

Foresight incorporates the following features:

- It is based on the need to inform decisions with knowledge, for policies and strategies to be based on sound evidence and expert opinion;
- It recognises that this knowledge is widely dispersed, and needs to be accessed through social networks;
- It recognises that change is a constant, and that it is important to be aware of the long-term context within which present decisions are being made and will have effect.

These all accord with the emergence of the knowledge society. However, it is also important to recognise that knowledge society foresight can be oriented at different points along a spectrum from technocratic to democratic decision-making. In practice, the governance of complex contemporary societies often involves a mixture of both orientations. Furthermore, the tools for either form of decision-making are themselves evolving, and foresight is now part of this process.

- Technocratic decision-making. Foresight provides policymakers with knowledge that they might not otherwise access, reflecting the wide dispersion of knowledge resources and expertise in the knowledge society. Decisions can thus be made more efficiently and effectively. Having drawn on a wider knowledge pool may also render these decisions more legitimate.
- Democratic decision-making. Foresight can be a tool for participation, bringing more stakeholders and points of view into the decision-making process. It is thus part of the armoury of methods for deliberative democracy, a way of enhancing social dialogue and informing more people about the key issues at stake – not just about decisions that have been taken for them.

The emphasis put on one or other approach is a matter of considerable interest, and will have a major impact on the style and substance of any foresight exercise.

2.2.3 Isn't foresight a matter of technological forecasting?

Foresight rose to the fore in the 1990s in the context of national technology foresight programmes, and these are still a major area of activity. The formal products of such exercises are largely a matter of research priorities and strategic goals for other aspects of science and technology.

Across practically all of these programmes, a major lesson has been that it is inadequate to consider science and technology issues without also taking account of a broad range of social dynamics. In some cases, these dynamics have been mainly identified with factors influencing invention, innovation, and diffusion of new technologies: entrepreneurship, financial institutions and incentives, scope for formation and growth of small firms, skill needs and educational systems, awareness of market and social demands for innovations, public acceptability of particular lines of advance, and so on.

Often these social dynamics have been framed in terms of barriers and obstacles to technological development, or needs for collaboration or public support. Less often, there is recognition of the importance of social conditions more generally as providing the context for the development and use of science and technology, and the social implications of such

patterns of evolution. This social context may include demographic and geographic change, cultural shifts, forms of economic organisation, and a host of other factors. A problem that has emerged in most science and technology-focused foresight activities is that they have only belatedly recognised the importance of broader economic, social and cultural factors. The programmes have had to address these wider issues without having recruited appropriate expertise at the outset.

There is no reason why foresight should focus on science and technology. However, with the emphasis on innovation in the knowledge society, and the continuing development of powerful technologies with potential for extremely widespread applications (e.g. information technology, biotechnology, nanotechnology), no long-term perspectives can neglect these fields. Scientific and technological knowledge will continue to evolve and be used in ways that will both shape and be shaped by social structures and processes.

Foresight approaches can be applied to social, political and cultural issues. Especially in regional foresight studies, in corporate foresight, and in many more traditional futures studies, there is considerable emphasis on factors like demography and migration, land-use and transport, environmental problems and attitudes, living standards, etc. This handbook will examine the issues raised by a focus on knowledge society issues.

But even if one were focusing on science and technology issues, foresight would still be more than just technology forecasting. It involves going beyond simple extrapolative prediction to consider alternative scenarios and construct strategic visions; it involves drawing on wider pools of expertise and on constructing networks. The same elements should be true of fully-fledged foresight applied to knowledge society issues.

See Annex A for further discussion of forecasting.

2.2.4 Isn't foresight just familiar futures research?

Futures research is in practice very diverse, with different traditions of work in different countries and milieus. Some futures studies have a great deal in common with fully-fledged foresight, and many futurists have urged that the field should be more connected to decision-making with more emphasis on involving wide participation. But efforts to put this into practice are infrequent (and often not well documented).

The best-known futures studies are those which have resulted in publications for wide audiences. These are typically studies that have been prepared by expert groups or gifted individuals, sometimes working for a particular agenda (e.g. the Club of Rome's desire to make environmental issues prominent in *The Limits to Growth*), or sometimes distilling analyses produced for multiple clients (e.g. Joseph Coates's *2025*). Work behind such publications may have been tailored to the strategies of specific organisations, which is one of the key elements of foresight. But the material available to the general public will not make this very clear, and the links to political choices are often diffuse: the aims may be more to shape public opinion than to influence specific decisions.

It is rare for these studies to involve wide participation. They may have drawn on many knowledge inputs, but the critical work is usually carried out by a small number of people with their own views and methods. Thus they typically fail to be fully-fledged foresight studies.

This does not mean that they are pointless exercises. There has long been a role for such studies, and now they can also provide valuable inputs into foresight exercises. They can be considered as resources for foresight, if not as fully-fledged foresight themselves. This handbook will consider these more limited exercises as well as the full foresight approach. And it should be made clear that such exercises may themselves be extremely sophisticated, in terms of the methods and

data used, and impressive in terms of their results and communicative reach. They continue to remain significant, and foresight is more of a complement to these approaches than a substitute for them.

See Annex A for further discussion of futures studies.

2.2.5 What are the main varieties of foresight activity?

A number of key distinctions between different types of foresight activity can be made.

First, the distinction will be made between 'top-down' and 'bottom-up' approaches. Top-down approaches are more like conventional futures studies, in that they place little stress on interaction. Even where they draw on inputs from a wide range of sources, these are mainly processed by a small expert group. This group elicits inputs of evidence and views from the wider community, perhaps using methods such as Delphi questionnaires, public meetings and teach-ins, and calling expert witnesses to give seminars.

Bottom-up exercises place high stress on interaction, gathering opinions and information from a wide range of sources and, in principle, securing more legitimacy for and 'ownership' of the activity, and establishing greater networks. They may solicit inputs about the design, orientation, content or dissemination of the foresight activity. Methods to achieve this include discussions and presentations, including those on Internet websites. Methods also have to be employed to integrate such inputs; most commonly panels or specialist teams are tasked with this.

Second, foresight activities vary in their emphasis on products or processes. Foresight activities that emphasise formal products stress the achievement of such outputs as priority lists, reports, etc. These products may be highly tied to specific decisions (with practical, concrete, action-oriented outputs such as checklists) or more aimed at providing background intelligence to inform policymaking or public opinion more generally.

Foresight activities that emphasise processes often focus on network building, development of foresight capabilities, 'embedding' foresight into organisations and wide constituencies of stakeholders. Experts and stakeholders are encouraged to exchange opinion, knowledge and strategic thinking. The ultimate objective is to increase social preparedness to anticipate, respond to, and shape change. Product and process orientations can reinforce each other: networking can provide better products, and product-based activity is a good basis for network building.

2.2.6 Why do people undertake foresight?

People undertake foresight for a variety of reasons. Visions of the longer-term future are of considerable intellectual interest. They also have a practical dimension in guiding actions being undertaken in the present. Many decisions take decades to achieve their effects. This is true for physical infrastructure: power stations and railway systems have to be constructed with long-term estimates of energy and transport requirements in mind. It is true also for social infrastructure: the teachers for the next generation of students need to be trained themselves now. Often, a view of longer-term possibilities is helpful in informing as to specific choices that should not be made today. For example, decisions that tie people to particular options may be less than optimal some years down the line. A view of how new technologies could deliver information or process wastes more effectively may affect choices as to equipping libraries or decommissioning power plants. A view of where people may live and how they may work and spend their leisure time could have major implications for developing urban centres and leisure facilities.

Many decisions rest upon some view of longer-term possibilities. Often these views are simple ones based on extrapolation of a few familiar trends. It is quite common to find even highly evident developments being neglected. Educational and pension planners widely neglected the major demographic swings in Western societies until crises began looming. Less familiar developments, such as the scope for technological or social innovations in any given area, are

even less commonly considered. Yet most areas of social life are intimately shaped by the opportunities provided by such innovations, and the responses that people make to these.

Furthermore, a focus on these innovations can be important in suggesting areas where effort could be directed towards changing developmental paths. Much foresight has been concerned with scientific and technological choices. It tries to establish research priorities, for example, by matching opportunities for investment in new knowledge and capabilities with the social and market requirements for such capabilities. Social innovations can also be the focus of action. Examples would include new approaches to child- or elder-care, new ways of organising working time or coordinating employment, lifelong learning and family life, even new ways of sharing information about social change and innovation. Such action could involve research, demonstrator projects, public debate and support for grass-roots action.

Visions of the future can be useful in other ways too. They can provide general information for many people whose own decisions – as to careers, educational qualifications, and lifestyle choices – may be informed by views of long-term developments. They can provide a basis for group identification: people may come together through recognising shared elements of future visions. Negative visions, for example, of environmental or military disaster, have often been the basis for protest movement formation. Groups campaigning around themes like world development or holistic education may have positive views that they share.

But often such groups are crystallised around a vision of the future developed by some third party. Another major reason for foresight is that process benefits can be obtained. Bringing groups of people together to share insights about long-term developments can help them orient their thinking more to this longer-term. They can enrich their own views of desirable and feasible options – and of futures to avoid – by interaction with others. Through this interaction they can become aware of: the range of other actors involved in shaping change, what the specific views and strategies of others are, where there are elements of consensus and dissent, where alliances may be forged, who possesses what knowledge or other resources that may be needed if particular contingencies develop, and so on. This process can be very useful for decision-makers. But it can be of wider benefit. One motivation for much technology foresight was to improve innovation systems, by encouraging better networking among different agents involved in change associated with technological innovation. Arguably, the need for similar support for social innovation is even higher.

2.2.7 How can it be brought to bear on the knowledge society?

One of the main issues that confronts knowledge society foresight is the disputed nature of the knowledge society itself. Whereas there may be little argument about what is meant by the specific technologies involved in most technology foresight exercises, there has been a great deal of debate about whether it is useful to use the term knowledge society and, if so, what its content should be. These debates can be healthy ones, helping to clarify matters and allow new perspectives to enter. They can, however, also turn into lengthy semantic arguments and even academic posturing and political point scoring. It may be helpful to turn the discussion away from the focus on labels, towards finding points of agreement about major trends and countertrends.

Technology foresight and more socially oriented foresight have a great deal in common, but there are several important dissimilarities. Among the main differences are the following features of more socially oriented foresight:

- Disagreement over the core features of social change – as in the disputes about the nature of the knowledge society itself. Differences of view occur within many areas of science and technology, but there is typically much more consensus around key underpinnings of specific fields than is the case in many areas of social change. Most social science disciplines have a longstanding debate between several worldviews or paradigms, and it is impossible just to wish this away. Ways have to be found to allow for cooperation across these different perspectives.

- Politicisation of perspectives. Some of the approaches in social research are traditionally associated with particular political ideologies, and it is not uncommon to find that knee-jerk responses are triggered by particular formulations. Foresight activity will often require facilitation that allows dialogue to happen by 'parking' such controversies on one side, as points of commonality are explored instead. However, at some point the political debate may have to be faced. An approach that can be helpful is to develop alternative scenarios that reflect different perspectives in ways that their proponents can find acceptable.
- Disarticulation between theory and practice. In scientific and technological foresight, many of the key innovators are themselves professional researchers, and other researchers will often have a clear idea of how innovations are being built upon (and in turn influence) the basic knowledge with which they work. This is much less the case in social science, where it is common for key innovators to be practitioners in firms, voluntary movements, policy institutions, who may have little contact with the professional research world. There are many exceptions to this, of course, for example in some fields of management science or policy research, or where social researchers are closely involved in grass roots action such as science shops. But on the whole this is a point of difference between social and more technological research. Foresight needs to recognise this when locating relevant expertise. It should be designed to help foster better links between research and practitioners.

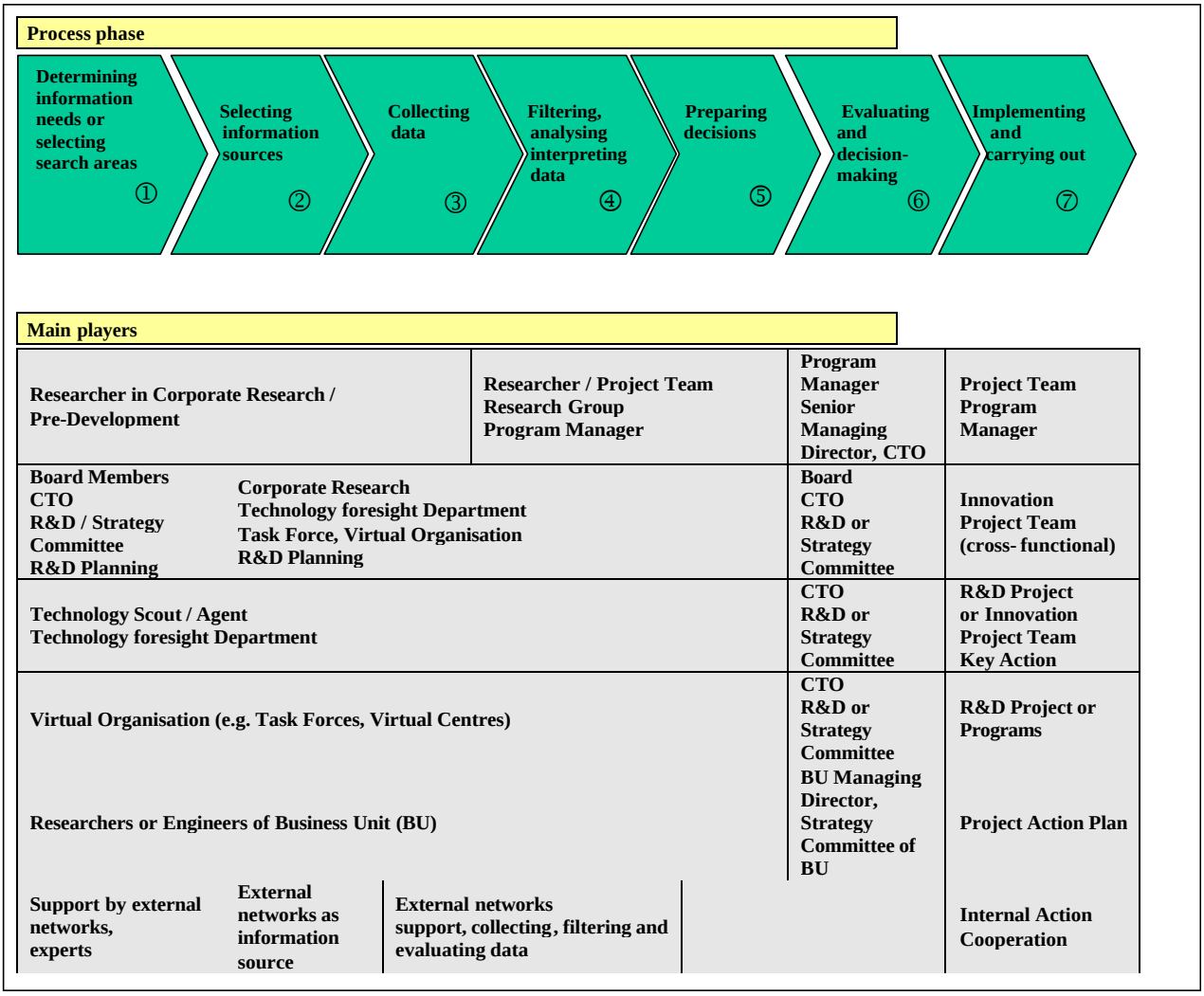
2.2.8 What experiences have there already been of knowledge society foresight?

Over the last decade, numerous foresight exercises have been conducted by governments (national, regional), companies (mostly large, but also by some SMEs), and other types of organisations (e.g. charities, trade associations, etc). The public sector exercises, particularly those conducted at national level, are the best known, while activities conducted in firms are nearly always proprietary and therefore secret. That said, a recent survey of anonymous large companies suggests that foresight is widely practised and that the arrangements put in place are not that different from those found in the public sector (see Figure 2.2.8).

Most of this foresight activity is ostensibly concerned with technology foresight, although such a narrow focus has proven difficult to maintain in most cases, with exercises almost inevitably straying into social issues. Few, if any, examples have framed their activities in terms of the knowledge society. Similarly, there is a surprising lack of foresight activity that addresses working conditions and industrial relations. Table 2.2.8 provides a useful list of national exercises initiated during the 1990s, which shows that most were largely focused upon informing science and technology policy. The most common time horizon has been 15 years, and a mixture of expert panels and the Delphi method have been deployed.

Since this list was published in 1999, the picture has evolved somewhat. For instance, most of the acceding countries are now undertaking national technology foresight exercises. These are focused mostly on priority setting and restructuring national research systems in preparation for joining the EU. At the same time, foresight in some EU Member States, especially those in northern Europe, have moved away from a technology focus and are now explicitly addressing social agendas. Regional foresight exercises have also become increasingly popular, with initiatives focusing upon a wide range of issues from industrial competitiveness to democratic renewal.

Figure 2.2.8: *Main phases and players in corporate technology foresight*



Source: *Reger, G., Technology analysis and strategic management, vol. 13(4), pp. 533-553, 2001.*

The European Commission has also come to be convinced of foresight's worth. As a result, foresight has been presented as one approach to help achieve the goals of the Lisbon Strategy. It is also seen as a way of realising the development of the European Research Area (ERA) through a process of 'open coordination'. Finally, the EC's Governance White Paper recognises foresight as a useful tool for democratising expert-based policy debates.

Table 2.2.8: *National foresight exercises as of 1999*

Country	Reference	Acronym	Method	Direct link S&T policy	Time horizon (years)
UK	Office of Science and Technology – Partnership for Progress, 1995 (14 volumes)	**UK95a**	Panels	YES	10-20
Italy	First Report on National Priorities of Industrial Research – Fondazione Roselli, 1996	**I96**	Panel & KTC	NO	10
Germany	Delphi, 1998	**D98**	Delphi	YES	30
France	Ministry of Economics, Finance and Industry – Key Technologies, 1995	**F95**	Panel & KTC	YES	5-10
USA	White House Office of Science and Technology Policy, Critical Technologies, 1995	**US95a**	KTC	YES	10-20
Japan	Science and Technology Agency and NISTEP Delphi, 1997	**J97**	Delphi	YES	30
Netherlands	Ministry of Economic Affairs – Technology Radar, 1998	**NL98**	Panels	YES	10
Austria	Delphi 1998 – Ministry of Science and Transport – Institute of Technology Assessment of the Austrian Academy of Science	**A98**	Delphi	YES	15
USA	George Washington University Delphi – Survey, 1996	**US96**	Delphi	NO	10
New Zealand	Ministry of Research, Science and Technology, 1998.	**NZ98**	Scenarios	YES	15
Australia	Australian Science, Technology and Engineering Council, 1996	**AU97**	Scenarios	YES	15
Ireland	Irish Council for Science, Technology and Innovation, Forfás, 1998	**IR98**	Panels	YES	15
France	Strategic Technologies Observatory – from the French Department of Industry – Key Technologies, 2005	**F99**	Panel & KTC	YES	5-10
USA	New Forces at Work – Industry views critical technologies – Office of Science and Technology Policy, RAND Critical Technologies Institute	**US98**	KTC	YES	5-10
Italy	Second Report on National Priorities for Industrial Research – Fondazione Roselli, 1999	**I99**	Panels & KTC	YES	
Spain	First Report on Industrial Technological foresight	**E99**	Delphi	YES	15
Hungary	Hungarian Technology foresight Programme	**H99**	Delphi & Panels	YES	15
Sweden	Technology foresight in Sweden	**SW99**	Panels	YES	10-20
South Africa	National research and Technology foresight Project (NRFT)	**SA98**	SWOT Scenarios	YES	10-20
UK	UK foresight Programme	**UK99**	Panels	YES	10-20

Source: *Gavigan, J. and Scapolo, J., Foresight, vol. 1(6), pp. 494-517, 1999.*

2.2.9 Further resources on foresight

Annex A provides an excellent resource on foresight. But for information on national foresight, see NISTEP (2001) Proceedings of an international conference on technology foresight, available at http://www.nistep.go.jp. The European Commission also provides useful sites on foresight in the context of the Lisbon Strategy and the European Research Area, e.g. http://www.jrc.es; http://www.cordis.lu/rtd2002/foresight/home.html.

Main methods and issues 3

3.0 Introduction

This chapter deals with those issues that must be considered in preparing for a foresight exercise. It introduces a 12-element framework (aide-memoir) for scoping knowledge society foresight and then goes on to discuss methods for determining the focus and objectives of foresight, for securing sponsorship and wider support, for identifying participants (experts and stakeholders), and for managing and organising such activities. This chapter therefore focuses on setting up the structures and conditions for the successful conduct of knowledge society foresight.

3.1 What are the main decisions to be made about a foresight exercise?

There are many different ways to conduct foresight exercises. This implies a number of strategic decision points in the design and delivery of foresight. It is important to recognise these choices from the outset through a process called scoping. This handbook has been written to help users to begin scoping their activities.

Why is scoping necessary?

- To review and perhaps pilot foresight options. It can be useful to set out some of the options available. In some instances, for example, where foresight has not been used before, it may be worth piloting some of the possible methods.
- To assess current and past arrangements. What is being done already and what are the strengths and shortcomings?
- To assess requirements against capabilities. Foresight exercises can sometimes be resource-intensive, in terms of human, social and financial capital. Not all foresight approaches are suited to all situations. Therefore, it is necessary to formulate a foresight approach that takes account of existing opportunities and limitations.
- To establish the need for any new structures or arrangements that will have to be put in place. Existing structures and/or routines may not be readily adapted to the participatory and creative environments demanded by foresight. In such circumstances, new arrangements may need to be put in place.
- To generate a flexible (responsive) blueprint for the exercise that uses the most appropriate methods. It is important for scoping to lead to an exercise plan that is responsive to changing conditions. Indeed, scoping should broaden options rather than constrain, and should engender an understanding of interdependencies between strategic choices.
- To make the case for foresight. A well-written report that demonstrates an understanding of foresight and sets out the various options can be a powerful tool for convincing others of the merits (and limitations) of undertaking an exercise. Moreover, because scoping is a process, it has the potential to accommodate participation from the outset, thereby engendering ownership of foresight early on.

Box 3.1 presents 15 elements around which foresight can be scoped. Most of these elements provide opportunities for strategic choice in foresight, although some of them will offer less room for manoeuvre than others (see Figure 3.1). All of these elements are addressed more extensively throughout the course of this handbook, but they are listed here in Box 3.1 to serve as an aide-memoir to the reader.

Box 3.1: *The 15 scoping elements of foresight*

The 15 scoping elements of foresight

1. ***Rationales*** – what are the arguments for conducting knowledge society foresight? These will depend upon the organisations (especially the sponsor) and communities involved. Rationales will tend to emphasise how things can be done better with the help of foresight. They may also point to other places or areas where foresight has been successfully deployed as exemplars.

2. ***Objectives*** – what will knowledge society foresight set out to achieve and by when? Objectives tend to exist at several levels. For instance, an immediate objective of those managing a foresight exercise is its smooth execution. But there will also be higher-level objectives that relate to the rationales offered for conducting foresight so, again, formal objectives tend to be dictated by the organisations and communities involved. Of course, objectives may shift over time and it is not unusual for different actors to hold different objectives for a foresight exercise.

3. ***Review existing strategic arrangements*** – how will knowledge society foresight complement or challenge these? Knowledge society foresight can be carried out as a relatively stand-alone activity, which can be particularly useful if the aim is to challenge a consensual order. However, there is the risk that foresight will be simply ignored and dismissed as irrelevant. For this reason, foresight is often embedded in existing strategic processes where it feeds into players' strategies.

4. ***Orientation*** – what will be the focus of knowledge society foresight? Foresight can have any number of orientations, but common ones over the last decade have included science and technology, business dynamics, territorial (e.g. urban and regional) visions, and societal problems. Orientation is closely tied to the rationales and objectives of an exercise and is therefore dependent upon similar factors, i.e. the agendas of organisations and communities involved.

5. ***Level*** – at what political/economic/social institutional 'level' is knowledge society foresight to be carried out? Foresight is practised at many levels, including national, supra- and sub-national, city, organisational (e.g. company, NGO, etc.), industrial sector, and issue area, to name but a few. The institutional level at which an exercise is conducted will have a significant bearing on many of the other elements outlined here. In particular, knowledge society foresight's objectives and orientation are limited/enabled by an exercise's position and location.

6. ***Time horizon*** – how far out is foresight to peer? The average time horizon for national foresight exercises seems to be around 10-15 years, although it may be as long as 30+ or as short as five years. There is some evidence that the time horizons adopted tend to be related to foresight's objectives and orientation. In other words, time horizon tends to depend upon the uses to which foresight is to be put. Of course, this is not to say that foresight has few consequences for the present. As has been argued earlier, a distinguishing feature of foresight is its emphasis upon action in the present. Moreover, foresight takes account of existing strengths and weaknesses, and of historical trends. In this sense, foresight is as much concerned with the past and the present as it is with the future.

7. ***Coverage*** – what sectors/issues/problems will knowledge society foresight seek to cover? Irrespective of an exercise's orientation, it is usually necessary to select the sectors/issues/problems to be covered by foresight, mostly because of resource constraints and the need to organise exercises of manageable proportions.

8. ***Participation*** – what should be the *breadth* of actor engagement in knowledge society foresight? Who participates in a foresight is a central concern of exercise managers, not least because of a perceived need to produce results that are widely considered to be legitimate, robust, and relevant. The need to implement these results is also an important consideration, given the process benefits associated with foresight. Who participates depends upon other elements of foresight's scope, including objectives, orientation, the themes/sectors covered, and the intended audience. Some exercises are quite limited in their breadth of participation, both in terms of actual numbers and the types of actors engaged. Others have set out to directly involve widely disparate groups, including citizens.

9. ***Consultation*** – what should be the depth of actor engagement in knowledge society foresight? This can be thought about along two dimensions: 'frequency' and 'reach'. Considering 'frequency' first, it is often thought that the issue of consultation is associated with only the elicitation of expert/stakeholder views on the future, for example, through Delphi or scenario workshops. However, there are a number of points in a foresight exercise where views might be elicited, for example, during the scoping process, during deliberation on the implications of foresight's results, etc. These can often be the most significant (yet often forgotten) consultation points, since they allow participants to make strategic choices about an exercise which, in theory, should engender greater ownership of the process and its outputs.

Who is to be consulted at each round of consultation is covered by the second dimension, 'reach'. This is obviously linked to the earlier discussion on participation, although it is unlikely that reach will be to the same extent for each and every consultation. In this respect, reach can be considered to be either 'widespread' or 'narrow'. Although there are no hard and fast rules for selecting any particular consultation approach, the choices made have implications for the credibility of the outcome of a foresight exercise, for the time needed for its completion, and for its eventual cost.

10. ***Duration and cost*** – how long does a foresight exercise last and how much does it cost? Much depends upon the other elements outlined here. So, for instance, if many areas are to be covered and hundreds, if not thousands, of people actively engaged, an exercise is likely to be expensive and time-consuming. More modest exercises are the norm, taking no more than 1-2 years to complete and costing approx. €100-250K. These can be described as 'punctual' exercises, in that they are carried out at a fixed point in time. Such exercises might be repeated at later points in time. There are also exercises that are ongoing and these are described as 'continuous'.

11. ***Methods*** – what methods are to be used at the various stages of an exercise? As this handbook argues, foresight methodology is not confined to consideration of approaches for thinking about the future (see Chapters 4-6). Rather, foresight methodology is far broader, taking into account the important tasks of coalition building, scoping, organisation and management, implementation, etc. Different methods can be used to address these tasks, many of which are outlined throughout this handbook.

12. ***Organisation and management*** – how can knowledge society foresight be organised and managed? Again, this is heavily dependent upon the choices made with regard to the other scoping elements outlined here. Yet, all too often, organisational models are 'borrowed' uncritically from elsewhere, with insufficient account taken of these other scoping elements. Partly for this reason, there are some common features of foresight exercises, including the use of steering committees and panels of experts and stakeholders. Managing this process, in terms of personnel and knowledge management, is a creative process, but some lessons can be learnt from other experiences.

13. ***Dissemination*** – how are the results of knowledge society foresight to be diffused beyond those immediate actors who took part in the exercise? After all, it is usually impossible to intimately involve everyone in the foresight process who is expected to act on its results. This is a non-trivial task, requiring 'translation' of results into palatable messages for consumption often by a variety of groups. One can imagine that knowledge society foresight results applied to the areas of working conditions and industrial relations would generate results applicable to business, government, and trade unions. Different messages may need to be conveyed to each of these. Of greater certainty is that the 'medium' through which messages will need to be diffused will vary between these groups (as well as within them). Project managers need to be aware of this early on and design their dissemination strategies accordingly.

14. ***Implementation*** – how are the results of knowledge society foresight to be followed-up with action? This tends to be a neglected consideration, with project managers often overly preoccupied with getting the foresight process 'right'. Getting the process 'right' can indeed increase the chances of successful follow-up action, but political awareness of the possibilities for follow-up action should ideally be considered from the outset. In most instances, successful implementation involves follow-up action by actors that may not have been directly involved in an exercise. This is particularly challenging, and it is probably wise to ensure that these actors have some involvement in the process at some stage.

15. ***Evaluation*** – how can the outcomes of knowledge society foresight be assessed? Arrangements should be put in place to obtain some measure of whether the exercise has met its objectives: a process known as summative evaluation. But the novelty of knowledge society foresight, especially as applied to the areas of living conditions, working conditions and industrial relations, means that some formative evaluation may also be useful. The latter is not so concerned with outputs and outcomes as it is with processes. A better understanding of these can be used to improve the conduct of future exercises.

Figure 3.1: *Some of the 15 elements outlined above and the degree of manoeuvre commonly associated with each*

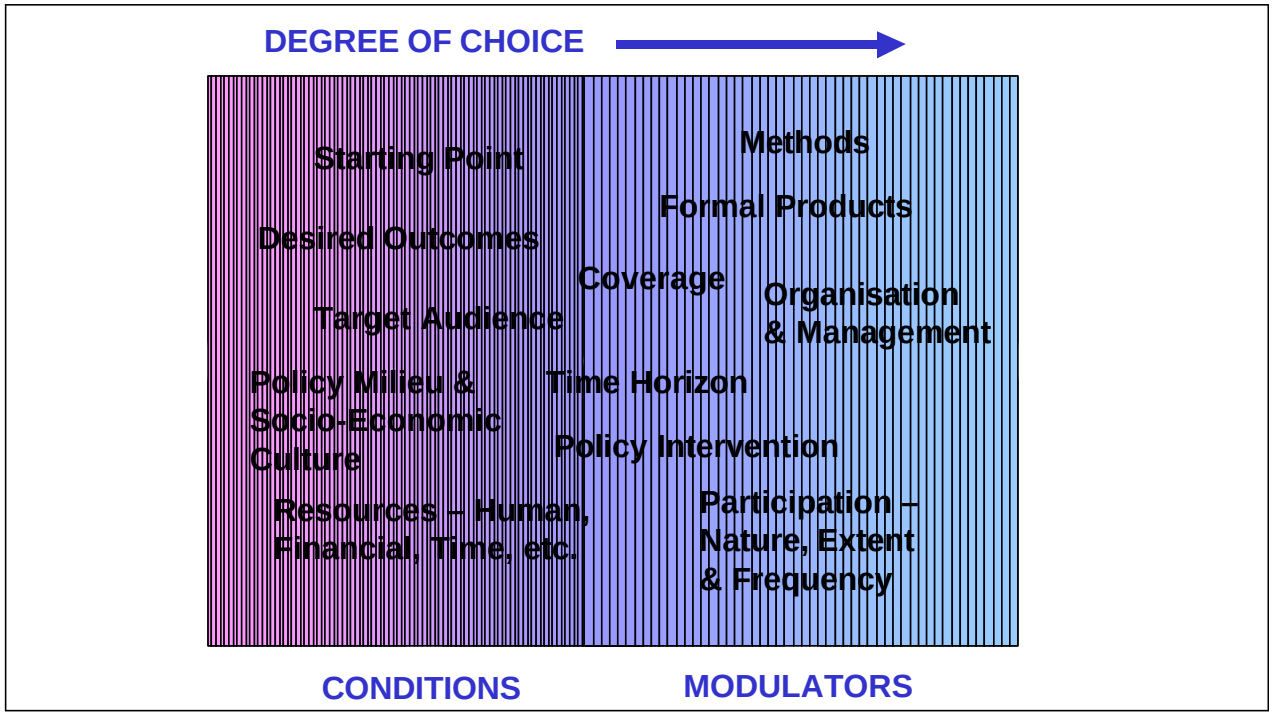


Figure 3.1 shows many of the 15 elements plotted according to the freedom of strategic choice commonly associated with each. Those elements on the left-hand side of the figure tend to be condition setting. Project managers often have little control over these as they tend to be pre-given. By contrast, project managers have greater leeway to modulate their activities around the elements on the right-hand side of the figure. Scoping these elements is the focus of this handbook.

3.2 How will the focus of knowledge society foresight be determined?

The focus and approach of knowledge society foresight will depend upon the specific challenges confronted, although a range of objectives are typically integral to most foresight activities. These objectives should be clearly stated, and internally consistent. In the first instance, often it is important to avoid being too specific. In order to gain widespread support for knowledge society foresight early on, consultation with key players is required. This can help to ensure early buy-in to the exercise. The involvement and mobilisation of such players is one of the key success factors and can be seen as an objective in itself.

A sense of social or political crisis, or the anticipation that break points are undermining established trends, often gives rise to demands for foresight (and/or similar strategic futures activities). It can be helpful to interpret the situation in terms of challenges, and to identify the critical challenges that should set the main thematic orientation of the foresight exercise. But a good measure of shared agreement as to the nature of these challenges must be established at an early stage in the foresight activity.

Once the challenges have been identified in broad terms, then it is important to consider the extent to which the organisations involved in knowledge society foresight, be they public or private, are able to influence or respond to such challenges:

- Some issues are best addressed by the private sector. But this does not preclude public administration from leading or facilitating a foresight exercise, for example as a forum helping private businesses reach consensus on what actions they might need to take.
- Other issues will have a national or global reach and therefore the crux will be to identify the appropriate perspective to take, and to consider how knowledge society foresight considerations might be linked to these broader plains.
- The challenges to address may be highly pertinent to a particular organisation, country, etc. but the political competence to deal with the issues may or may not reside in that organisation or the state. Other players will have to be brought on board very early on if the chances of connecting to critical users are to be maximised.

These are just a few of the considerations to bear in mind. However, the underlying questions of competence, prerogative and authority, are absolutely vital. Since knowledge society foresight should be a participatory process involving time and commitment from stakeholder representatives, activities must carry a stamp of approval strong enough to assure participants that they are engaged in a worthwhile endeavour. This in turn implies that knowledge society foresight findings and outputs must be followed up and acted upon. Otherwise, stakeholders are unlikely to give the foresight a second chance. Similarly, care must be taken not to promise too much to too many players.

3.3 How can the areas that require attention be identified?

It must be recognised from the outset that it is impractical to set out to cover all possible themes and/or sectors, even if project managers choose to narrow an exercise's scope to just one of the three areas covered by the Foundation, i.e. living conditions, working conditions and industrial relations. This necessitates some sort of selection. Yet how such selection has been made in existing foresight activities is rarely made explicit. Methods ranging from 'recycling' existing strategic priorities to undertaking SWOT analyses have played an important part. Even fads and fashions probably play a role here, as in many other organisational decisions. Lobbying by interest groups is another influence. This certainly is an area where consultation of key regional players is likely to pay dividends, both in identifying themes of concern and through increasing the likelihood of commitment to later stages in the exercise. Nonetheless, difficult decisions will perhaps have to be taken when there is demand for more themes and/or sectors to be addressed than resources or time will allow.

3.4 What is the most suitable time horizon?

Foresight is centrally concerned with increasing the time horizon of planning activities. This is not just a matter of 'stretching' existing horizons, extending familiar planning and intelligence gathering into a longer-term future. A major point about the longer-term is that it brings into relief trends, countertrends, and possible events that are of limited concern in the short term. Such developments may not be crucially important to one's immediate prospects. But if they are not taken into account until the problems start to be highly manifest, then it may be too late to adapt effectively, or the costs of coping with change may be higher than they would be otherwise. Consider, for example, the question of developing a base of skills to cope with economic or technological change: this is often a matter that will require years to put into place.

In practice, the time horizon of knowledge society foresight activities will differ considerably, since what is thought of as the 'long term' varies considerably across different issues and different cultures. An apparent paradox of foresight is that, while a long time horizon provides the opportunity to develop a broad vision, most players' expectations are for short-term activities. In fact, there is no paradox here. Knowledge society foresight should be instigated in order to think about possible futures, with a view to changing what is done today for the better. Knowledge society foresight is therefore about readjustment, in the present, to create more agile organisations, cultures, etc. for the future.

3.5 Who will pay and how long will it take?

The financial burden of regional foresight activities are typically borne by a wide range of players, not least by the participants themselves, who usually provide their thoughts and time for free. 'Official' sponsors can be from the public or private sectors, as well as from the 'third' sector (e.g. trade unions, voluntary groups, etc.). It is not unheard of for foresight to be co-sponsored by all three.

As for costs, little indicative financial data exists on foresight exercises in general. But a good way to begin to estimate financial costs is to develop an outline of what a knowledge society foresight exercise might look like through using this handbook. It is a good idea to keep this outline flexible, so that different activities can be added and removed, thereby increasing or reducing the costs. Experimentation is recommended, and it is probably wise to develop a range of options.

Core, and usually centralised, financial costs are most likely to result from such elements as:

- the running of a project management team;
- the organisation of meetings and events, travel and subsistence of at least some of the participants (some participants may even have to be paid to give up their time for the foresight exercise. This is uncommon, but in some parts of Europe, it might be necessary.);
- the production and dissemination of publicity material;
- the operation of extensive consultation processes (e.g. questionnaire surveys);
- other activities, both routine and one-off, associated with an exercise.

Finally, the duration of a regional foresight exercise will depend upon its focus, objectives, coverage and the extent of participation. But, if other foresight experiences are indicative, anything from three months to three years should be anticipated. Foresight can also become a 'continuous' activity, something that is discussed later in chapter eight.

3.6 What methods can be used to identify relevant expertise and stakeholders?

Stakeholders are persons, groups or institutions with interests in an activity, a project or programme. Primary stakeholders are those directly affected by the activity. There may be secondary stakeholders, such as those implementing the action. Though they may not all be aware of the implications of the activity for their own well-being and resources, some stakeholders are likely to have quite clear strategic concerns. 'Stakeholder analysis' has been developed as a tool for participatory planning, and involves listing stakeholders and attempting to identify their interests in the activity. One may attempt to infer from experience or available evidence, or to find out via interviews or even surveys, answers to such questions as:

- What stakeholders specifically expect of the activity? (Are these expectations realistic and well-informed?)
- What benefits might they experience, and how might these be affected by participating in the activity rather than leaving it up to others?
- How can this be communicated?
- What resources could or should stakeholders contribute?

- Do they have interests or objectives that might conflict with the activity?
- What are their attitudes to each other – are there conflicts to resolve or manage?

Broad classes of stakeholders should first be identified. A simple starting point is to consider the roles of governmental, nongovernmental (NGO), industry, professional, and citizen groups. It is important not to be too restrictive in identifying, for example, the sort of government department or firm that should play a role. Different levels (national, regional) and sizes of organisation might be required. What is important is to recruit gifted individuals who are prepared to learn and share, and not just parrot their organisation's official positions.

Methods for locating such individuals involve a search through databases and web resources, or seeking advice from other informed people. Representative approaches can involve asking scholarly, professional and industry organisations for names. It has to be stressed that the people sought are not to act solely as representatives of their bodies, rather they are being recruited to give a representative sample of opinion. Reputational approaches are also commonly used in foresight. For example, questionnaires might ask informed sources to nominate particularly knowledgeable people in required areas of expertise (snowball surveys and co-nomination methods are particular versions of these).

The more formal methods are important for reaching beyond the 'usual suspects', but approaches such as co-nomination are time-consuming. Any methods can be limited by the choice of initial informed sources, so it is important to cast the net widely. If the area under consideration is large, many new names may be generated by such approaches. In smaller areas, there may already be little to learn, since most players are likely to be already well-networked. It may be important to ensure representation of women (gender balance is often highly skewed in such activities) and ethnic minorities, people from regions, etc.

The methods for locating expertise are similar to those for stakeholders in general. Experts should not themselves be stakeholders (though they often are). Sometimes they will be able to input the views of stakeholders they work with, but sometimes their expertise will be more narrowly technical.

Box 3.6: *Some examples of stakeholder types*

Stakeholders in a scenario study of alternative futures for Venice included:

- Policymakers: public bodies involved in town planning and management including economic, environmental, and social aspects (i.e. city administration, Assessorato all' Ambiente; Assessorato al Turismo; mayor, health services, etc.)
- Technicians: private and public companies involved in the lagoon recovery and, in general, all the agencies involved in the management of environmental issues of Venice (foundations; Agencies for Agenda 21; etc.)
- Citizens: citizen groups and associations for a sustainable Venice; neighbourhood committees (consigli di quartiere) local NGOs, etc.
- Entrepreneurs: Multinational corporations; worldwide travel agencies; local associations representing different sectors of production (e.g. fisheries, industry) and services (banks, insurance, tourism, commerce).

Source: *VISIONS Final Report: Integrated visions for a sustainable Europe, April 2001, ENV4-CT97-0462, Maastricht: International Centre for Integrative Studies;*
Available at: http://www.icis.unimaas.nl

Those who use the European Foundation for the Improvement of Living and Working Conditions include:

- Individuals within the institutions of the EU, Member State governments;
- Employers' and trades union organisations who are involved in EU policy development in the areas of working conditions, living conditions and industrial relations;
- Decision-makers on the funding and future of the Foundation (the Budget Committee of the European Parliament, the European Commission and the Council of Ministers);
- European social NGOs and international organisations in the social policy field;
- Entrepreneurs, managers, trade unionists and professionals;
- The academic community;
- The media;
- The general public.

3.7 What methods can be used for raising awareness and building support?

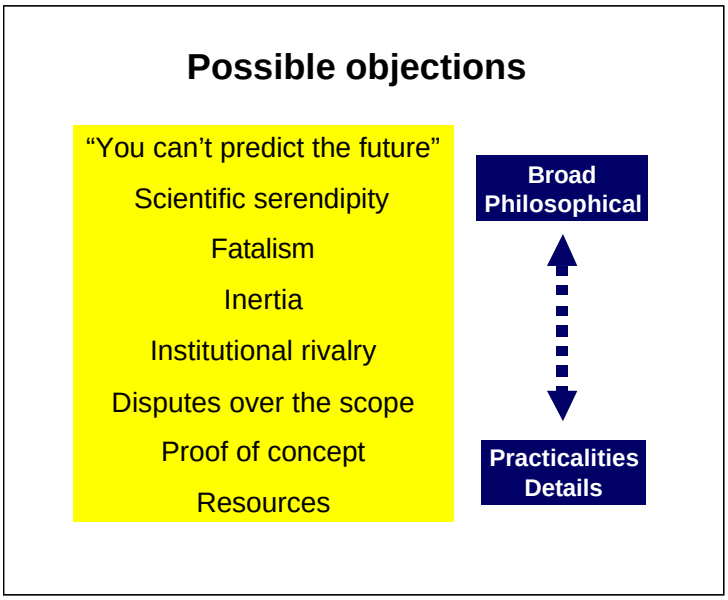
Communication is a key activity in foresight. Arguments for a foresight activity, instructions on how to participate effectively, and dissemination and implementation of results – all of these involve communication to potential supporters, participants and users. Various tools can be used to promote widespread appreciation of, and participation in, foresight activities, including:

- Publications and traditional communications tools (databases, newsletters, etc.) aimed at widespread promotion of the activities to be carried out and identification of players interested in participating. This handbook can also be used in a similar way;
- A remote communications forum designed to disseminate information and promote the activities carried out and completed by foresight. Websites are being used to increasingly good effect in foresight activities, and can provide an important way of reaching people remotely;
- Initiatives aimed at encouraging participation, such as conferences, workshops and other meetings. These may be oriented toward dissemination of decisions already taken and preliminary results, or they may seek active consultation as to the aims and activities of knowledge society foresight. They may be tied to the actual work of foresight in terms of generating visions and gathering knowledge. It is often helpful to work together with specific intermediaries and sectors of activity (trades unions, research centres, industry associations, government ministries, etc.), whose aim is to encourage participation and promote a more active and knowledgeable involvement among their members or clients;
- Illustration of knowledge society foresight 'success stories' in organisations and/or areas characterised by similar problems and objectives.

Nevertheless, it may prove more difficult than anticipated to gain the support of groups essential to the successful conduct of a foresight exercise. Some of the possible objections / barriers are shown in Figure 3.7 along a continuum stretching between broad philosophical objections (e.g. scientific serendipity) to those that are more practically-based (e.g. lack of adequate financial resources).This list is by no means exhaustive. Moreover, some of these objections, while

commonly encountered, have little grounding, since they are based upon a misconception of foresight as a tool for predicting futures as opposed to creating them.

Figure 3.7: *Some common objections and barriers to foresight*



3.8 What are the typical approaches for organising and managing foresight activities?

A structure for any foresight activity needs to be thought through, including the assignment of roles to working groups, panels, committees, sponsoring agencies, trainers, etc. The tasks assigned to such parties are linked to the type of foresight planned. Common characteristics include, for example, the vital initial step of establishing a steering committee and management team. Many activities also make use of 'expert' groups or panels that focus on particular issues. Thus, common organisational elements include:

- A steering committee that will approve the objectives, the focus, the methodology, the work programme, validate the strategy and tools for communication, and help to promote the results. It will define / adjust the assessment criteria and review the deliverables. It will monitor the quality assurance process for the whole project. The steering committee can also be a key actor to raise awareness, mobilise experts, and to nominate them to various panels.
- A project team that will manage the project on a daily basis, with tasks such as:
  - leading the project on a daily basis;
  - maintaining regular contacts with the stakeholders and the steering committee to ensure that the project direction is maintained;
  - keeping accurate records of costs, resources and time scales for the project;
  - ensuring integration of management reports and their presentation to the steering committee;
  - checking that the project maintains its technical objectives;
  - ensuring that the project maintains its relevance to wider activities, initiatives, and policies.

- Securing high political support early on, which demonstrates that the exercise is taken seriously. If key people are first targeted and won over, a momentum can be established. It would be helpful if 'champions' or 'ambassadors' could be enlisted early on to put forward the arguments for knowledge society foresight. Such figures are vital to seeing projects through difficult times; but there are sometimes risks of rivalry (e.g. between agencies), or of divergent expectations.
- Expert work, which, more often than not is organised around expert panels/working groups. Expert work is highly significant in terms of:
  - gathering of relevant information and knowledge;
  - stimulation of new insights and creative views and strategies for the future, as well as new networks;
  - diffusion of the foresight process and results to much wider constituencies;
  - overall impact of foresight in terms of follow-up action.

The mechanics of setting up these groups need to be thought through very carefully, since their membership will influence the whole exercise. Moreover, the management style of these elements will need to be defined. For example, will working groups be given the freedom to make many of the decisions outlined in this handbook for themselves? (This is a definite possibility if the exercise is to be sponsored by more than one organisation.) Alternatively, a central project team or steering committee might define the terms of conduct to be followed (this is more common). Tasks and responsibilities will have to be assigned to the different groups appointed.

Whether the aim is to set up a process-based or a product-based foresight activity (see chapter two), one of the main features of foresight activities must be the active involvement of the various stakeholders from initiation and throughout all the stages of the activity. This is a core factor differentiating fully-fledged foresight from more narrow futures and planning approaches, and is an important determining factor in foresight's organisation and management.

While critical details of the foresight exercise have to be decided by the steering committee and management team, there is still much scope for wider consultation about the process, its key themes, methods, etc. A programme of meetings that can explain what is being planned and gather feedback can be a valuable input; other modes of consultation involve requesting written submissions, etc. Such approaches can be important in legitimising the exercise and helping to clarify its functions and alleviate misunderstandings about what is involved. This requires adequate preparation, and soundings to provide early warning of any political fault-lines that may be encountered.

Widespread participation by various types of players should not be of token value only (though such participation does play a role in establishing the legitimacy of the activity). It should be highly-valued as a source of vital knowledge and perspectives. It should not be occasional and episodic (though there will certainly be occasions where specific knowledge inputs are required and particular sorts of consultation arranged). Foresight requires the participation of players in guiding the participants from the identification of the general and specific objectives, through the planning of the activities to be completed and the methodologies to be adopted, to the management of operations and the dissemination of results. Participation must be considered as a determining factor of the final result.

In terms of 'how' to ensure wide and in-depth consultation, promotional activities, such as those suggested previously, offer opportunities to elicit views on the conduct of regional foresight. Moreover, many of the methods used in foresight require inputs (e.g. data, visions, etc.) from participants. In other words, foresight activities 'naturally' offer a number of opportunities to consult stakeholders. It is up to project managers to decide how to take full advantage of these.

Finally, setting up simple tools that will allow the project team to monitor the foresight project follows what is now considered good practice in project management. Monitoring consists of continuously observing and ensuring that the

resources foreseen for each project step are used effectively as defined in the blueprint, that work schedules are respected and that outputs actually materialise. It will help the project team to control and focus the implementation of the project. On-going monitoring involves:

- observing the activities undertaken during the implementation of each step in the project in order to compare them, in real time, against the targets set;
- continuously adapting the project plan to its environment. As new knowledge is gained and stakeholders are activated, the vision or process of the project may need to be altered: foresight projects are not expected to be rigid.

The monitoring methodology should involve a set of selected indicators that are designed to provide relevant actors with specific and topical data that allow them to follow the course of the project. A simple way (related to classical PERT project management tools) of implementing such monitoring is to set up and complete a table such as that shown below (see Table 3.8).

See Annex B for further discussion of knowledge management in knowledge society foresight.

Table 3.8: *PERT-type framework for managing foresight*

PROJECT MILESTONES	Expected deadline	Probable target date	Corrective Action		Budget apportioned	Budget actually used	Corrective Action	
			What	Who When			What	Who When
Engage stakeholders								
Establish infrastructure								
Choose focus and methods								
Gather existing information inputs								
Generate new knowledge /fusions of knowledge								
Create shared visions								
Produce formal deliverables, 'final' products Disseminate results, promote implementation								
Monitor implementation activities								
Facilitate use of methods and results by stakeholders								
Work for embedded and follow-up activities								

Source: *FOREN, Practical guide to regional foresight, 2001.*

4 Approaches to forecasting

4.0 Introduction: the use of forecasting methods in knowledge society foresight

There are many different types of forecasting method. At one extreme, there are computer-based efforts to quantify trends and their outcomes in order to predict the 'most likely' future. At another, there are techniques based much more on dialogue and discussion, and intended to examine alternative possibilities, generate visions of desirable futures, or define 'wild cards' (unexpected, but possible, events). Many people identify some of these methods with foresight. For example, the Delphi survey has often been seen as *the* foresight method. But in practice, most foresight exercises use a combination of methods, and it is the choice of which methods to combine that becomes the important question.

It should be stressed that forecasting and foresight are not synonymous. Forecasting tools are intrinsic to foresight, but the purpose is not primarily to achieve a set of forecasts (or any predictions). It is more one of envisioning the future (or, more accurately, envisioning alternative futures), and developing capabilities to relate current decisions to long-term prospects. The aim is to provide strategic intelligence to inform decisions, and to build new social networks that can develop strategies more proactively. The process of envisioning futures is most critically a matter of achieving better understanding. Better understanding, first, of change processes and opportunities. Secondly, better understanding of the sources of knowledge and of the agency that can be applied to developing and implementing strategies.

The forecasting methods reviewed below should be viewed in terms of their contributions to these objectives. Effectively any forecasting output can be used as information inputs to foresight processes. It is common to find panels and workshops reviewing the results of earlier forecasting activities as well as undertaking or commissioning new ones. (The next chapter considers the use of information inputs in group activities.) Any given foresight activity will need to assess what combination of methods is to be used, and what previous sources can be drawn upon.

The forecasting methods described below are grouped into two main sets. First those that are largely based on expert judgement, and then those that are based more on statistical and related methods of analysis.

4.1 Forecasting approaches mainly based on expert judgement

4.1.1 What are the main methods for eliciting evidence from experts?

Expert judgement is particularly important where the topics under consideration are complex ones, where there is uncertainty about data or the interpretation of data, or where future developments are liable to result from activities that are highly specialised and not widely understood. For these reasons, expert inputs are usually central to foresight exercises, and knowledge society foresight is no exception.

The elicitation of expert opinion most often takes place in the following ways:

- public hearings to parliamentary or government committees;
- court proceedings or semi-judicial processes;
- structured interviews that observe a minimum of certain definable criteria concerning the elicitation of expert opinion; this can be considered as a minimal subset of the preceding procedure.

The results of such approaches can be valuable inputs into foresight activities. In the discussion below, methods are considered that are especially developed for eliciting systematic views about the long-term future from experts. With the

exception of 'genius forecasting', these procedures are fairly unfamiliar, though often people will have heard of terms like 'Delphi' and 'cross-impact'.

The choice of any of these elicitation procedures needs to be set against the terms of reference set by the programme sponsor. If evidence for judicial decision is needed then court or pseudo court proceedings are necessary. If expert opinion in terms of probabilities is needed, than another sort of elicitation procedure must be adopted.

Two big questions have to be confronted in using expertise. The first is locating relevant experts, as discussed in the previous chapter. In the case of knowledge society foresight, it is particularly important to identify real expertise in the domains in question, not just to go to the 'usual suspects'. This may mean contacting professional and scientific organisations, research councils, and the like. Given the importance of practitioners in effecting social change, experts may be nominated by voluntary organisations, the social partners, etc. What is important here is to identify people who can speak from experience, whether this is based on research or action, and who are able to go beyond just presenting the position of a specific interest group.

The second big question concerns the relations between expertise and the public in general. Apart from seeking legitimate expertise, i.e. expertise that can be validated as being based on real knowledge, there may be need for expert views to be communicated to the public in sensitive and effective ways. Apart from such obvious issues as avoiding excessive jargon, there is a need to avoid people's inputs being restricted because of fears of various kinds. For example, that they will be seen as advocates for scenarios that they are exploring because they see these as important possibilities to consider. Or, that a great fuss may be raised about apparent disagreements between their organisations' positions and those articulated in the foresight work (see Box 4.1.1).

Box 4.1.1: *The role of opinion and experts in foresight*

Foresight depends crucially on opinion about future events and their likelihood, frequently gathered from 'experts'. Consequently, foresight is not science but an art that may draw on methods that stem from the traditions of science. It is important to understand the basic features of opinion, expert opinion especially, and how it is garnered.

All opinion garnered during a foresight study is necessarily subjective (there are very few certainties about the future) and needs to be thought of in probability distributions, though the latter is usually either ignored or not employed for convenience. Opinions vary according to the circumstances in which they are given, the substantive knowledge of the opinion givers, and their ability (i) to work with their substantive knowledge in a future orientation, and (ii) to imagine circumstances in the future that may influence the future development of their field of knowledge.

The circumstances in which these opinions are given may include (i) face-to-face interviews to elicit opinion on defined topics; (ii) court proceedings; (iii) public hearings exemplified by parliamentary and similar committees; and (iv) public enquiries following accidents or similar happenings. All of these sources of opinions may be used in foresight but each source has its own characteristics. Elicitation will be discussed in the next paragraph as it has a special role.

'Face-to-face' elicitation of expert opinion can take several forms that are frequently used in foresight. These include surveys, such as the Delphi method, which is used when consultation is widespread, and direct interviews either as part of widespread consultation or in a more constrained consultation. The methods for both are in the public domain. While the former is widely used, the latter is barely known or understood by the foresight fraternity. This is disturbing since it reveals the general lack of understanding within the foresight fraternity of the underpinning importance of subjective opinion and the associated theory to the entire foresight project.

Court proceedings set precedents that may influence future events and trends, such as the influence of insurance claims arising from asbestosis. Initially, court proceedings are only concerned with the resolution of a dispute, but their outcome can have lasting influence or can set a persistent trend in motion either through precedent or through subsequent legislation. In court, expert witness evidence is taken to represent the entire distribution of knowledge in their field. In this way their behaviour in court can influence science and its directions.

Public hearings typify the practices of committees of parliamentary and advisory bodies. The number of people called before such bodies is limited and they are often limited to public figures who either have eminence in their field or are thought capable of presenting opinion in a selected field. Unlike the courts, parliamentary and advisory committees do not have an executive role, their influence being through (i) their interpretation of the evidence presented to them by the expert witnesses called before them; (ii) the sponsor to whom they report; and (iii) the impact of their findings on public mood in relation to the purpose of their enquiry.

Public enquiries have some of the characteristics of both of the foregoing but without the executive force of court proceedings. Their terms of reference are tightly defined. Uncertainty is admitted into the evidence of expert witnesses that is not the case in court proceedings where a judge must make a binary choice (or acquit) even though the 'balance of probabilities' may be invoked.

The **selection of experts** to provide opinions for foresight is a matter that generally receives insufficient attention. Often the process is haphazard and depends on personal recommendations of variable quality. Formal methods, such as co-nomination, exist to enable the selection of experts, however they are defined, to be placed on a firmer footing. This is done by enabling a cross section of the expert population to be selected, encompassing the factors of age, gender, position in life and affiliation in defined fields of interest. Associated self-assessments of expertise mean that a great deal is known about each person who is invited to provide opinion for a foresight study.

4.1.2 What is genius forecasting? How can it be used?

The rather misleading term 'genius forecasting' is used to describe generating a vision (or several visions) of the future through the insights of a gifted and respected individual. One of the problems of futures research has been the emergence from time to time of guru figures who, for a while, attract considerable attention and interest as prophets or as proponents of particular directions of change. How they have reached their visions is usually left unclear, and their debt to other futurists is rarely acknowledged. Much of futures research is identified in the public mind with the work of such figures and this is a factor in the suspicion about 'futurology' on the part of many academics and policymakers, a suspicion that has spilled over onto foresight on many occasions.

Genius forecasting is readily dismissed as being just one person's viewpoint. Not only are individuals likely to be partisan; it is likely that few individuals have the span of knowledge required to cover the whole range of factors that may change the future. However, it is undeniable that some individuals can provide fresh thinking, and can take perspectives that may otherwise be neglected in the work of committees and panels. For example, the work of Gordon Rattray Taylor in the 1970s drew attention to the effects of the shift from what he termed a patrist-dominated society to a more matrist society. (See Box 4.1.2.)

While some such individuals work as solitary academics, journalists, or activists, gathering and honing their insights over years of experience and study, it is also common for futurists to draw on the work of many colleagues. It is considered genius forecasting rather than more conventional futures studies when such figures synthesise these ideas of larger study teams in new ways, stamping their own strongly held views on them. Influential examples could include Alvin Toffler's *Future shock* and *The third wave*, or John Naisbitt's *Megatrends*.

If such studies are used critically, as the work of gifted but fallible visionaries, rather than as the supernatural revelations of prophetic gurus, they can be useful in indicating drivers and scenarios that may be useful to consider. The nature of such visions is that they tend to ride on particular hobbyhorses, and to present views that are rather one-sided (emphasising particular technologies or social problems, viewing these in a monochrome positive or negative light, etc.) Thus it is helpful to place them in the wider context – of other genius forecasts, and of futures efforts that use rather more transparent methods.

A related source of information is science fiction. While much of this genre is little more than the use of fantastic props to rationalise childish adventures, the best works provide challenging and thoughtful images of future possibilities. Some of the most vivid extrapolations of social and technological developments come from this source, and some science fiction writers are themselves futurists – Arthur C Clarke and Brian Stapleford are just two examples. The flow of ideas can be the other way round. The film *Minority Report* assembled a panel of futurists and trend-watchers to suggest elements of the future society it was dealing with (one in which privacy and some civil liberties have been traded off against security). Judicious sampling of science fiction – which will require advice from a connoisseur of the genre – can help suggest ways of thinking about and presenting images of the future.

Box 4.1.2: *'Genius forecasters': Gordon Rattray Taylor and Alvin Toffler*

Some gifted commentators have offered uncannily perceptive visions of the future. Sometimes these visions may be in a narrow field; on other occasions the target may be much wider. Two such 'genius forecasters' are the Englishman Gordon Rattray Taylor and American Alvin Toffler.

In 1949 Gordon Rattray Taylor's *The conditions of happiness* described a series of ideas about how Western Europe might be organised after the Second World War. In his own words, while the work '…received glowingly favourable notices. ….it made singularly little impact'. In 1968, *The biological time-bomb* was among a number of contemporary examinations of emerging population problems and, in 1972, revisiting *The conditions of happiness*, Rattray Taylor produced the perceptive *Re-think: radical proposals to save a disintegrating world*.

Re-think's scope was broad and deep. It began by examining patterns of the past from sexual swings, through the 'success society' to the value of values. In the first section, the swing from a 'patrist' to a 'matrist' society was identified. It examined issues now associated with feminism that are of great importance. The discussion moved to the 'psychological slum', proposing the notion of social suicide as characterised by the mass and anomic society, and finally raised the question of the identity crisis and how society undermines identity. The final stage of the book examined prospects for the future: dealing successively with the notions of a 'paraprimative' society; the rat race; citizens of Utopia; the new anarchism and the 'technomaniacs'. *Re-think* raised a mountain of questions that remain unanswered, concluding: 'In any situation there are likely to be three alternatives: drift, return to the past or a new synthesis. How can we make quality of life, rather than power or profit or gimmickry, the criterion of all our choices? That is the paramount question for the next half century'.

In contrast, Alvin Toffler's books have a more 'racy' style. In many senses, Toffler's books are an unknowing and unintended response to the questions raised by Rattray Taylor though, perhaps, Toffler relies too frequently on anecdote. *Future Shock* was published in 1970; *The Third Wave* appeared in 1980; *Power Shift* in 1990. *Future Shock* raises and addresses the question implied by Rattray Taylor in the phrase 'the death of permanence'. Toffler's point was that impermanence had or would soon become a feature of everyday life. 'Transience', 'novelty' and 'diversity' are threads of impermanence that would increasingly stretch human societies' capability to adapt, raising the need for strategies for survival. In 1970 the microelectronics and communications revolutions were low on the horizon of perception and their likely influence on human society only discussed in restricted circles. Toffler's later books move

markedly in that direction. In some ways they may be less adventurous because, by the time of their publication, many, but no means the majority, of the issues they raised, were already in currency. Nevertheless, he provided powerful accounts of the development of an information society that were widely influential, even among academic researchers on the topic.

Several decades after their publication it remains unclear how much influence Rattray Taylor and Toffler's books have had in shaping future societies. Uncertainty of influence is likely to remain an attribute of genius forecasters.

Source: *Denis Loveridge*

4.1.3 What are the techniques of relevance trees and morphological analysis?

Relevance trees and morphological analysis are probably the two best-known 'normative forecasting' methods, being developed within the context of large managerial and technological efforts. (For instance, 'how can we get a human being on to and safely back from the Moon?' Many techniques of this sort were born or elaborated in the course of the space programme.) These methods are used to identify what is needed to achieve future objectives: what the circumstances might be, what the key capabilities, actions, and knowledge requirements would be.

- A relevance tree subdivides a broad topic into increasingly smaller subtopics. This is presented in the form of a tree-like diagram. The result is a mapping of the various critical aspects of a system, or of a problem, or the possible solutions to a problem.
- Morphological analysis involves mapping 'all possible' solutions to a problem, so as to determine different future possibilities. It has been used for new product development and in constructing scenarios.

Both methods are tools for thinking systematically about the topic of concern. They can generate unexpected possibilities, new visions of the future, and new thinking about options. It is for this reason that they are described as forecasting techniques, rather than just as planning tools, even though they clearly have aspects of the latter.

These approaches are far from easy to use. They require in-depth analysis, by people familiar with the techniques, and drawing on expertise in the problem fields. Lengthy work may be involved, since the alternatives and combinations of alternative elements involved may be numerous. Assimilation and use of the results of such exercises by wider groups can be quite difficult, because the result is usually a mass of technical detail. However, even a partial mapping of the issues as enabled by such approaches can be a powerful intellectual stimulus. But this is still liable to require considerable inputs of time and critical judgement.

4.1.4 What is the Delphi method?

The Delphi method is so widely identified with foresight that it is easy to forget that, even among national foresight programmes, several make no use of the method. It is important to recall that a wide range of different Delphi approaches are available, although practically all examples used in foresight to date have followed one particular model.

Delphi involves a survey of opinion. In principle this should be expert opinion. But it is a survey that is designed to feed information back to its respondents, not just to provide material for processing by data analysts. What makes Delphi different from other opinion surveys is the way in which this is accomplished. Delphi does not just involve a one-off posing of questions (though sometimes conventional opinion surveys are mistakenly described as Delphis). The survey is circulated to the same set of respondents at least twice (in the classic studies, several more iterations were common). Together with the same set of questions, the respondents in later rounds receive feedback on the structure of responses at previous rounds. (Again, ideally, they should receive information on why judgements, and especially extreme

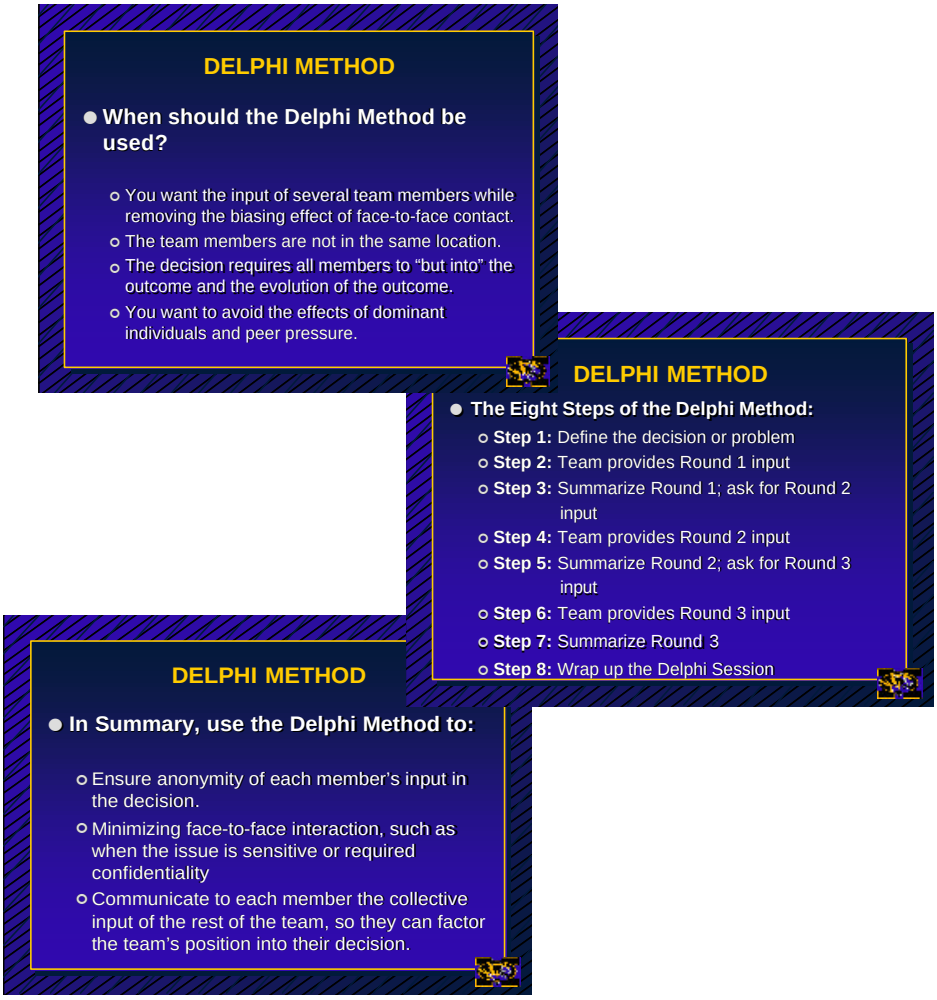
judgements, were made. The idea is that all respondents should thus be able to have access to special information that only a few possess, but which can inform judgements that diverge from the average.)

The purpose, then, of providing this feedback, and offering the chance for respondents to modify their judgements in its light, is to promote exchange of views and information and, in the case of Delphi forecasting, to allow people to see how far their forecasts and expectations correspond to those of a wider pool of respondents. The anonymity of the survey is, furthermore, intended to reduce the dominance of discussions and the exercise of influence by the loudest or most senior figures.

Box 4.1.4: *Delphi method*

The accompanying slides derive from a presentation by Tamara T. Stone on 'Evidence-based decision-making for health service organizations', available online at:
http://www.hmi.missouri.edu/course_materials/Executive_HSM/semesters/F2000/HSM473/Evidence-Based_Decision-Making_for_Health_Service_Organizations.ppt

The Delphi method is here outlined in very general terms – which befits the wide range of applications it can have (not just forecasting ones). It should be noted that many actual Delphi exercises do not involve the three rounds specified here.



4.1.5 How can Delphi methods be used?

The most common application of Delphi has been to investigate when particular developments might happen, requesting judgements usually about the most likely time period in which a particular development might occur. For example, at which of a set of five-year periods is it most likely that more than a quarter of the workforce will be engaging in one or other form of teleworking?

An alternative application, that has been used less often but that may be more useful for some purposes, is to enquire about how far a development might have occurred by a particular point in time. For example, what proportion of the population might be living in single person households by the year 2020?

Often, alongside these forecasting questions, there will be other survey questions about possible driving, constraining and facilitating factors, or about the economic or social implications, of particular trends. Box 4.1.5i illustrates this with a number of questions drawn from an exercise applying Delphi to transport foresight.

Many other types of Delphi are possible: the method can be applied to eliciting and interrogating judgements about practically any issue. Box 4.1.5ii presents a flow chart for the Delphi process. For instance, it is quite possible to seek opinions about the extent to which various policies might contribute to a solution of a social problem, or even about what priority should be given to different social and economic objectives. Such policy and goals Delphis have been applied relatively rarely, though it may be that they could be explored usefully as knowledge society tools, as well as specifically in knowledge society foresight. Another important aspect of Delphis that is often neglected is the stress that is usually put, by default, on consensus. It is very common for the majority view to be taken to be the Delphi forecasts, but at least three points should be borne in mind here:

1. Even though there may be less exercise of influence in a Delphi survey than in a face-to-face meeting, there may still be conformity pressures at work, pushing people toward an average view.
2. In conventional Delphis, some convergence of views is typical. But it is important to examine those topics where this does not happen. These suggest divergent views about current processes and future trends, and perhaps the presence of different implicit scenarios among respondents. (The Delphi normally asks for the best guess about what will happen, and does not ask respondents to reflect on alternative scenarios.)
3. It is possible to design Delphi exercises so as to cluster viewpoints and differentiate among perspectives. While such approaches have been developed, they have also been overshadowed by the more common consensus-oriented approaches.

Delphi studies provide impressive results when well conducted. It must be stressed that this will require careful and laborious choice of participants, preparation of questions, and provision of feedback. Some so-called Delphis do not reiterate the survey or provide adequate feedback to respondents, and their value is thus compromised. Delphi surveys are fairly time-consuming and labour intensive. Drop out rates among respondents may be high, and persuading them to fill in successive questionnaires is troublesome (which is one reason why few iterations has become the norm).

Box 4.1.5i: *Examples of Delphi questions*

The set of statements that follows is drawn from those used in the transport section of the UK technology foresight programme's Delphi study in the mid-1990s. These are the small set of questions where over 10% of the experts responding to them considered that the development listed would have negative implications for the quality of life. They are displayed not just for their intrinsic interest, but to indicate the sort of succinctness and clarity that is required of Delphi statements.

The respondents were asked, using check boxes, to provide a number of opinions on each topic. These were:

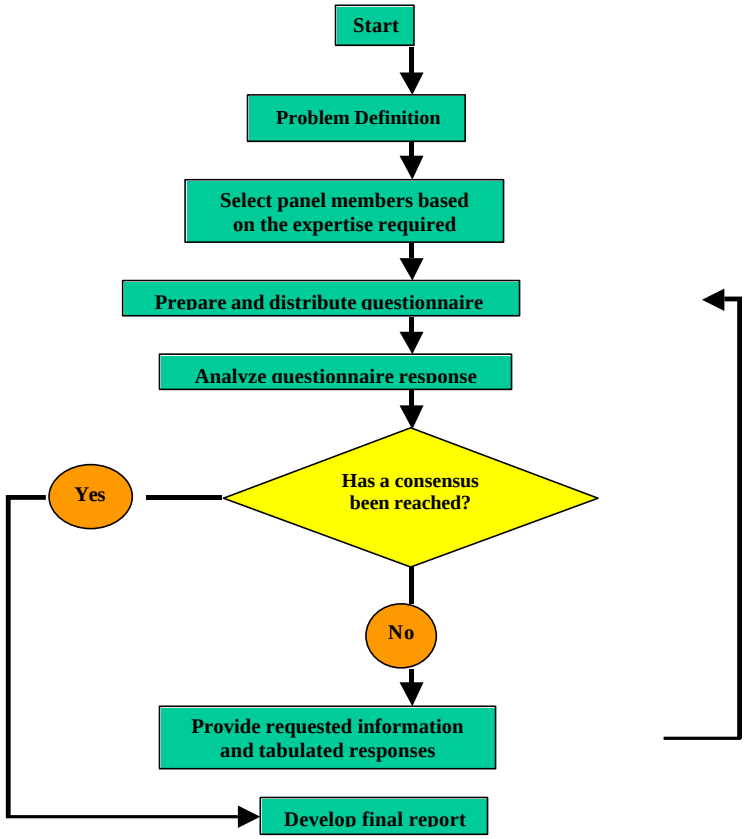
- when the event would happen, if at all;
- whether its implications would be positive or negative for wealth creation and quality of life;
- where the UK stood in respect of the scientific knowledge and capacity for commercial exploitation of the innovation;
- what sort of collaboration would be required within and beyond the UK to realise this.

Topics:

- Widespread use of unmanned and cost-effective feeder ships for transporting freight from main ports/floating docks to domestic destinations via coastal routes/rivers.
- Practical use of tracked transport systems combining vehicular and infrastructu re technologies for inter-urban travel at speeds of 500 km per hour.
- Widespread use of vehicle and driver monitoring and control devices which automatically enforce a driving style which conserves energy, reduces emissions and promotes safety.
- Total number of leisure journeys reduced by 5% through the use of tele-presence and virtual reality.
- Practical use of a substantial network of special roads which allow equipped vehicles to travel in automatic, driverless mode.
- Widespread use of pilot-less navigation and docking using GPS.
- Widespread use of large (>300 seats) subsonic aircraft which are quiet enough to take off and land at night from airports in populated areas.
- Commercial introduction of a supersonic aircraft with over 300 seats, range over 6000 nm and seat mile costs within 20% of subsonic equivalent.

Box 4.1.5ii: *A Delphi flowchart*

The following helpful flowchart is drawn from a guide to methods for use in risk assessment, and outlines a Delphi process oriented to developing a consensus. Not all Delphis are consensus-oriented, and even those that are in practice usually terminate after a few rounds, whether or not consensus is reached on all topics.



Source: *from an Australian National University (Faculty of Economics and Commerce, School of Business and Information Management) lecture by Sigi Goode on 'Project Risk Management' at:*
http://ecocomm.anu.edu.au/bim/teach/courses/infs3059/INFS3059%20-%20L4.pdf

4.1.6 What does Delphi require?

Delphis are labour-intensive efforts, and not just on the part of the questionnaire respondents. In particular, great care has to be taken in formulating appropriate topics. These need:

- to be succinct and unambiguous (a single question, asking for a judgement on a single issue, and using as few words as possible, is essential);
- to avoid overtly evaluative or arcanely technological language (a statement which labels something a 'crisis' or 'problem' may imply a diagnosis of the situation which some respondents will not share);
- to avoid prejudging which of a number of competing possibilities will be realised, unless this is specifically the object of enquiry. (For example, if interest is the proportion of the population accessing broadband communications, it is unwise to simply ask about the availability of fibre optic systems. And it may be wearying, and use up valuable survey resources, to ask detailed questions about the extent of use of each of a number of competing technologies or social practices.);

- to deal with realistic themes in credible ways (for example, it makes little sense to ask about when *all* of the population will be vegetarian, or when they all will adopt any other practice).

If they fail in these respects, respondents are liable to rapidly be alienated, and/or responses will be unintelligible. Thus it is important that question development be undertaken rigorously. The sources of information from which to select themes to pursue in the Delphi can be varied. Usually a panel will make the selection. Indeed, the task of selecting the questions can be a very helpful exercise for illuminating shared views and points of disagreement as to future possibilities. (This is one reason why it is unwise to rely on replicating the topics used in other studies.) However, final question formulation is generally best left in the hands of an expert survey designer, in order to meet the criteria specified above.

As has been repeatedly stressed in respect of expert-based methods, recruitment of the appropriate span of expertise is also vital. This may prove more difficult in some knowledge society foresight fields than it is in the more common technology-oriented Delphis, because research and practice are more often fragmented. Also, social analysis is often seen as a matter of 'common sense', while technology requires specialised training, or so it is reasoned, and many people thus believe that they are expert in topics where they may have many opinions but lack deep analysis.

On the more general point, it is sometimes the case that respondents are asked only to complete those topic questions where they believe themselves to have sufficient knowledge to venture an informed opinion. A better approach may be to ask them to attempt all questions but to indicate how familiar they are with the topic (say on a five-point scale of expertise, allowing them to indicate whether they actually work on the topic or just have a lay familiarity with it).

Material needs to be quickly processed and fed back to respondents in a form they can rapidly understand. Computer equipment makes this a great deal easier than it used to be, but the task should not be underestimated.

Delphis have traditionally been mainly conducted through postal surveys. They can also be used within group meetings. Lately, there have been examples of workshop participants completing their questionnaires online and thus receiving very rapid feedback as to the views of the whole group. Also, development of Internet-based Delphi methods has allowed in principle for a faster turn-around of material among geographically dispersed groups. These approaches are likely to receive much more attention in coming years.

Still the definitive text on the Delphi method is:

Linstone, H.A. and M. Turoff (Eds), *The Delphi method, techniques and applications*, Addison-Wesley, Reading, Mass. USA, 1976.

Box 4.1.6: *Delphi in the Austrian foresight programme of the late 1990s*

This programme combined technology and society and culture foresight, and featured both a technology Delphi assessing technological and organisational innovations (with about 1,600 participating experts) and a society and culture Delphi assessing trends (with about 1,800 participants). The results of the two Delphi exercises were analysed separately and complemented with an integrated analysis of overlapping thematic fields. Further innovative features were the design of the technology Delphi as a decision Delphi.

Technology Delphi	4 common fields:	**Society and Culture Delphi**
♦ Environmentally sound construction and new forms of housing	←←←←→→→	♦ New forms of housing and living
♦ Lifelong learning	←←←←→→→	♦ Lifelong learning
♦ Medical technologies and supportive tech. for the elderly	←←←←→→→	♦ Health and illness in social transformation
♦ Cleaner production and sustainable development	←←←←→→→	♦ Clean and sustainable production
♦ Organic food		♦ Ageing and life cycle
♦ Mobility and transport		♦ Structural change of work
♦ Tailor-made new materials		♦ Social segmentation
In each of the seven fields of the technology Delphi, the experts assessed about 40 technical and organisational innovations (almost 300 altogether). These were assessed in terms of: ♦ degree of innovation; ♦ importance for Austrian society, ♦ economy and environment; ♦ chances of realisation in Austria within 15 years; ♦ chances for Austrian leadership in R&D, implementation and economic exploitation; ♦ desirability; ♦ suitability of various supporting measures).	A common set of 17 megatrends *(*wider economic, social, political and environmental developments) was also evaluated by all experts.	The seven fields of the society and culture Delphi elicited expert assessments of almost 400 social, cultural, economic and political trends (in total), in terms of: ♦ relevance for Austrian society; ♦ potential for realisation in five, 15, 30 years; ♦ degree of priority for Austrian politics; ♦ degree of priority for Austrian research policy; ♦ degree of conflict potential for Austrian society; ♦ desirability of trend ('match' with value systems).

The contents of the questionnaire were developed by an interdisciplinary panel for each field, the members being largely decision-makers. The experts were in part identified by a co-nomination method, and an effort to recruit roughly one third each from: technological and social research, industry, and public administration / user representatives.

Source: *This account is based on an account provided by Georg Aicholzer (ITAS, Vienna), as part of a review entitled Deepening of foresight exercises having taken place in six countries, produced for the ESTO network in 2001 as part of its 'C+' review of foresight, technology forecasting, and technology assessment.*

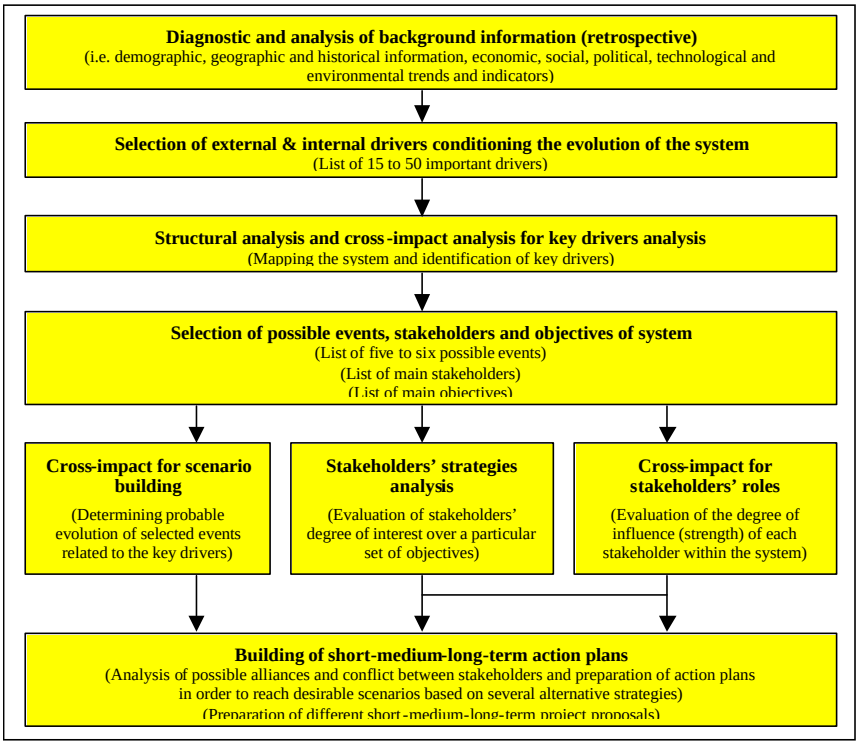
4.1.7 What is 'la prospective'?

In the mid-1970s the French Atomic Energy Commission (CEA) considered the use of Boolean matrix properties to represent in a systemic way subjective knowledge related to the future development of nuclear energy. The resulting methodology proposed a marriage between quantitative methods and qualitative subjective values that requires a high level of commitment and dedication from participant experts.

The main intention of combining Boolean matrix properties with the collective judgements of experts is to facilitate the identification of important explicit and hidden relationships between variables (drivers) of a system. For example, the increased use of ICTs has an explicit (direct) effect on teleworking but has no direct influence on worker sabbaticals. Increased use of ICTs also has an explicit effect on better training and broader education and the latter has an explicit influence on worker sabbaticals. Therefore there is a hidden or indirect path through which increased used of ICTs could influence worker sabbaticals.

The analysis of large systems requires an evaluation of all possible paths (connections) between its elements. It is quite complicated for the human mind to visualise the complexity of huge networks and the hidden interconnections between its elements. The following box summarises the process and methods used in 'la prospective'.

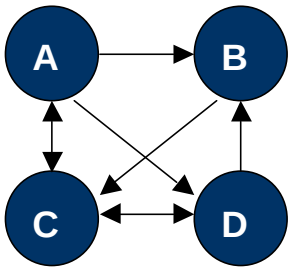
Box 4.1.7: *The process and methods of 'la prospective'*



4.1.8 Cross-impact analysis for identification of key drivers

Box 4.1.8i represents a system of four drivers and their interconnections. The arrows in the left side diagram indicate existence of direct influence of a driver over another (i.e. Driver A exerts a direct influence over B, C and D).

Box 4.1.8i: *System of four drivers and their interconnections*



A Boolean matrix representation of the interactions of the factors or drivers of a system provides a better understanding about the relationships in terms of existing influences and dependencies

Direct influence matrix

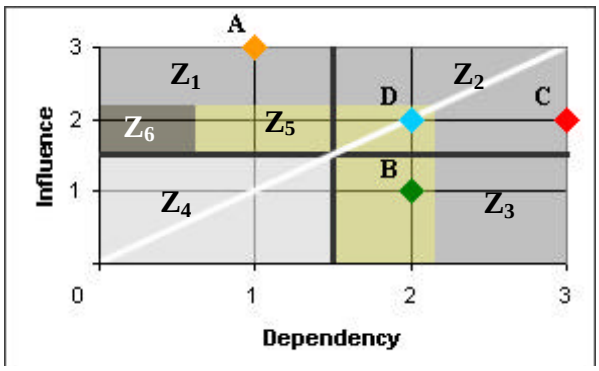
	A	B	C	D	Tot. I
A		1	1	1	3
B	0		1	0	1
C	1	0		1	2
D	0	1	1		2
Tot. D	1	2	3	2	8

Boolean matrices (based on 1s and 0s) have very important properties in the context of networks and evaluation of systems evolution. One (1) means that there is a connection (i.e. influence, impact, effect, etc) between a pair of variables (drivers) and zero (0) means that there is no connection. The number eight (8) in the bottom right corner of the above Boolean matrix indicates the total number of paths or connections that exists between drivers A, B, C and D (note the eight arrows in left side diagram of the box).

The sum of a row represents the total direct influence (through direct paths) that a specific driver exerts over the system (i.e. number three at the end of the first row indicates that driver A has three direct ways to influence other drivers within the system). 'The evolution of highly influential variables (drivers) will have the greatest effect on the system'.[1]

On the other hand, the sum of a column represents the total direct dependency that a specific driver has on the system (i.e. number one at the bottom of the first column indicates that there is one path through which the system can directly influence driver A). 'Dependent variables (drivers) are those that are most sensitive to the evolution of the system'.[1] The sum of values of the row and the column of a driver provide two indicators, total influence and total dependency, which will be used to classify each driver in a Cartesian map (see figures below).

Box 4.1.8ii: *Use of influence and dependency to classify drivers*



In the left side explanatory chart, driver A belongs to Zone 1, driver B and D belong to Zone 5, and driver C belongs to Zone 2 (See box 4.1.8i).

The **direct influence-dependency map** provides useful descriptive information about a system. It helps to explain common sense assumptions that could have been made in advance about the importance of certain drivers. The chart can be divided into six zones: Z1 (Influential drivers: explanatory drivers which condition the system), Z2 (Key drivers: high influence and high dependency, unstable by nature), Z3 (Resultant drivers: influenced by determinant and relay drivers), Z4 (Autonomous drivers: trends or drivers relatively disconnected to the system), Z5 (Regulating drivers: hard to state something in advance about their evolution) and Z6 (Neighbouring drivers: usually remain in the sidelines, but sometimes evolve into dominant ones by relocating themselves into Z1).

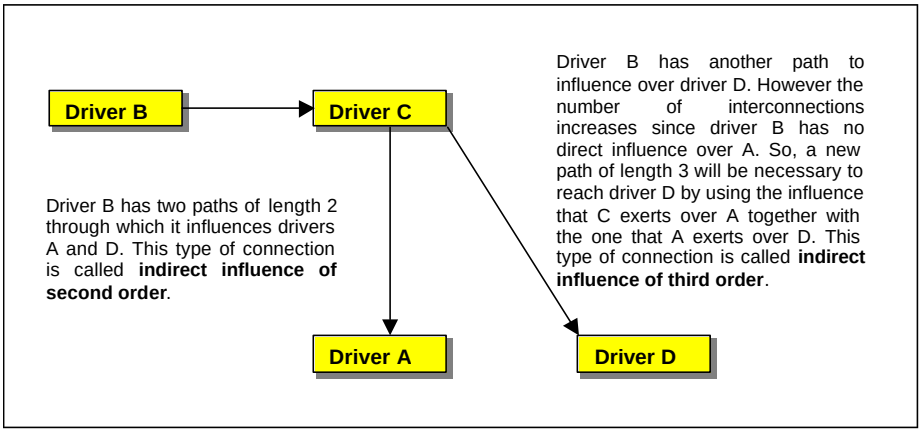
[1] Adapted from Godet, M., *From anticipation to action. A handbook of strategic prospective*, France, 1994, p.99.

Box 4.1.8iii: *Typologies of variables (drivers) within a system*

Dominant or determinant	Dominants of the system. These drivers have a high level of influence and a low level of dependency (influences or brakes evolution).
Key or relay	Unstable drivers. These drivers have a high level of influence over the system and a high level of dependency; therefore require careful attention and study since all action on them has a regressive effect due to the strong linkage with other drivers.
Neighbouring	Inside on the system. These drivers have medium influence over the system and very low dependency; they usually remain in the sidelines, but sometimes evolve into dominant or determinant ones. Therefore it is important to recognise their evolution.
Regulating or average	Drivers with medium influence and dependency playing a strong role in the working or evolution process of the system. Require attention in order not to produce a fracture.
Resultant or dominated	Indicate evolution of the system. These are very sensitive drivers with low influence and medium to strong dependency.
Autonomous or excluded	Drivers with low influence and low dependency. Are not inside strongly on the system. Have joins with the system, which can possibly be strong.

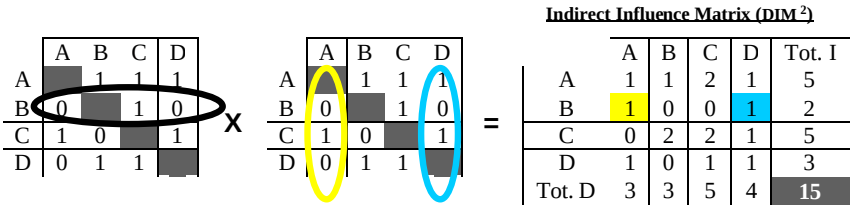
The principle of indirect influences is quite simple (see Box 4.1.8iv, adapted from example in Box 4.1.8i). Driver B only exerts direct influence over driver C (B→C). However driver C exerts influences over drivers A and D (C →A & D). Therefore, B has an indirect path of length 2 that allows it to exert influence over A through C (B→C →A; the linking arrows represent the number of paths or influence loops that variable B goes through in order to influence variable A).

Box 4.1.8iv: *Using hidden or indirect influences*



Mathematically, indirect influences are the result of several multiplications of the Direct Influence Matrix (DIM) by itself (DIM*DIM=DIM^2). The number of times the matrix is multiplied generally depends on the size of the system. Small systems consisting of 10 to 20 drivers might require four to five multiplications (DIM^4 or DIM^5) in order to reach a stable pattern in the indirect influence-dependency map (similar to the one in box 4.1.8ii). For larger systems of 20 to 60 drivers the hierarchy might still experience minor changes at the seventh or eighth power.

Box 4.1.8v: *What is behind the matrix multiplication?*



The mathematical basis for the example in Box 4.1.8iv involves the multiplication of row B (left) times column A (middle) resulting in number 1 in the cell [B, A].

- Operation: B row * A column = 0*0+0*0+1*1+0*0= 1, which means there is a path of length 2 through which B influences A.
- Operation: B row * D column = 0*1+0*0+1*1+0*0= 1, which means there is a path of length 2 through which B influences D.

Looking for hidden interconnections involves careful analysis of several graphical representations, such as the one in Box 4.1.8iv, of the resulting indirect influence matrices (DIM^2, DIM^3, … DIM^7 and DIM^8). As shown in Box 4.1.8i, identifying key drivers involves a combination of drivers that have an explicit or direct high level of influence and dependency on the system with those that reach the same hierarchy level though hidden interactions.

Direct and indirect influence-dependency maps provide researchers and decision-makers with an overall picture of the structure of a system. They help understanding and explain assumptions that have been made in advance before starting a study. They also provide surprising results when counter-intuitive hidden relationships between variables (drivers) result in the 'popping up' of unexpected key drivers. It is also possible to make use of these maps to detect whether a system is stable or unstable.

Stability of systems is achieved when there is a relatively low number of key or relay variables (drivers) and representative number of dominant drivers (A dictatorship is a classic example for this type of system). Unstable systems usually present several drivers along the main diagonal and many located in the key zone (Box 4.1.8ii). In general, some of the detected key drivers involve critical issues that are very difficult to speak about due to their high level importance. It is also common to find that some of the drivers that are important for the organisation carrying out the study are located in a zone of autonomous or excluded variables (see Box 4.1.8ii).

The use of the cross-impact method is one of the various numbers of tools that can be used to organise and interpret subjective knowledge by means of rigorous collective and structured reflection about the interrelations between different elements within a particular system. Its usefulness strongly depends on the level of commitment of involved participants and the richness of discussions and reflections on the results of the exercise.

4.2 Forecasting approaches mainly based on statistical or mathematical analysis

4.2.1 What are the advantages and disadvantages of working with numbers?

The handbook has already discussed some forecasting methods that rely heavily on numerical data – quantitative variables – as a way of representing issues. A statement that says that x% of people will be doing something in the year Y is more impressive than simply saying that it is expected that the proportion of people engaging in the activity will grow in the future.

Methods such as Delphis and cross-impact matrices process expert judgements quantitatively, and represent their results in terms of probabilities or trends. The handbook discusses quantification at this point because the methods described in this subsection are heavily reliant on analysis of statistical and similar data. However, many of the points made here apply to methods such as Delphi.

Quantitative data have advantages and disadvantages. Three major advantages are as follows:

- Statistics and similar indicators should make apparent how the resulting information has been reached. The methodology should be properly explained. Official statistics are generally effective in this respect but consultancy reports or data used in newspaper articles are often far less reliable. This is not to say that statistical indicators are always very good guides to the points of real interest. Many statistics are 'by-product statistics', explaining, for example, how administrative agencies are dealing with problems rather than about the scale of the underlying problems. (Thus, statistics of domestic violence may derive from the number of cases being reported to the police, rather than about the underlying reality. Trends may be as much a matter of changes in willingness to report such events as reflecting increases or decreases in assaults.) Indicators are just what they say they are – indicators, not comprehensive accounts of the issue at stake. However, good statistics are reproducible, and it should be much clearer as to how they have been produced and how they yield the results that they do than is the case for, say, expert judgements of the situation at hand.
- Quantitative data can be manipulated in consistent and reproducible ways. The full armoury of mathematical techniques is at hand for data analysis (with powerful statistical software readily available). This allows the user to make precise comparison between cases, to present estimates in terms of levels of change, and to check on the consistency of different elements of a forecast (e.g. to see whether all of the elements of expenditure add up to the totals that have been allocated).
- Quantification also allows for visualisation of data in graphs and charts, and again software is now available to make it possible to produce these easily.

The main problems with quantitative approaches are:

- Some factors are hard to represent numerically, and these may be the most important ones at stake. One should not assume that just because something is measurable it is central. There is a tendency to pay more attention to quantitative indicators than to the wider, qualitative picture.
- There are dangers of 'spurious precision'. Just because something can be expressed to several decimal points does not mean that it is a well-founded estimate. Indeed, often figures are expressed with more precision than is meaningful, e.g. even the current situation may not be fully known, so a claim about the level of a variable in 2050 has to be taken with a large pinch of salt. 'Guesstimates' need to be recognised as such.
- Numeracy and skills for working with quantitative data are unevenly developed. Some people find offputting more than the most basic statistical information; many find it difficult to examine the data critically (or at least in an informed way).
- The most sophisticated quantitative methods require considerable expertise to apply. They may be difficult for outsiders to deconstruct, and sometimes they have to employ their own experts to get a grasp of what is going on.

- Finally, many assumptions about the nature of the data and the most appropriate methods of analysis are concealed in statistical techniques, and it is common for data analysts to follow common practices rather than to examine whether they are really adequate for the task at hand. This is clearly illustrated by the numerous references to 'statistical significance' in studies that have nothing to do with random samples, and the frequent applications of parametric approaches to data that do not follow normal distributions. (These approaches can sometimes be justified but they are often used with no reflection at all as to why they are being used in specific cases.)

4.2.2 What is trend extrapolation? How can it be used?

Trend extrapolation is one of the most widely used of all forecasting techniques. Formal statistical methods of trend extrapolation have been developed, of varying degrees of sophistication. Many forecasts that stem from expert judgement are probably actually achieved by an impressionistic trend extrapolation of one sort or another.

First, there must be a trend that can be identified. This can be practically any phenomenon that can be expressed in quantitative terms, and where a pattern of development is visible. Among the things that have been subject to trend extrapolation are population and attitude data, technological performance and even the size of world empires. A trend refers to historical data: extrapolation means that these data are projected forward. This may be done impressionistically or by fitting a curve or straight line to a series of data points by hand; or, more usually in contemporary analyses, by mathematical or statistical equation fitting. This section elaborates on these two features a little more.

Trends. Good historical data are available for some phenomena. In countries where there is a well-established tradition of censuses and surveys, for example, one can expect accurate information on population size and structure, the composition of the economy and workforce, and so on, usually at regular intervals over a period of many decades. For many phenomena, however, there are few if any data that stretch back over any period at all. Sometimes the phenomenon is a new one (e.g. teleworking); sometimes it relates to something that is hard to measure (e.g. views about acceptable risk), or that people have not been very interested in until recently (e.g. extent of on-the-job learning).

An effort may be made to substitute space for time in extrapolation. An example would be to assume that the state of affairs that characterises a richer country or more affluent social group today will be the case in a poorer country or social group in the future. This sort of quasi-extrapolation is really a form of statistical modelling (see below); but all extrapolation involves some modelling, as will be explained.

Extrapolation. Fitting a curve to a series of data points by hand is often a good way of gaining insight about the development of a trend. But one is liable to make errors of various kinds when doing this, not least by seeing patterns where there are none, or arbitrarily ignoring data points that do not correspond to the anticipated trend. Curve-fitting by hand is particularly difficult where there is a lot of 'noise' in the data, or where one is dealing with cyclical phenomena (e.g. the business cycle may make long-term growth trends obscure). Various statistical techniques enable straight lines or a variety of curves to be fitted to a set of data points, and projected into the future.

Box 4.2.2 outlines some uses of trend data and extrapolations employed in a study of the future social environment in the UK. It will be observed that the author's commentary wields additional evidence in order to interpret the trends he depicts.

Extrapolation can forcefully indicate the scale of change that would follow from a trend continuing into the longer-term. A rapid rate of growth can make a small phenomenon into a big one, given enough time. Trends that are discounted because they are currently only of minor significance may prove to be extremely important in years to come, and extrapolation can forewarn of this. Sometimes, however, extrapolation comes up with results that seem to be patently implausible. This may represent a failure of people's imagination, or it may indicate that the extrapolation is problematic.

If the growth in, say, part-time workers is faster than the growth of the population as a whole, this does not mean that one foresees a future where cats, dogs or robots are being counted as part-time workers. It simply means that a linear extrapolation has reached its limits. There is a 'ceiling', in the jargon. Extrapolation may confront just where ceilings may be reached in the development of a phenomenon.

Various statistical techniques also exist that allow fitting S-shaped curves (e.g. logistic curves) to trend data. Such methods are frequently used for examining and forecasting phenomena such as the diffusion of consumer products – or the spread of contagious diseases – in a population. Where there is an obvious ceiling, such approaches can be very powerful, but in the case of many social phenomena there is a good deal of guesswork in deciding where the ceiling might lie or when it might be reached.

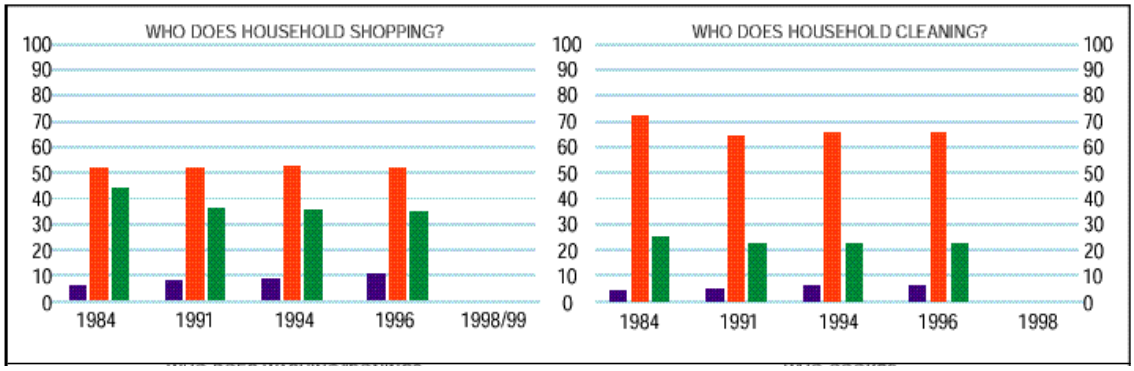
Trend extrapolation is widely used, and fairly easy to employ and explain. But in order to assume that a trend will continue to evolve into the future, there must be a good reason to believe that it will persist rather than change its course. Of course, the fact that something has happened for a long time may create a plausible base for assuming that it will continue to do so, but quantitative changes may suddenly become qualitative ones. Heated ice turns into water after reaching a certain temperature, and the water in turn will transform into steam, for example. Thus it is wise to identify just what forces are driving a trend; then one can consider whether these are liable to persist, and to have the same effects. Unless these are taken into account, then trend extrapolation is unconsciously founded on the assumption that such forces will continue to operate in familiar ways. It is better for such assumptions to be explicit.

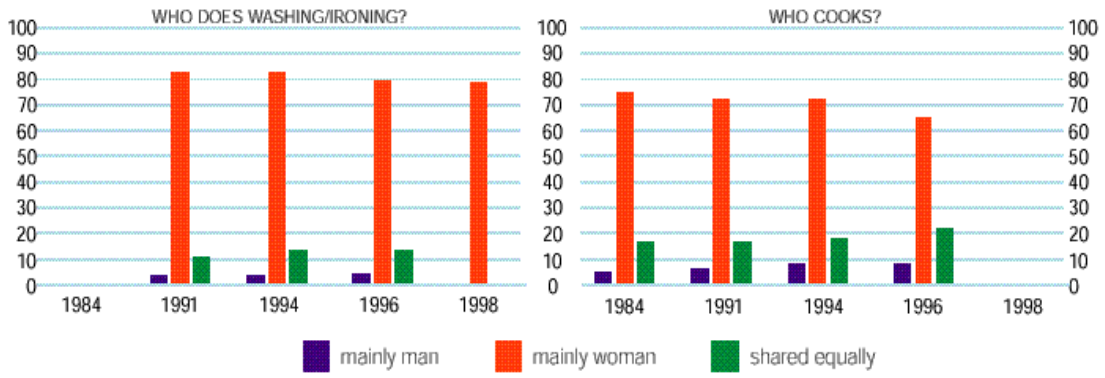
Box 4.2.2: *Trend extrapolation: examples from the 'Britain towards 2010' study*

'Britain towards 2010' set out a view of changes over the coming decade in the UK, mainly drawing on available forecasts (e.g. results of modelling demographic and economic trends) and using some basic extrapolations.

The first graph below represents an example of trend data being presented with no effort at extrapolation. The reader is left to form her or his own impression of how the trend may develop. Scase provides this commentary:

> *For those living together, changes in the nature of gender roles are likely. In future, domestic duties may become more equally shared, but any shift in this direction should not be exaggerated. Research suggests that changes in the past have not been pronounced and are unlikely to be dramatic in future… If there are any major adaptations in present-day practices, these are more likely to occur among younger 'dual career' couples… the burden of responsibilities falling upon working class women could become even more pronounced as a result of duties acquired through 'serial' personal relationships. Men will continue to be able to avoid their domestic obligations. But for women these obligations may even increase. Not only will men still see childcare as a female obligation but women are also likely to acquire added duties of caring for the elderly as a result of increased life expectancy…*



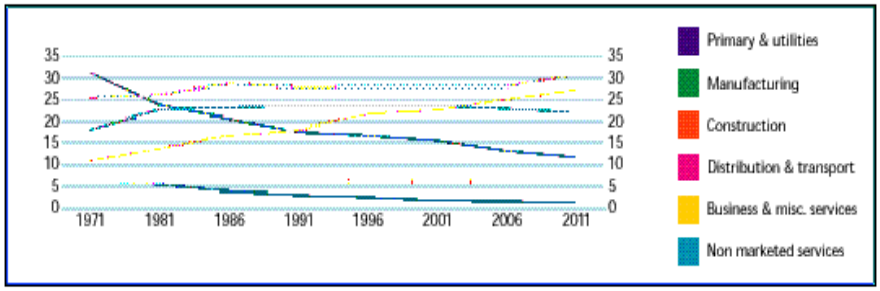


Sources: British Social Attitudes Survey: Social and Community Planning and Research
1984/1998: ESRC British Household Panel Study, University of Essex, 1991-1996 (figures based on women's responses)

Elsewhere in the report, Scase presents data series that are subject to extrapolation. In the two examples below, regression analysis has been employed. The trends in the various parameters represented in these graphs have been estimated as functions of time, and then the future data points are calculated on the basis of future points in time. Scase's commentary associated with these data (which form the prelude to material on non-standard work and other issues) is:

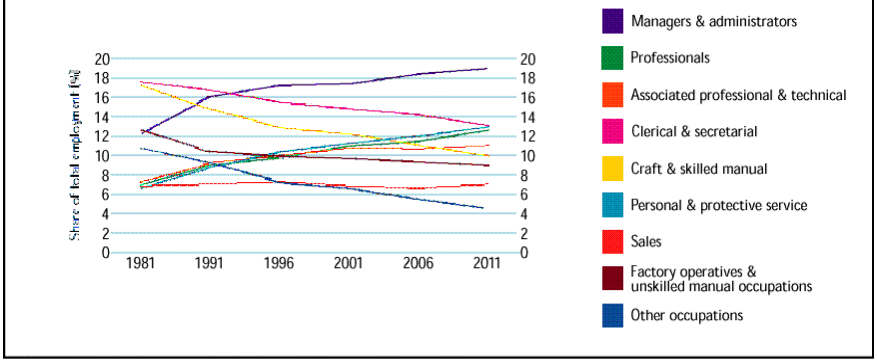
> *Over the past twenty years the British economy has undergone major transformations. The decline of manufacturing and growth of service occupations is well documented. More people now work in Indian restaurants than in shipbuilding, steel manufacturing and in coal mining combined. There are currently three times as many public relations consultants as coal miners. This process is likely to continue as Britain becomes a predominantly service and information based economy. …major shifts in Britain's occupational profile will also continue. Managerial and professional occupations will grow with a related decline in …skilled and semi-skilled manual tasks. By far the greatest number of jobs created over the next decade will take the form of 'non-standard employment' i.e. part-time work, flexi-hours or self-employment. It would be too optimistic to assume that these changes will lead to a more egalitarian society. Inherent in the growth of a service and information economy is the creation of jobs that are low paid, insecure and offer limited career opportunities. Changes in the retailing sector – the decline of traditional, independently owned shops and the growth of supermarket chains – have created low paid and low skill jobs. The growing need for care assistants to care for an ageing population has led to the creation of part-time, low paid employment. Moreover, the growing use of ICTs is generating similar low paid jobs in call centres…*

Changes in industrial structure



Source: 1971-2006 – Review of the Economy and Employment 1997/98, Institute for Employment Research. University of Warwick. (figures for 2011 based on linear regression of IER figures)

Changes in occupational structure



Source: 1981-2006 – Review of the Economy and Employment 1997/98, Institute for Employment Research. University of Warwick. (figures for 2011 based on linear regression of IER figures)

Source: *Chapters two and three of Richard Scase, Britain towards 2010: the changing business environment, London, Economic and Social Research Council (and Office of Science and Technology), 1999.*
Available online at http://www.esrc.ac.uk/2010/docs/britain.html

4.2.3 What are the problems with trend extrapolation?

The discussion above has pointed to some of the most common problems with extrapolation. To elaborate on these, extrapolations can be problematic when:

- they are founded on inadequate data. The data may be weak, not truly reliable. For instance, historical data may not have been really measured, but may be estimated or guessed. The data may not extend back far in time. It is very unwise to project a trend, based on only a few years' observations, forward decades into the future.
- they substitute space for time in highly misleading ways. The fact that richer people are more likely to employ servants, for example, does not mean that, as society as a whole grows richer, the number of servants will grow. (If anything, the argument should be that more affluent people are less likely to want to be servants, or at least to work at traditional servants' wages.)
- they fail to assess underlying driving forces, so that there is an inability to anticipate changes in these forces. For example, long-term trends in energy use were disrupted by changes in oil prices in the 1970s. A decline in cinema audiences (as people switched from cinema to TV) was reversed at the end of the twentieth century, as filmmakers found ways of making the cinema experience more attractive.
- they do not examine whether qualitative transformations might disrupt, or radically modify the meaning of, change in quantitative indicators. More generally, indicators are just that – indicators, rather than the complete story of the phenomenon of interest. For instance, home ownership statistics in the USA seemed to conflict with data on household formation in the 1970s, because more people were living in trailers/mobile homes, and these were not being captured in housing statistics. The problem here does not only apply to trend extrapolation, but it is confronted very starkly in simplistic approaches to extrapolation.
- they make assumptions about whether and when ceilings will be reached, often basing these on very poor information (for example generalising from apparently similar phenomena). The early years of the development of a phenomenon are often a very poor guide to how the trend will develop in the longer term, as has been vividly demonstrated in the field of computing. At one time it was thought that the world market for computers, i.e. the ceiling of diffusion, would be at most a handful, and then this was raised upward to a matter of a few hundred. Currently there are around a billion computers in the world and, if forecasts of the development of ubiquitous embedded computing are accurate, in a few decades there could well be many computers per inhabitant of the richer countries at least.

These are not reasons to abandon the use of extrapolation. They are reasons for its use to be critically informed.

4.2.4 What is simulation modelling?

In the last few decades, low-cost powerful computers have become widely available. General-purpose software tools like spreadsheets, and a number of easy-to-use modelling languages, have come on stream. These developments have meant that computer simulation is no longer just the preserve of highly expert teams working on large and expensive computers, producing analyses that few other people can examine or test. Some sorts of simulation have become widely familiar, in particular through the availability of computer games, and especially the 'God games', which allow players to experiment with evolving societies. (*Civilisation* was the first well-known example of this lively genre.)

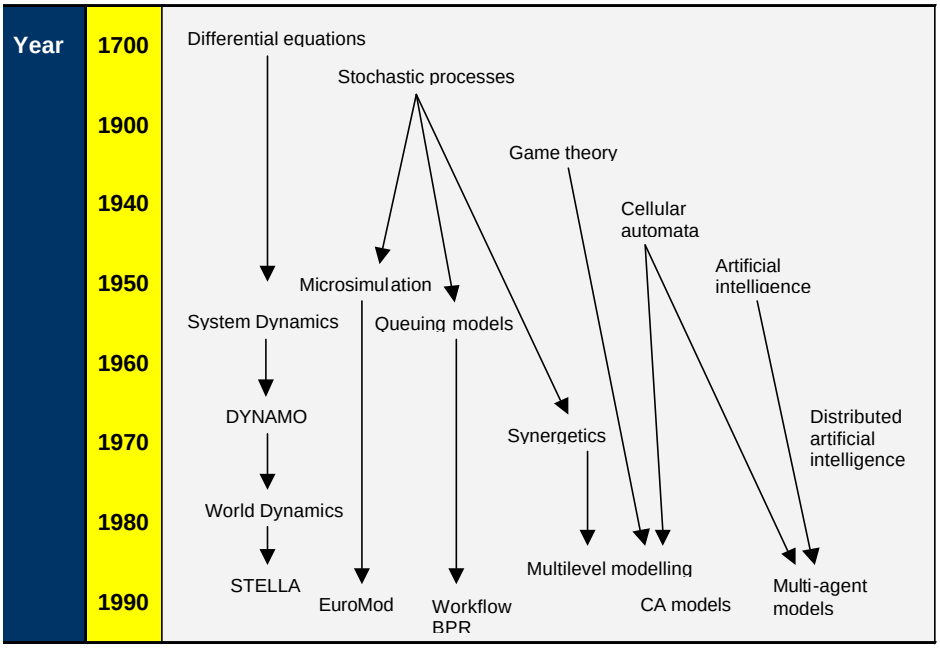
This is not to say that the massive, high-tech models have become redundant. Issues such as climate change and more immediate weather forecasting require massive computer facilities. Large-scale models are routinely used in economic projection, and major resources are also required for modelling processes as dissimilar as nuclear explosions and the impact of social security reforms.

So what are computer simulations? They are models. Imagine a physical model, such as a train set. Each of the various elements of the real-world system are reproduced in miniature. The model consists, in essence, of various objects with specific features (some fixed, some variable) and with relationships between them (the locomotive pulls the carriages, a change in the points affects the path followed by the train). A computer model is much the same but, in place of a miniaturised version of the physical objects, there is an electronic representation of them, and of their features and relationships.

A computer model represents a system in terms of its key components and relationships and, like the model railway, it can be used to project how the system will operate over time, or as a result of specific interventions. The computer is immensely versatile, however, and it can model practically any system – or at least, it can represent an understanding of the system, as far as it can be expressed in terms of variables and relationships (see Box 4.2.4 for the evolution of simulation modelling).

Box 4.2.4: *Evolution of simulation modelling*

The figure below sets out an account of the evolution of different approaches to simulation modelling, showing that different lines of development have stemmed from mathematics and, more recently, computer science. The developments on the left of the diagram, being longer established, have had considerably more uptake in futures and foresight work, but some of the newer developments are beginning to find roles too.



Source: *Nigel Gilbert, Agent-based simulation of societies.*
Available at: http://www.agentlink.org/happenings/easss/2002/pdf/Agent%20sim%20of%20soc.pdf

4.2.5 Where is computer simulation used?

Computer models have been developed most extensively to simulate systems that have relatively easily quantifiable properties. The most familiar models of social systems deal with economic issues, where the key variables can mainly be expressed in terms of stocks and flows of monetary values, or are related to headcounts of people such as employment levels. Headcounts are also used in demographic models. Movements of people between states; age categories; events such as birth, childbearing, death, etc; or location in geographic or economic terms can be simulated.

Such models are typically based on extensive analysis of statistical data. The relationships between variables, for example, the effect of an increase in prices on the demand for a class of products, can be estimated from such information. They usually deal with aggregates, such as economic sectors, population groups, etc., and it is only recently that there has been much expansion of alternative approaches. Among these alternatives are: 'game theory' models, which examine the interaction of different actors where the outcomes of their behaviour are partly determined by how the others choose to act; 'genetic algorithms', where there is scope for learning or evolution to be simulated; and 'agent-based' systems where models of several different entities interact together. These latter approaches have considerable promise, but to date they are mainly research tools and have rarely been used in routine forecasting activities.

Economic models are routinely used in forecasting (usually fairly short-term) developments, and thus in informing economic policy. Demographic models are used for forecasting future requirements for education, pensions, and the like. Transport models are used for forecasting mobility (and the impacts of new urban development plans, for example). Micro-simulations are used to examine the impact of labour market developments and social security reforms on household behaviour. But while such models are used increasingly widely, they rarely attract much attention in themselves.

Probably the first instance of computer simulations gaining wide interest was with *The limits to growth* and a number of other 'world models' in the 1970s. These were highly ambitious attempts to simulate economy-environment interactions for the whole planet over decades and even hundreds of years. They involved heroic and highly contentious assumptions concerning natural resources, technological change (or its absence – *Limits* was technology-blind), and human affairs. While they succeeded in raising awareness of many key issues, their quality as forecasts was highly suspect, and the sustained criticism they received cast a long shadow over modelling efforts. One common criticism was that the models had been constructed by people who were more like general-purpose computer experts or management scientists. They were not real experts in economic or ecological affairs.

Another area where modelling has attracted a great deal of attention in recent years is in climate change research. Extremely large and complex models have been developed in efforts to examine and project forward trends in global weather. Since these are the product of large teams from many countries, and have attracted the support of many leading researchers in the climate field, the controversy concerning their results has been very different from that associated with *Limits.*

Many interesting lines of development of new simulation approaches are finding a use in social scientific, and also in natural science and engineering, applications. One approach utilises 'cellular automata', of the sort familiar in the computer 'game' LIFE. Here each cell in a space filled by cells is seen as behaving according to the cells around it. For example, one can imagine that the cells are people, and that their likelihood of adopting a particular attitude or behaviour is determined by how many of their neighbours are doing the same. Such simple models are able to 'predict' stable and unstable social structures that can emerge in the space.

Agent-based models are now the focus of much interest. These allow us to explore the results of the interactions of a number of agents (people, organisations, etc.), each of whom has a measure of bounded rationality and capability to learn about the others and the environment. The agents can communicate (or at least affect each other through their behaviour), they can be quite dissimilar from each other in terms of resources and capabilities, and they can interact in ways that go beyond those in simple cellular automata systems.

Simulations using such techniques are being actively explored among social scientists in practically all disciplines. Their efforts have already moved beyond highly abstracted models to models describing real social situations. They have been applied to planning in real-life situations such as telecommunications network management and prediction of crowd behaviour when emergencies occur in the built environment. Most of the issues addressed in foresight are necessarily very complicated ones, and such models are likely to provide insights into sub-domains of these issues in the immediate future, rather than giving us large-scale general-purpose models. But developments here are certainly worth attention, and surprising innovations and new directions are quite possible.

4.2.6 What are the advantages and problems of simulation modelling?

Computer simulation is slowly becoming a more familiar and less mystifying activity. There are several major advantages, and also certain drawbacks, associated with modelling. In its favour, the approach can:

- Force people to think systematically about assumptions concerning the dynamics of a system, and make them search for relevant data with which to test, explicate or elaborate such assumptions. (Unfortunately, many modelling studies do not set out and share these learning processes with other people. One is expected to take it on faith that they have been systematic in their efforts, and left to wonder whether the extra effort of documentation was more than the team could manage, or whether they are covering up weak parts of the study. The lack of sufficient documentation of models has led researchers to discover serious problems when trying to replicate studies.)
- Make the user set out the assumptions in a formal language, that can also often be represented in terms of graph diagrams and other figures setting out the subsystems and relationships involved. (However, in practice, the language of modelling is impenetrable to most non-experts, so thorough analysis is hard for outsiders to undertake.)

- Allow the exploration of alternative starting conditions, events and interventions; even allowing the user to experiment with changing assumptions and (in the case of some work carried out at RAND and elsewhere) to compare the behaviour of models of the same system based on different understandings of how it operates.
- Deal with a much larger number of variables simultaneously than ordinary people are able to do, and process the material in a systematic and meticulous way, with innumerable calculations. It can even be the case that outcomes will be achieved that were unexpected or unpredicted by the simulation's designers, especially in the more evolutionary models involving games, agents and genetic algorithms.
- Enable the user to present results in detailed graphical form, graphs, charts etc., allowing a comparison of results for different times or conditions. Box 4.2.6 displays an example of how a model can be simply represented and its outputs set out for use by lay audiences.

The quality of a model is only as good as that of the assumptions it is based on (and the data with which it has been calibrated). In the days of *Limits to Growth*, the mystique of the computer as an 'electronic brain' made it easy for many to overlook the fact that any model necessarily rests upon assumptions made by its human designers. The computer cannot inform itself about the real world. It captures just one representation of the system being assessed.

While this is more widely understood than in the past, a continuing problem is that, especially in the case of large and complex simulation models, it can be difficult for non-experts to identify and critique the assumptions that have been built into them. Many large models are subject to little independent inspection, and the details of some are commercially confidential.

Large-scale models require large teams to locate and analyse data, to formalise it in terms of the model. Simpler models may be used with quite basic PCs and simple programming languages and tools. (It has often been shown that the key behaviour of many large models can actually be generated from much simpler models. In essence, only a few of the variables and relationships are driving the greater part of the behaviour of the system.) However, issues of quality control need to be tackled. It should not be assumed that some of the more experimental and exciting directions of developing simulation that have emerged more recently are readily used for forecasting.

Models of social, political and cultural change have been produced for decades but, outside of the areas discussed above, they are not well-established. Understanding of how these systems work is incomplete and hotly debated, with very different worldviews being brought into play. It can also be hard to identify and locate appropriate data on key variables, let alone to estimate the relationships between them.

Highly complex models can even be difficult for their builders to understand. There are cases of modellers misinterpreting the behaviour of their own models (i.e. assuming that one factor is behind a trend, when actually another one is). It is arguable that, in many cases, it would be best to construct simple models and become familiar with how these operate, and then to build 'satellite models' that allow for more complicated issues to be pursued, than to try for an ill-judged 'holism' at the outset.

As already mentioned, few models can cope with structural or qualitative changes. While progress is being made in this direction, the most widely used models are very limited in this respect. Indeed, many models depend upon unrealistic assumptions about economies tending to an equilibrium state – an article of faith shared with mainstream economics, but disputed by many other social scientists.

In conclusion, simulation modelling is a valuable tool in forecasting, though so far developments have mainly been restricted to the more traditional simulation approaches, or to highly specific issues. Some of the newer approaches are already being used for practical planning purposes, however. They may also be valuable in explicating the range of outcomes that might emerge, and the conditions that promote specific outcomes. Such outcomes might include the types

of coalition that may emerge, or whether a dominant design is likely to take over as opposed to a range of designs securing their own niches, etc. This may prove to be a valuable line for development, improving our understanding of real-world systems.

Though challenging, modelling is becoming more accessible, and a variety of new approaches are being developed that overcome some of the unrealistic features of traditional models. Non-experts will need to avoid being over-impressed by huge volumes of quantitative outputs, and to remember that simulations are just models made by humans. They thus inevitably reflect human fallibility, incomplete knowledge, and partiality as between different understandings of priorities and processes.

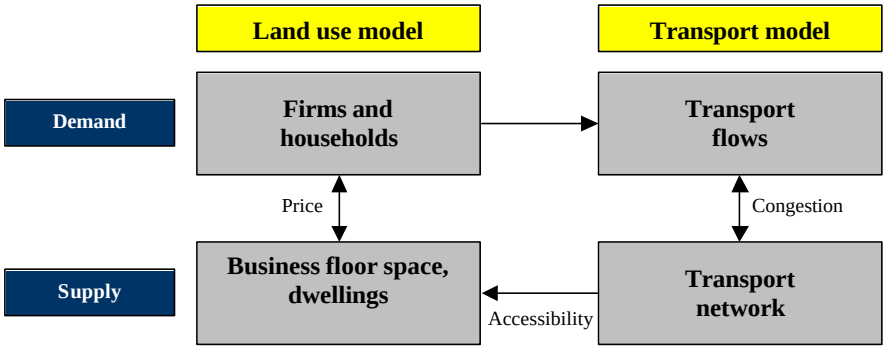
For further information on simulation modelling, see:

D.H. Meadows and J. Robinson, *The electronic oracle: computer models and social decisions*, John Wiley & Sons, Chichester, 1985.

Rotmans, *Cloudy crystal balls*, European Environment Agency, Copenhagen, 2002.

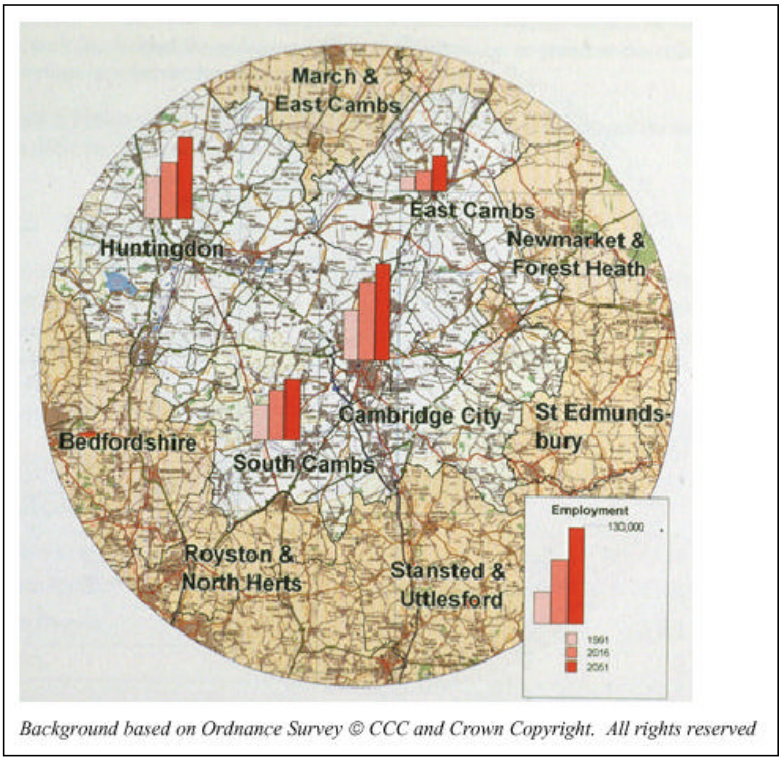
Box 4.2.6: *Simulation model used in 'Cambridge Futures' project*

MENTOR is a land use model, and the picture below identifies only its main components. Much detail is modelled within these elements. The model simulates developments in the land market, the location of households (disaggregated into different socio-economic groups) and of firms (disaggregated into different economic sectors). The model uses such data inputs as: forecast changes in regional housing and employment; and constraints imposed by planners in terms of land available for development. It considers multi-modal transport flows (in terms of time, cost and comfort of travel between zones in the region). The simulation produces forecasts of developments in the location and prices of housing and non-residential buildings, and of living and production costs (including labour, transport, etc).



The model above was one resource used by a group working on futures for Cambridge (UK). This group examined seven options for the long-term development of Cambridge, ranging from minimum growth within the city and its surrounding district to maximum development (densification within the city). Maps and charts were produced for each scenario, and the computer models allowed for a 3-D animated simulation through time. This enabled the options to be examined in terms of economic, social and environmental sustainability, and to be presented and evaluated at public meetings. An example of the sorts of output yielded is depicted below. This displays the forecasts for 1991- 2051, for employment growth in the minimum growth option.

Source: *M Echenique, The Cambridge futures process: communicating model results*
Available at: http://www.odot.state.or.us/tddtpau/symposium/Echenique.pdf



4.2.7 Further resources on forecasting

Armstrong, J.S., *Principles of forecasting. A handbook for researchers and practitioners*, Kluwer Academic Publishers, Boston/Dordrecht/London, 2001.

Stevenson, T., Barbieri-Masini, E., Rubin, A. and Lehmann-Chadha, M. (ed.), *The quest for the futures: a methodology seminar in futures studies.* Selections from the methodology seminar in futures studies. Turku, Finland, June 12-15, 2000. Finland Futures Research Centre. World Futures Studies Federation. Painosalama, Turku.

Bell, W., Foundations of Futures Studies, *Human science for a new era*, Transaction Publications, UK and New Brunswick, USA:

Volume 1: Purposes, knowledge, 1997.

Volume 2: Values, objectivity, and the good society, 1996.

Knowledge base of futures studies. Foresight International, Queensland, Australia. Comprehensive, 1996. Available on CD.

Volume 1: Foundations. Edited by Richard Slaughter.

Volume 2: Organisations, Practices, Products. Edited by Richard Slaughter.

Volume 3: Directions and Outlooks. Edited by Richard Slaughter.

Volume 4: The Views of Futurists. Edited by Sohail Inayatullah.

5 Generating strategic intelligence

5.0 Introduction

Most of the methods that have been discussed so far are well known. Many stem from the very creative period of the 1960s and 1970s when technology forecasting and wider futures studies were the focus of much work. Since the horizon of many of these studies was *The Year 2000* (the title of the famous Kahn and Wiener book), it is fitting to review these approaches soon after the passing of that fateful date.

In moving on, it should be remembered that the point of foresight is not to generate accurate forecasts. Looking back at some of these early studies, it is striking how much they got right and how much wrong by way of prediction, and what sorts of things were handled well or poorly. Inaccuracy because of faulty conceptualisation is one thing; but a forecast may be proved 'wrong' because it was designed to inform action that would move away from an undesirable future (even if this was the most probable scenario at the time of authoring), or because it was part of a process that said what information would be needed to generate better-founded views of the future.

The point of foresight is to improve capabilities of foresight users to anticipate and deal with change – both exogenous change and the consequences of their own actions. The aim is to improve these capacities by fostering better understanding of the key processes that are at work, the desirable options that might be pursued, and the location of relevant knowledge and expertise. A vision of the future articulated in a foresight exercise needs to be read in terms of how far it has advanced these capabilities. This may not be immediately apparent from the written text, because these outputs may be poor reflections of the learning achieved by participants.

This chapter focuses on the activities, undertaken within the main phases of a foresight process, which are aimed at the generation of 'strategic intelligence'. This means achieving improved understanding of the major issues that confront the knowledge society foresight user in the longer-term. Often this is seen as a matter of 'envisioning the future' (or 'alternative futures'). Strategic intelligence may stop short of constructing shared visions, and remain more at the stage of better awareness of and information about key drivers of change, implications of developments, options for action. But often the production of shared visions is a useful tool for generating such analyses. Chapter seven will consider methods and issues connected with identifying actions to be undertaken as a result of knowledge society foresight. Here, the focus on the development of strategic intelligence will provide a series of questions and answers concerning approaches and methods used in informing the work of knowledge society foresight participants, enabling them to develop better strategic intelligence through foresight.

Throughout the discussion of methods that follows, it should be remembered that the choice of methods used has considerable effect on the management, cost and outcome of any foresight programme.

5.1 Panels, expert groups and workshops

5.1.1 What is the role of panels?

The steering committee of a foresight exercise will often be composed of high-level individuals whose time is already in high demand. The task of managing and synthesising the overall foresight process is itself a daunting one. Thus it is common for national and regional foresight programmes, which set out to address a wide agenda, to have a layer of panels that implement foresight analyses and produce analyses in a number of specific areas.

In S&T foresight, these areas are typically concerned with discrete technologies (e.g. ICT, biotechnology) or application areas (e.g. agriculture, transport). In more socially oriented foresight, and indeed in some S&T foresight activities, panels

deal with more horizontal topics (e.g. environmental issues, demography). Box 5.1.3 illustrates the evolution of panels on the UK foresight programme. (It remains to be seen how well this programme functions without a panel structure, as this is currently being wound down. If the focus of the new programme is as narrow as appears, there may not be such a requirement for panels.)

It would seem likely that knowledge society foresight activities could at the very least have two panels – one for living conditions, and one for working conditions and industrial relations – but it might well be that themes such as domestic work, leisure activities, education and training, and so on, should have panels of their own. This is a decision for the steering committee to make on the basis of the objectives of, and resources available for, the exercise.

The main task of a panel typically comprises synthesis of the inputs concerning its areas of concern. These are fed into the foresight process. They may include written or verbal testimony, research and forecasting reports, and other sorts of input that will be discussed in a later question. The panel will gather relevant information and knowledge. (Brainstorming and SWOT analysis are among the methods used in panel work.) It will quite possibly play a role in stimulating the formation of new networks and revitalising established ones (for example, by setting up working groups, as discussed below). It may provoke others to develop strategic intelligence (e.g. through scenario workshops). It may also set out to generate its own visions of the future, and develop new insights about, and creative views and strategies for, the future. It can help in relating the exercise to much wider constituencies, and in diffusing the foresight results. In later stages of the foresight process, the panel can play important roles in establishing priorities, and in designing, promoting, and overseeing follow-up actions.

Panel work needs to be related to the overall exercise. Too much autonomy can create difficulties for synthesis of their outputs, combining their scenarios, and agreeing on shared priorities. Such problems seem to have befallen the UK exercise in its second round, leading to the move away from panels announced in 2002.

5.1.2 Who should be members of a panel?

Panel members must be selected carefully. At the risk of creating a utopian ‘wish list’, some ideal characteristics can be indicated. They must collectively have knowledge that covers a wide range of the topic under consideration, and not be narrow specialists. Ideal participants will be open-minded and creative team workers. Practitioners, researchers, policymakers, and other stakeholders may be recruited. Too narrow representation is not only liable to result in limited analysis, but increases the risks of ‘capture’ by interest groups, and a lack of legitimacy for the process. The participants should be able to speak and relate to each other as experts, rather than as interest group representatives: they are inputting their knowledge, not fighting an organisation’s corner.

5.1.3 What support do they require?

The previous chapter discussed methods of identifying participants in foresight processes, including panels. Additionally, methods must be employed to motivate the panel, to assign tasks to it, and to activate participants in the development and sharing of knowledge. These may include team-building methods, and strategies to make it clear that the panel work is valued (e.g. high quality meeting rooms and accommodation, acknowledgement of panel members in official documentation). The panel requires support in the sense of secretarial assistance (e.g. for note-taking, preparation of schedules), technical assistance (e.g. processing data, preparing materials for presentation, locating sources of evidence and expertise), and task support (e.g. keeping the work to schedule, relating it to the wider foresight exercise). (See Box 5.1.3 for the panels in the UK foresight programmes 1 and 2.)

Box 5.1.3 - *Panels in the UK foresight programmes one and two*

Original sectoral panels established in 1994	Notes
♦ Agriculture, Natural Resources and the Environment ♦ Chemicals ♦ Communications ♦ Construction ♦ Defence & Aerospace ♦ Energy ♦ Financial services ♦ Food & Drink ♦ Health & Life sciences ♦ Information Technology ♦ Learning & Leisure ♦ Manufacturing ♦ Materials ♦ Retail & Distribution ♦ Transport	1. A deliberate effort was made to include both technology supply-side panels and others focused more on technology users (including services). The initial orientation was very much toward S&T foresight, however. 2. The panels comprised industrial managers, researchers, policymakers, and other stakeholders in the area of concern, as well as being supported by a facilitator and technical secretary. 3. After the initial round of activities it was decided to merge the IT and communications panels into a single panel, while Agriculture, Horticulture & Forestry was split off from Natural Resources and the Environment. 4. The Manufacturing Panel was renamed Manufacturing, Production & Business Processes. 5. A new panel on Marine Science was formed (partly as a result of sustained lobbying by proponents of this area).
Restructured sectoral panels established in 2000	
♦ Built Environment & Transport ♦ Chemicals ♦ Defence, Aerospace & Systems ♦ Energy & Natural Environment ♦ Financial Services ♦ Food Chain & Crops for Industry ♦ Healthcare ♦ Information, Communications & Media ♦ Materials ♦ Retail & Consumer Services ♦ (Marine panel continued for some months, in order to conclude its activity)	Three **thematic panels** were established alongside the sectoral panels ♦ Ageing Population ♦ Crime Prevention ♦ Manufacturing 2020 And every panel was to consider two underpinning themes (which had been considered for panel status): ● Education, Skills & Training ● Sustainable Development
2002: a highly critical review in 2001 having concluded that the programme had become too diffuse and in effect lost its way, the activities were again restructured with a smaller set of technology-oriented projects in areas where S&T could have 'major and possible disruptive impacts, both on the economy or society'. The first two were 'Flood and Coastal Defence' and 'Cognitive Systems'. The standing panels – previously at the heart of the foresight process – are to be run down 'in order to allow new issues to be targeted, and picked up quickly' by 'a new fluid rolling programme of projects'.	

Leadership and conflict management skills are required to maintain motivation and morale, to resolve disagreements, and, perhaps, to ensure that the panel's work and any problems it faces are adequately understood by the steering committee. In the UK foresight programme in the 1990s, each panel had an authoritative chairperson, a civil servant as a technical secretary, and an outside expert (trained in foresight) as a facilitator. A member of the steering committee was appointed in a liaison role with each panel, and funds were provided with which panels could purchase small amounts of consultancy. (Some used this to commission research, for additional Delphi analysis, to pay for professional writing up of their conclusions, etc.)

5.1.4 What is the role of other expert groups?

In larger foresight exercises, groups of various kinds are often constituted to carry out work on topics that have been identified as important ones. These may be topics that span the work of several panels, and which have only been recognised in the course of the work as requiring more study. This may be a matter of providing research inputs that could be widely used, for example on demographic trends, or one of generating visions concerning critical influences on

or implications of themes developed in other parts of the exercise (e.g. urbanisation, social inclusion and exclusion). It may be helpful to establish a group to relate an ongoing knowledge society foresight exercise to important stakeholders who were overlooked, or could not be recruited rapidly enough, when the process was first initiated: for example, people in remote regions, young people and ethnic minorities.

Such groups may be largely composed of existing participants in knowledge society foresight, or they may recruit new members, usually people who can bring special expertise to bear. This can be a useful way of adding further inputs to the process without unduly enlarging or disrupting the work of established panels.

Box 5.1.4 illustrates an exercise using an expert panel to prepare a report on the future of industrial relations, of interest both because of the substantive content of its study, and because of the careful organisation of its method. This particular instance is nevertheless limited in terms of a fully-fledged foresight process, because the group's analysis, though drawing on a variety of inputs from experts and interest group representatives, does not involve wide participation. Whether this is a limitation on the validity of its conclusions or on the political effectiveness of the exercise will relate to the range of inputs and involvement that were achieved in the study. In some circumstances, this more conventional exercise can prove a highly effective way of marshalling information and drawing policy-relevant conclusions.

Box 5.1.4: *A high level group on industrial relations and change in the European Union*

The task for the high level group (HLG) was to propose recommendations (addressed to European policymakers and social partners) aimed at modernising industrial relations (IR), and at enhancing the positive contribution of IR to the process of managing change. It was asked to consider the role for IR in a changing knowledge-based economy, what new or renewed partnerships are required to manage change successfully (given the emergence of new forms of governance); to examine the scope and content of IR in a knowledge-based economy (what priorities and new topics will have to be addressed); and to identify structures and procedures that can best contribute to the quality of IR in a knowledge-based economy and how these may be efficiently implemented at European level.

The HLG was chaired by a special adviser to the Portuguese Prime Minister, providing it with good access to senior policymakers. Members included university researchers, members of companies, trade unions and their respective federations. The HLG held a range of hearings over several months in 2001, including discussions with researchers into job flexibility and labour markets, with the European social partners (ETUC, CEEP and UNICE) and sectoral social partners, with representatives of the European Commission, the Council of European Municipalities and Regions) and leading companies, etc.

The HLG's final report identified six new challenges for Europe's industrial relations:

- **Globalisation** presents new challenges to European social legislation and protection and IR systems. A form of 'coordinated decentralisation' of bargaining has developed in many EU Member States, creating more space for negotiated flexibility.
- **Economic and Monetary Union.** Wage convergence should be based on 'catching up' and a convergence of productivity levels. There may also be a demand for wage flexibility if adjustment mechanisms are called for at national level.
- **Enlargement.** Many candidate countries are relatively poor and some are still in a process of transformation, and their IR experiences are diverse. The challenge of how to bridge the development gap with the EU average will be key.

- **Technological change and the knowledge economy** create a need to enhance IR instruments and structures. Mutual exchange of practices at EU level will be a key instrument in disseminating knowledge and experience.
- **Demographic trends.** The trends include ageing, the declining birth rate and immigration. A positive approach to 'active ageing' should be developed. In particular, more efforts should be made to retain older workers in the labour market.
- **Labour market changes,** including demand from employers for a more flexible, skilled and specialised workforce, and demand from employees for more participation, choice and flexibility in the organisation of working life.

The report highlighted a number of key recommendations, including the following directed at the social partners:

- They should create a new committee at the highest political level, close to the annual spring European Council, with a multi-annual work programme;
- They should explore new ways of negotiating agreements by making further use of the Treaty provisions and exploring the possibility of entering into voluntary framework agreements;
- They should put forward proposals for reform of the institutional framework governing the bipartite social dialogue, including proposals to modify the Treaty;
- They should develop their own process adapted to the specificities of IR. This could build on the 'open method of coordination', exchange of experience, 'benchmarking', recommendations, joint opinions and negotiations;
- They should be provided with technical assistance at European level to help them develop IR (the interaction between the European and national levels is currently the weakest link in IR).

In terms of such resources the report notes the new European Monitoring Centre on Change (EMCC), based at the European Foundation for the Improvement of Living and Working Conditions, as an institution that will help to promote a network of institutions to follow up best practices and promote exchange of experience. A special effort should be made to train and inform national actors on actions, methods and results of the European social dialogue and on IR systems in other EU and candidate countries. In order to develop a 'benchmarking' approach to IR, appropriate indicators should be established to measure and assess the quality of industrial relations. Social dialogue and EU-level consultation should be used as a tool to promote successful enlargement and to address the challenges of the post-enlargement years. Enlargement should be mainstreamed into all levels of European social dialogue.

Source: *European Commission, Directorate-General for Employment and Social Affairs, Report of the High Level Group on industrial relations and change in the European Union, March 2002 (Unit EMPL/D.1).*
Available at: http://europa.eu.int/comm/employment_social/soc-dial/rapport_en.pdf

5.1.5 What is the role of scenario workshops?

Scenario workshops are a particularly important component of many conventional futures exercises (especially in the business world), though many foresight programmes have used them little, if at all. The handbook will discuss scenario approaches in general later, together with the methodology of scenario workshops. At this point, a few comments will be made on the nature and role of scenario workshops in particular.

As the name implies, the activity of scenario workshops involves creating or elaborating on scenarios. Such scenarios should also possess greater legitimacy than those generated by a smaller expert group or visionary guru (at least if the workshop has drawn upon a reasonable range of participants). But it is wrong to think that the resulting scenarios are the main product of the work (though they may be important and particularly visible as outputs). There are also benefits from

involving members of an organisation or community in the activity, which partly explains the popularity of such workshops in business environments.

Such workshops bring together a range of knowledgeable and experienced participants, usually stakeholders of one kind or another, within a structured framework of activities that encourages them to:

- 'network' - to learn about each other, and about their points of shared interest and potential collaboration, to exchange information, views and insights;
- identify points of agreement, disagreement and uncertainty;
- create new shared understandings;
- develop action plans and other instruments so as to help mobilise future activity.

Since the scenarios produced are a product of the participants' interactions, their own input and efforts, they are, in the management jargon, more likely to have 'ownership' of them. This jargon is a little misleading, because the 'owners' are keen to give away information about their scenarios. They are better-equipped to be 'carriers' of the scenarios to the outside world, because:

- They understand the logic much better than they would if presented with the material in a standard report. Thus they are more aware of the superficial grasp that other reporters and commentators may have on the scenarios, and be keener to get the 'real message' across.
- They have deeper insight into the considerations that have gone into the scenarios. They understand, for example, under what circumstances a scenario might not be realised, or the reasons for putting forward apparently implausible scenarios.

Chapter six will examine the mechanics of scenario workshops in more depth.

5.2 Information inputs for groups

5.2.1 What information inputs might groups need?

This section of the chapter outlines questions concerning the sorts of background material that may be used as inputs to panels and workshops, and the methods that can be used to produce these. As already noted, some of these approaches may be implemented, on a more or less formal scale, within the groupwork itself. But it is common to commission some inputs on these themes as 'starters' for groupwork, providing something of a common pool of information that participants can draw upon and that they know they share. Box 5.2.1 illustrates this with the example of background inputs used in a recent scenario exercise.

The inputs discussed in this section are particularly useful for groups, but of course they may form part of the input to almost any sort of foresight exercise.

See Annex B for further discussion of knowledge inputs into knowledge society foresight.

Box 5.2.1: *Background inputs prepared for a scenario workshop*

The workshop in question was conducted in early 2002 for the UK's Economic and Social Research Council (ESRC). It was commissioned to help the ESRC identify priorities for social research that were raised by the development of genomics science and technology. An earlier 'design workshop' had been held with representatives of the sponsor, stakeholders in genomics, and a number of leading UK futurists. This approved the development of a set of background inputs for the scenario workshop:

- **Overview and forecasts of the applications of genomics.** An account of genomics science and technology and applications, the promises and the problems identified by some commentators, was prepared (particularly for those less familiar with genomics). This identified and provided forecasts for agricultural, human health and other applications of genomics. The design workshop discussed what points needed to be made.
- **Key drivers of genomics: forecasts to 2015.** A first specification was drawn up and a grouping of major factors driving and shaping genomics and its applications. One major activity in the design workshop was an exercise in listing and categorising such factors. Ten drivers affecting the development of genomics and its applications and modes of application were eventually chosen. Three forecasts were developed for each of these: an extrapolative forecast, a challenging or 'hard times' forecast, and a 'successful' visionary forecast.
- **Genomics and society: four scenarios for 2015.** Drawing on the other material, four scenarios were developed which explored the interaction of the various drivers to 2015.
- **Genomics and social science.** This paper provided a series of questions and forecasts related to genomics in terms of the issues that this raised for social science.

These background documents provided 'homework' for workshop participants before they met, and implicitly carried the message that a serious effort was underway, to which a good deal of work had already been committed. It meant that participants were exposed to a common body of information, both about the area and the methodology that was being employed.

It is interesting to elaborate a little on the **Genomics and social science report**. The strategy adopted in this report was to take a set of generic 'thematic priorities' already developed within the ESRC and familiar to its staff as well as to UK social researchers. (These were: 1. Economic performance and development; 2. Environment and human behaviour; 3. Governance and citizenship; 4. Knowledge, communication and learning; 5. Lifecourse, lifestyles and health; 6. Social stability and exclusion; and 7. Work and organisation.) For each of these priority areas, examples were set out of the ways in which the evolution of genomics could influence social research requirements. This was done by generating speculative forecasts about relevant applications of genomics and indicating the social research challenges that would follow. As well as providing a useful tool for the workshop, it subsequently transpired that this approach proved very useful in achieving recognition of the importance of genomics and of the scenario exercise within the ESRC, since it brought the relevance of the topic to the attention of specialists in all areas of work.

Source: *Full documentation on this study can be downloaded from http://www.altfutures.com and http://les1.man.ac.uk/cric*

5.2.2 What is SWOT analysis? How is it used?

SWOT stands for strengths, weaknesses, opportunities and threats. These are the categories used in SWOT analyses, which are often background inputs to foresight activities. This role is focused on here, but it should be noted that foresight activities such as scenario workshops may also conduct their own SWOT or SWOT-like analyses. Opinion as to SWOT issues can even be derived from Delphi studies (it is quite common for such surveys to ask respondents to indicate how one's country or organisation compares to others in various ways, for example). Most SWOT analyses deal with the immediate situation, however. Such an assessment is a common business tool, and is widely used as a preliminary step in planning processes in many types of organisation.

SWOT analyses are usually prepared by an expert team using a variety of data sources and often a programme of interviews. Evidence is drawn from various sources: expert opinion as revealed through interviews, or statistical or benchmarking comparisons, for instance (e.g. the competitiveness surveys produced by some consultancies and government agencies). The assessment is often summarised in the form of a 2x2 matrix, presenting an overview of significant internal and external factors influencing strategies (or possible futures) in positive or negative ways. Internal positive factors are strengths, external ones opportunities; internal negative factors are weaknesses, external ones threats. In addition to identifying major opportunities and threats, these are prioritised in terms of their importance and probability; similarly for strengths and weaknesses.

SWOT analysis requires knowledge sufficient to support definition and prioritisation of factors. Thus it is necessary to access sufficient relevant expert knowledge. (Equally, it is important to avoid problems such as consultants simply reiterating standard diagnoses without enough attention to local specificities.) While weaknesses may be underplayed – there may be political pressures to do so – it is also possible to underestimate one's strengths. Repeated disappointments may lead to 'learned helplessness', fatalistic acceptance of disadvantage as a permanent feature, and failure to consider opportunities.

Box 5.2.2: *Example of results of a SWOT analysis*

Tellus Consultants studied the long-term benefits of participatory approaches to sustainable economic policymaking for the people and governments of the Pacific Islands. SWOT analysis of how participatory methods could fit their situation resulted in a huge array of factors. For brevity, only the first three of each of the lists provided in their report are cited. This is only about one-third of the total content, which is also accompanied by a more detailed discussion.

Strengths that can help support a participatory integrated policy for resource use

- Social cohesiveness of family or one-talk or church systems. If decisions on how resources are to be managed are integrated with this basic cohesiveness, they are likely to be successfully implemented and supported.
- Willingness to share with family, one-talk or church members. Often seen as an impediment to economic development, this is a key requirement for agreeing to restrict or regulate resource use.
- Oratory in the indigenous language, often with an excellent sense of humour and justice. Although many concepts related to sustainable development are presented in modern English jargon, they are all basic, easily understood ideas that can be discussed locally, providing someone makes an effort to bridge the language gap.
- ….

Advantages

- Relative food security. With few exceptions, Pacific islanders currently have enough food to eat. But their local food security is in constant danger from natural threats such as drought and storms. Their present health is a vital advantage compared to countries where their first priority is to avoid starving to death.
- Equitable climate and scenic beauty. As with food security, climate security allows Pacific islanders an opportunity to treat their financial and resource needs with leniency. In harsh climates necessity may force people to use every resource to survive. Hurricanes and droughts do happen in the South Pacific and, were it not for rapid aid supplies, the climate might seem less hospitable.
- Low population densities (with some local exceptions). There is still room to experiment and expand in most Pacific islands. Land is available for new agricultural efforts, providing the landowners want to become involved in them.
- …

What do Pacific Island governments do well?

- Cooperate regionally on international matters. Sustainable development policy and an understanding of sustainable resource use have spread rapidly throughout the region because of the hospitable and democratic regional organisations.
- Obtain foreign aid and assistance. The small governments of the Pacific have been highly successful in gaining funds, equipment, and guidance from the metropolitan countries. This will be an obvious advantage in the development of an information economy.
- Pacific islanders mediate internal disputes well. There is a unique sense of justice in the Polynesian and Micronesian countries. Senior government officials in Polynesia and Micronesia are often master social strategists. This can be of great advantage, providing they are willing to participate in a participatory process.
- Maintain law and order, peace and harmony (with some obvious, but minor, exceptions). Somehow this does not extend to enforcing national laws concerning economic and environmental issues. But crimes of a physical nature are dealt with rapidly and effectively.

Weaknesses of the people and governments of the Pacific Islands relating to sustainable development:

What could be improved by participatory processes?

- A sense of self-sufficiency in contrast to the pervasive 'dependency role' assumed by many communities (and governments).
- Bridging the gap between European and island governance.
- Methods for information gathering.
- ...

What is done badly that might be improved by training in participatory methodology?

- Public communications.
- Enforcement of environmental and economic laws and regulations.
- Business, especially in rural areas.
- …

What should be avoided that might be facilitated by participatory processes?

- Dividing the country into two major sectors with conflicting objectives: export oriented, cash and foreign dependant national government versus subsistence oriented, self-sustaining local communities.
- Making government policy without consideration of and participation by all interested parties.
- Liquidating natural assets (soil, forests, minerals, marine resources) to buy non-essentials.
- …

Opportunities the Pacific Islanders don't control but would like to take advantage of:

What good chances face the Pacific islands that could be improved with the full cooperation of the villagers?

- The perception of the Pacific islands as idyllic, peaceful and relatively sustainable countries invites the interest of people in industrialised urban areas. ('South Pacific Island Paradise Syndrome' - SPIPS).
- Tourism, based on 'SPIPS', is considered to be one of the main opportunities for the Pacific island countries. It is already a major earner of foreign exchange in New Caledonia, Fiji, Vanuatu, Tonga, Samoa, the Cook Islands and Tahiti. Most governmental and regional tourism agencies already have an integrated participatory policy process involving local communities at all stages of a tourism development plan.
- The sub-region is a favourite for aid donors, as the countries are, for the most part, democratic, obliging and polite. Yet aid donors are increasingly aware of the need for performance, especially in terms of sustainable resource use. Participatory techniques can help improve on the ground progress towards sustainable goals and tie in with the global action plan Agenda 21.
- ...

What are the interesting trends that will influence sustainable development?

- Rapidly improving alternative energy sources, including solar and hydrogen energy, are reducing dependency on foreign fuel supplies and increasing the potential for rural development and participation.
- The requirements for environmental impact assessments (EIAs) and sustainability for international bank loans. EIAs include a component on the impact of a project on local communities.
- The global dominance of the WTO. (Like the UN, the organisation has a potential for small country representation and influence.) It is not certain how this will impact on such issues as forestry, organic foods and resource use but there will undoubtedly be a major change in resource trade in the Pacific as a result of WTO policies.
- …

What are the external threats facing the Pacific island countries that might be abated or mitigated by the improvements in linkages between local, national and regional organisations?

What obstacles do the Pacific island countries face?

- Decreasing food security, calling for a more efficient use of land and sea resources.
- Health problems from poor nutrition caused by improper diets of 'convenience foods', specifically heart disease, diabetes, and cancer.
- Increased problems with agricultural pests due to commercial agricultural practices.
- …

What is the competition doing?

- Increased competition from in-country tourism development in New Zealand and Australia will increase the need for Pacific island tourism destinations to present the best possible aspect, and this requires public participation in maintaining village and public property tidiness.

- WTO removal of trade barriers defeats preferential trade agreements. This may result in poor opportunities for manufacturing in the Pacific islands and increase the need for activities for unemployed people, especially youth.
- Increased population and development in Asia promotes unsustainable harvesting of forestry and fisheries resources in the Pacific. Although rural islanders are conversant with the problems adherent in resource abuse, the existing policy conflicts between government levels erodes community solidarity against large-scale development.
- …

Can the Pacific islands keep pace in a rapidly changing world?

- The global explosion in computer technology requires early training of youth in computer literacy (computers are common in primary schools in Australia, New Zealand and the United States and nearly ubiquitous in secondary schools). The Pacific islands are falling behind, unable to obtain and maintain computers for schools. Participation in national and international data gathering projects can assist schools in learning and applying practical skills leading to sustainability.
- Software updates are an annual or semi-annual event but many government agencies are using software that has been extinct for a decade. Participation in regional and international information exchange programmes can provide government workers with up to date software that can facilitate their work.
- Skills in repair and maintenance of electronics and mechanics require updating on a regular basis.
- …

Bad debt and cash-flow problems plague the Pacific island governments.

- Obtaining development funds is difficult for the private and government sectors in the Pacific islands. When projects are hampered by conflicts over land or other resources, investors are frightened away. By encouraging participation of the resource owners at the very outset of development policymaking, many of these conflicts can be resolved.
- Imports have exceeded the value of exports for so many years most Pacific islands have acquired massive foreign debt.
- Currency evaluation and even the printing of money are controlled by foreign nations.
- …

Source: *SWOT analysis for participatory research in the Pacific.*
Available at: http://www.tellusconsultants.com/swot.html

5.2.3 What is benchmarking? How is it used?

Benchmarking has become highly fashionable since the 1990s, when it first took off as a management tool for corporations, in which firms compared themselves (or more often, employed consultants to compare them) with similar firms. A major intention was to locate examples of 'best practice', and to locate weaknesses in one's own operations. The methods have now diffused from the corporate sector to be used by organisations of all types. For example, there is now much interest in benchmarking policies across different countries. Process benchmarking involves comparing the activities and systems in use, while performance (target) benchmarking focuses more on the outcomes.

Benchmarking can be a very useful exercise, allowing for 'learning by comparing'. It can help to highlight opportunities ('how do they achieve that?' 'could we adopt this approach?'), and weaknesses ('why is our performance inferior here?', 'why are we not using these systems?'). These are clearly related to SWOT approaches as discussed above. In keeping with this, benchmarking can also help identify likely competitive challenges, for example where other companies' achievements may mean that they will move into one's markets or where there are opportunities for one's current

competitors to intensify their efforts. Benchmarking can also be used to support the formulation of goals ('we should be up to that level by the year 2010', 'we want our policies to be working as effectively as their policies').

However, it is also widely argued that benchmarking can be misapplied, and that it is sometimes used rather mechanically in situations where it is at best only partly appropriate. Are the entities being compared really alike? They may differ, for example, in terms of strategies. Thus, the goals of policy may differ from country to country. Consider, for example, social welfare systems. They may differ, too, in their systemic context. Thus, performance indicators may mean different things in different contexts (even if statistically defined in the same ways). For instance, unemployment levels may mean different things if one is dealing with countries or regions with extremely different levels of female participation in the labour force, or entry of young people into higher education. Social and economic structures can vary so widely that a great deal of interpretation may be required in order to understand the basis for performance differences, in terms of knowledge society foresight indicators as well as in more economic issues. Unreflective use of benchmarking may lead to ill-informed efforts to import practices from other countries and organisations that are not suited to the local environment, and to equally ill-founded judgements about how well or badly one's own country or organisation is advancing towards the knowledge society.

It is important, in order for benchmarking to proceed effectively:

- to examine the topic area carefully, in order to identify the most appropriate issues around which to build indicators;
- to examine which of various indicators might be most useful (e.g. it may be more appropriate in some cases to weight a 'raw' indicator in terms of the population size or even the size of a population subgroup such as elderly people, small firms, etc.);
- to determine appropriate comparative organisations or situations;
- to build in a process of debate and reflection, in which the meaning of the comparisons can be discussed, rather than it being assumed that the 'statistics speak for themselves'.

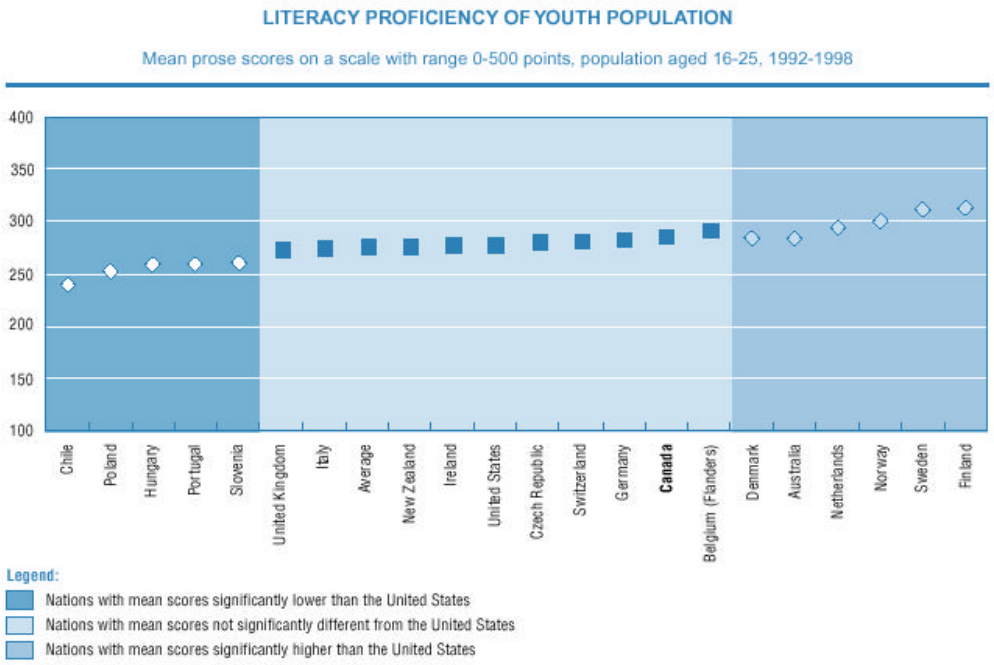
Box 5.2.3 presents data from one report, indicating how statistical measures may be brought to bear in comparing the performance of different countries.

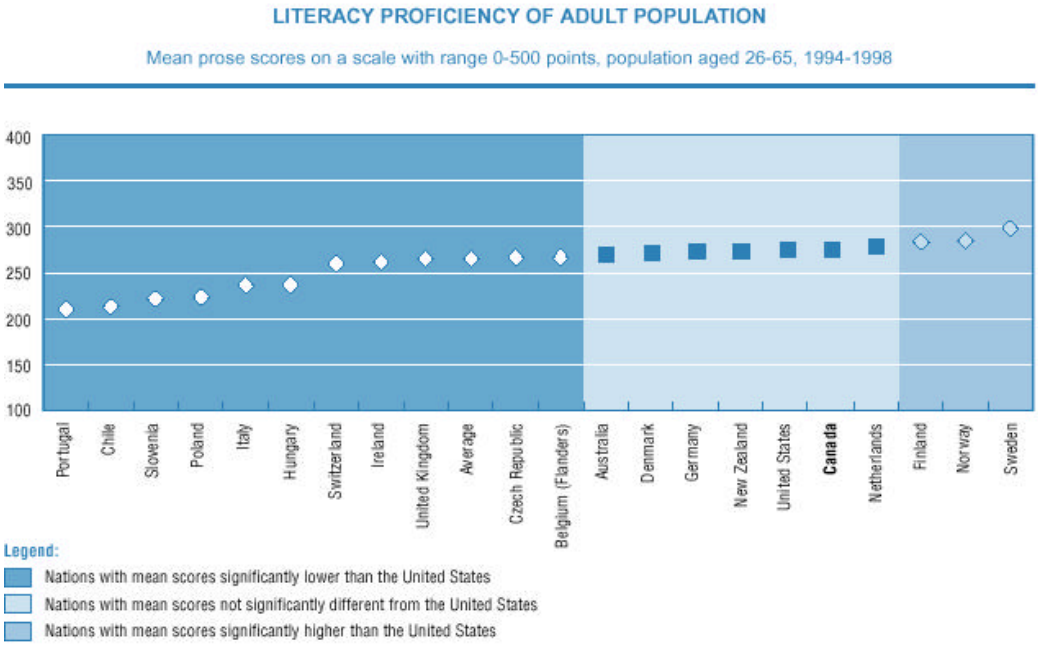
Incidentally, benchmarking may be applied to foresight itself. Several national foresight programmes have been preceded by reviews of practice in other countries. A series of reports on benchmarking and best practice for strategic futures exercises was prepared for the UK's Performance and Innovation Unit in 2001 by the Henley Centre for forecasting, and can be accessed from the PIU website (http://www.piu.gov.uk/reports/reports.shtml).

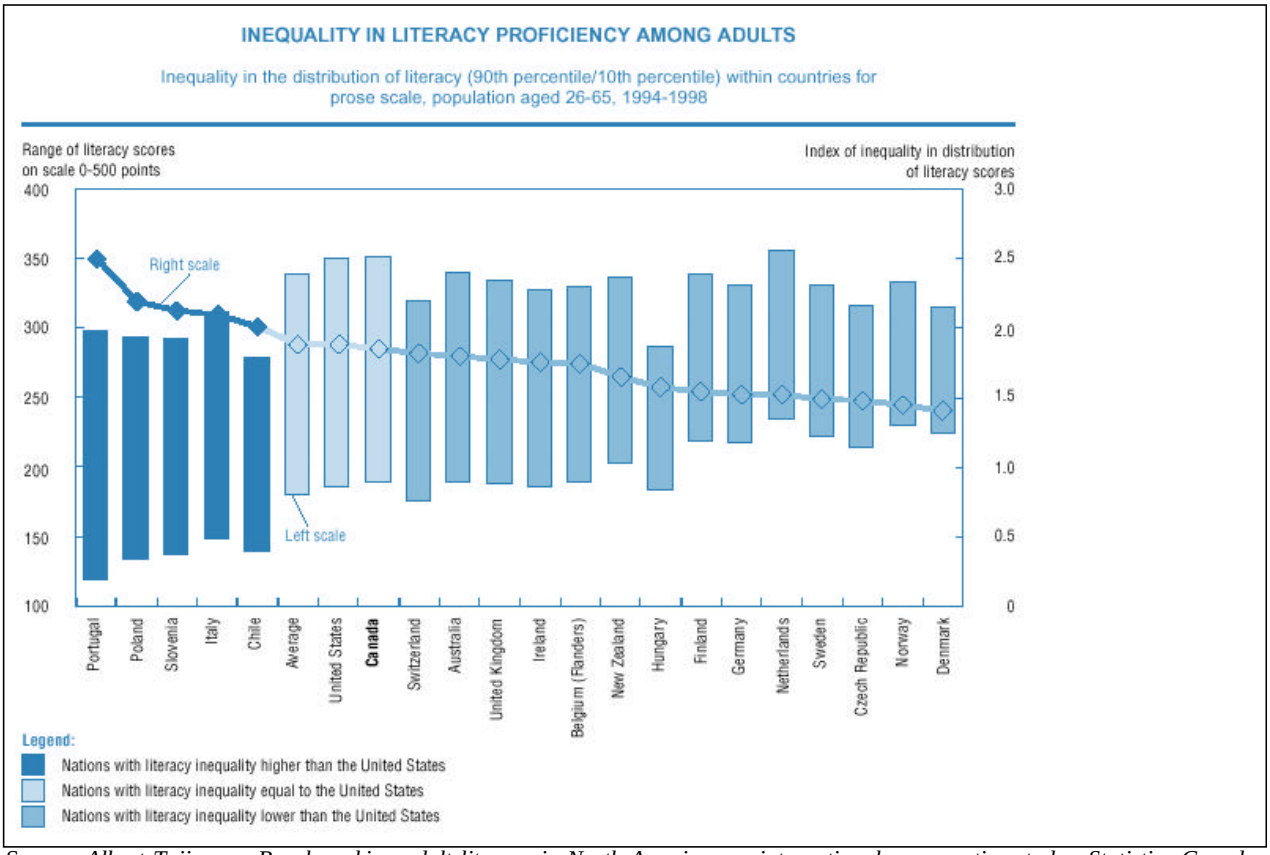
The foresight field has also been guilty of transferring practices without adequate consideration of their usefulness in local circumstances. (In the 1990s at least two European countries simply applied the Delphi methods (and questions) used in an earlier Japanese study. There was little effort to prepare questions more appropriate to their local contexts – except removal of questions about such themes as rice production and earthquakes). Not surprisingly, these exercises were not notable successes, even in the limited sense of providing data about national circumstances that could be compared with Japan's!

Box 5.2.3: *Benchmarking the information society*

The 22-country International Adult Literacy Survey saw a report published by Statistics Canada that presented 10 indicators for comparing literacy proficiency. The findings tend to portray American adults as being at an average level of prose literacy performance – behind the Nordic countries and the Netherlands, but level with Australia, Canada and Germany. On every indicator, some countries do better and some do worse than the United States. Some examples of these indicators are displayed below.







Source: *Albert Tuijnman, Benchmarking adult literacy in North America: an international comparative study, Statistics Canada, Ottawa, 2001.*
Catalogue no. 89-572-XIE Available from:http://www.hrdc-drhc.gc.ca/sp-ps/arb-dgra/publications/research/2000docs/89-572-xie.pdf

5.2.4 What are issue surveys? How are they used?

Issue surveys are used to consult a wider range of expert opinion than could readily be accommodated in face-to-face meetings, to find out what they consider to be important developments in their areas. Such surveys, using post or e-mail (or, in one case, telephone interviews), can inform the development of Delphi studies, background information on important developments, or scenario workshops.

The surveys may be fairly open-ended ones, in which the experts are allowed to elaborate on the issues in their own style, often supplying relevant documentation and the like. However, such material can be hard to process, and many respondents are very reluctant to embark on such an open-ended exercise (its time requirements are practically endless).

Thus more structured approaches are common. One approach used effectively in the UK foresight Programme in the mid-1990s involved a four-page questionnaire, in which respondents were successively asked to specify, in their own words:

- what the major drivers and shapers are in the area of interest (thus for transport the drivers might be environment and congestion);
- what sorts of problems and needs these create (e.g. specific pollution problems and waste of time and safety risks);
- what sorts of solution and innovations might be applied to these (shifts to public transport, new types of engine, better traffic information systems);

- what sorts of research, knowledge, or capability might be needed to achieve these (research into systems that allow a rapid shift across transport modes without wasting people's time or incurring extra expenses, use of fuel cells in designated urban areas, improved transport telematics software, user interfaces, devices).

Such approaches can draw on a wide knowledge base, allowing many more people to contribute their insights. They can provide more time for reflective inputs than would be possible in workshops, and engage people who would not be able to commit time to a longer involvement in foresight. The specific sets of questions to be asked in knowledge society foresight will very much depend on the objectives of the process, e.g. is it intended to inform research priorities, identify needs for social dialogue or innovation, etc.? Relevant and useful responses will only be obtained if the questions are designed carefully. As usual, the selection and motivation of respondents is also important (motivation requires clear explanation of the process and its importance. This can be enhanced, for example, by a covering letter of support from an authoritative and/or respected figure).

Finally, the task of gathering such intelligence has also to be accompanied by a serious effort at value-added analysis, if the respondents' inputs are not to be wasted. This approach can generate a large volume of qualitative data, and time has to be set aside to process and present this. It is not sufficient simply to transcribe the material and make it available: summary and synthesis is required. It is usually helpful to attempt some sort of quantification (e.g. how often are particular sorts of problems cited?). Care needs to be taken to allocate sufficient time and expertise to this.

As with many of the methods discussed in this handbook, the issue survey has been applied to examine issues concerning futures studies and foresight themselves. Box 5.2.4 presents material derived from one such study.

Box 5.2.4: *An issue survey concerning the use of early warnings*

The millennium project investigated the use of futures studies through sending three rounds of questionnaires to its global lookout panel of 'futurists, scholars, business planners, and policy advisors… selected on the basis of their publications, interests, expertise, and recommendations…' The first round of the questionnaire series asked about ethical issues related to timely use of early warnings. The second round questionnaire asked what the impediments were and how they could be reduced; and the third round focused on evaluating suggestions collected in the second round.

The panel was asked to imagine two or three situations they were familiar with where available early warnings did not lead to effective action, rating the causes of this on a five-point scale ranging from 5 (= Almost totally responsible) to 1 (= Not involved or only a minor contributor). Of around 30 topics, the most highly scored were (scores in italics):

2 **Institutional:** the fact that no one has responsibility to act; lack of adequate coordination among responsible ministries and agencies; institutional inertia. 3.90

1 **Financial:** lack of funding or the fact that the people who ought to pay are unwilling to do so. 3.89

19 **Disinterest in the future:** near term issues gain more attention than those that have more distant future consequences. 3.81

16 **Planning inadequacy:** lack of a long-term view. 3.77

7 **Personnel:** lack of decision skills – decision-makers do not understand the complexities of the issues about which they must decide; lack of professionalism of policymakers; lack of trained personnel; lack of an inventory of national and regional capacities; reduction of brain drain. 3.73

12 **Strategic:** lack of clear-cut strategy and goals, lack of coordinated actions among nations. 3.69

11	**Complexity:** lack of understanding of the magnitude of problems; lack of models showing complex interdependence of events and policies; lack of understanding of consequences of actions; stereotypical thinking. 3.63
5	**Political:** the action interferes with national interests or it has been proposed by a political opponent; lack of involvement of regions, corporations and specific groups. 3.63
6	**Information:** lack of accurate, reliable and sufficient data and information, or the uncertainty of the risk; conflicting information; lack of coordinated scanning. 3.60
14	**Lack of consensus:** differing interests and ideology among key actors, politicians, public, and particularly lobbying groups in society. 3.60
28	**Paradigm lock:** not being able to see or accept that there may be a completely different worldview. 3.59

Source: *Millennium Project, Factors required for successful implementation of futures research in decision making, Army Environmental Policy Institute, 2000.*
Available from: http://www.geocities.com/CapitolHill/Senate/4787/millennium/applic.html

5.2.5 What are environmental scanning, technology watch, and similar approaches to trend-spotting?

A large number of approaches are in use to help identify important developments in the environment of organisations. Issue surveys provide one approach, based on polling experts. A variety of multiple 'genius forecasting' may be employed, for example by requesting a number of expert or well-informed commentators to select and write about topics that they believe will be important for the future.

Other approaches typically involve systematic analysis of some documentary source. Media coverage of issues is commonly used. Box 5.2.5 presents a description of how a team set about locating and classifying, and then working through and presenting, material on a large number of social trends relevant to the future of work. There are several developments of interest here. With the growth of the Web, it is possible now to use electronic means to search press coverage of various themes, and to experiment with classifying the material in different ways. Several organisations offer trend-spotting services. Some of these provide regular digests of a wide selection of what they believe to be important developments for the future; some focus on specific areas (such as possible trends in fashion and tastes).

There are also more specialised types of data source that can be examined, and methods of analysis to track developments. These are particularly well developed for examination of science and technology issues. For example, bibliometric approaches may be used to examine the number of journal articles that address particular themes. (This can obviously be applied to social science issues, and can also be used to see what countries and research disciplines seem to be picking up particular issues.) Patent analyses are used to look for areas of interest in technology development. Such data are used to provide early warning of activities that may provide technological challenges to the established modes of operation of an industry, for example.

These approaches are particularly useful for addressing emerging themes that conventional trend analysis might find it hard to spot, often because there are as yet no established data on the issues of interest. Even if not used in a very systematic way, some sort of trend-spotting is likely to be used implicitly in any foresight exercise. A relevant issue for ongoing foresight activities is exactly what sort of regular environmental scanning systems to introduce.

Box 5.2.5: *Human resources environment trends*

In a review of their past studies, Coates and Jarratt talked about two trend scanning exercises on human resources issues, both conducted by themselves with the aid of three junior professionals. Conducted before the advent of Web-based resources, they collected clippings and photocopies from newspapers, periodicals and other sources, and sorted these into some 160 folders with 'broad, evolving topical headings'. Trends were identified within and across topic areas, outlines prepared about these, and discussed in team meetings. Groups of trends were packaged together and mailed to clients.

In a 1988 study, seven themes were identified:

1. Diversity in the workforce: flexibility in management
2. Integration of home and work life
3. Globalisation: integration of the economy into the world economy
4. Integration of HR planning with business unit planning
5. The changing nature of work: re-educating and training the workforce
6. Striking a balance between costs and demands for benefits
7. Interaction with the social agenda in new ways.

The trends within the globalisation theme, for example, include:

3.1 Mergers and acquisitions continue, with more foreign actors involved

3.2 Workforce and market demographics in Europe and Asia present new opportunities

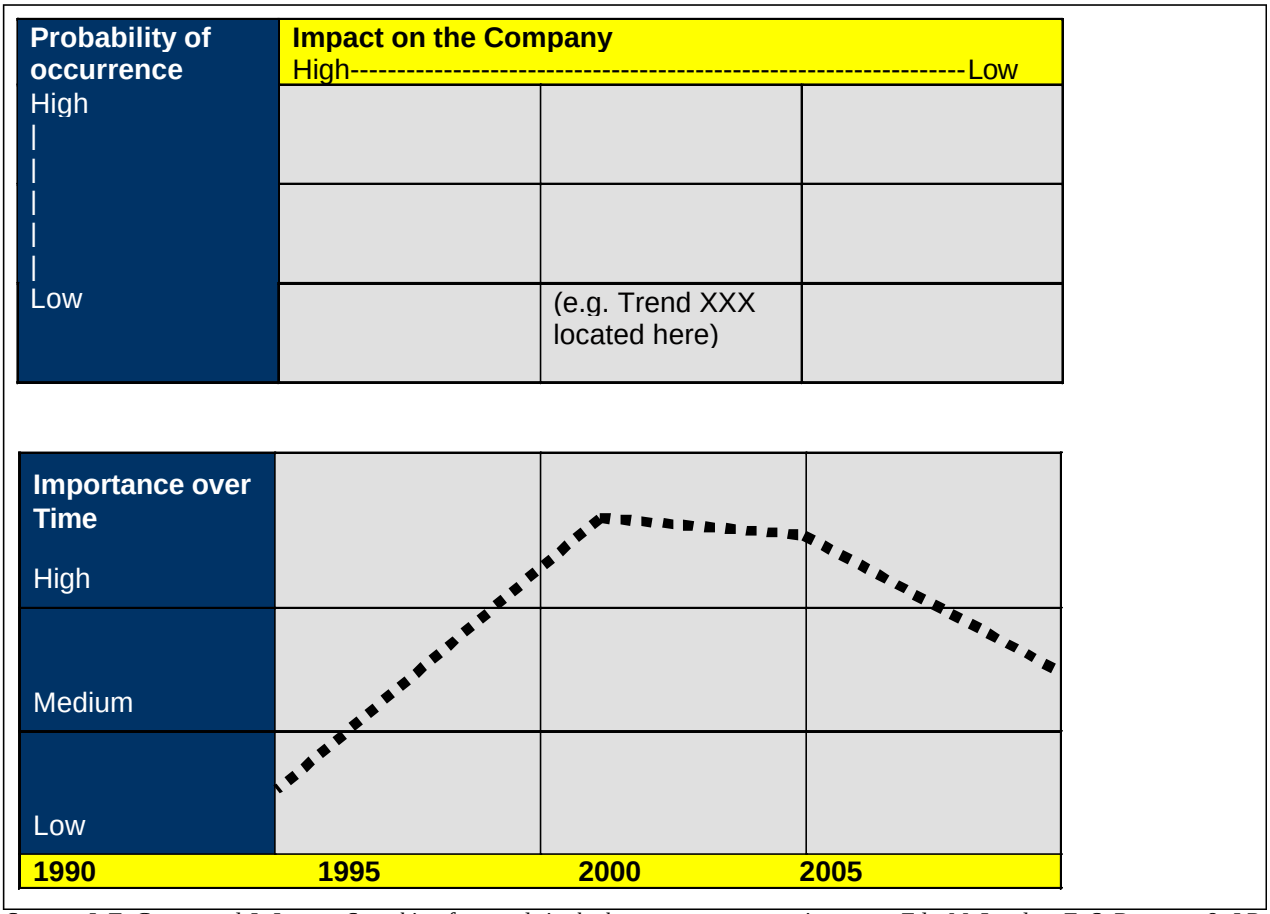
3.3 Sweeping changes are altering market basics

3.4 Worldwide technical and scientific competence will sharpen competition

One of the approaches utilised for presenting these trends is to organise the discussion in terms of:

- The trend: trend analysis (summary, description, statistics, illustrations); countervailing forces (factors likely to slow or reverse the trend).
- Implications: implications (primary implications for the client/topic area); less charted areas (more speculative implications); provocations (more far-reaching possibilities).
- Summary page: statement of the trend, summary of implications, importance to topic, graph indicating evolving significance of the trend; notes on other important trends related to this one.

The two tables presented below illustrate the sorts of presentational device used in these reports.



Source: *J. F. Coates and J. Jarratt, Searching for trends in the human resources environment, Eds. M. London, E. S. Bassman & J P Fernandez Human resource forecasting and strategy development New York: Quotum, 1990.*
See also: *Coates et al, Future work: seven critical forces reshaping work and the work force in North America, Hoboken, NJ: Jossey Bass, 1990.*

5.3 Working group methods

5.3.1 What is brainstorming? How can it be used?

Brainstorming is one of the best known methods for generating novel solutions to problems. It has been extensively used in futures work due to the pioneering developments of brainstorming workshops by the late Austrian futurist Robert Jungk. Brainstorming can be used on an individual basis. As with various other group and creativity methods, a number of computer support programmes have been released in recent years. Here the focus is on the 'classical' group method.

Brainstorming aims to reduce inhibitions about generating 'wild' ideas, and thus to stimulate creativity and novel (or previously unarticulated) viewpoints. The term is applied loosely to any free-ranging discussion, but the original definition refers to a specific set of steps. The process involves two main steps:

- A period of freethinking, which is used to articulate and capture ideas, with no critical comments. This can be organised as a group activity, with people speaking ideas out loud and a facilitator or group member capturing them on a whiteboard or on a PC linked to a display. There can be a preliminary step at which group members are requested to work alone and jot down several ideas on their own notepads or PCs. (This is supposed to reduce the pressure to think along a track established by the group.) Once ideas are being articulated, members should be able to ask for clarification of anything that is obscure, and to build on previous ideas: the main rule is that they should not snipe at others or critique ideas at this stage.
- The early stage of idea-generation is followed by more rigorous discussion of these ideas. This typically involves grouping them (usually through a process of group discussion concerning which ideas can be combined together) and prioritising the most important themes. This latter activity could involve voting. For example, each member might be allowed to allocate a number of votes across the list of topics that has emerged, or every idea is given a rating of one to 10 in terms of importance. This usually requires some preliminary reduction in the number of ideas. At this stage, it is legitimate for group members to introduce considerations that may render some ideas unworkable or irrelevant, though it is important to maintain a friendly spirit and not to personalise criticism.

These steps can be organised in many ways. The core common feature is that the facilitator should provide an encouraging and optimistic ambience, and prevent group-think, undermining criticism, etc. One variety of this approach is to set several subgroups to work at the same or slightly variant tasks, and to make an effort at 'selling' their key ideas to each other. It is also generally argued that brainstorming will be most effective if preceded by some presentation of background material about the nature of the problem and the solutions that have been tried (see the discussion of background material above).

The method may be used as a way of relaxing inhibitions and creating a sense of ease in a group, for example by using a classic exercise (e.g. thinking of uses for a brick, or for surplus CD-ROMS). This can demonstrate that within the group there are very different types of contribution that can be made, and these constitute valuable potential for problem-solving. More commonly, it would be applied directly to the topic at hand, for example to brainstorm ideas about important trends, about drivers and inhibitors of a specific development, to nominate stakeholders, even to specify a set of scenarios that would be relevant to examine. It may be a useful technique to use in establishing the future work of the group itself, e.g. to pinpoint the topics that will need to be addressed at successive meetings, the decisions that will need to be taken.

Brainstorming is only a starting point. It should not normally be expected to generate output that can be directly used in reports, etc., though sometimes reproduction of a long list of ideas, no matter how wild some of them may be, can be useful for future group work. A skilled facilitator is required to reiterate and enforce the ground rules so as to maintain openness and prevent animosity, especially where participants are inhibited or liable to express ideas that are offensive to other group members. Increasingly, brainstorming is supported by computer tools, though the classic implementation of flipcharts to capture ideas is effective.

Box 5.3.1: *Instructions provided for a class on Information Technology Security, using brainstorming methods to examine threats*

Brainstorming technique

- Individual Work: 5-10 minutes for each person to attempt to come up with two possible attacks.
- Group Work: In round-robin fashion each person should describe one of his or her attacks, which are recorded by the facilitator.
- Brainstorming: Ideas that are generated as a result of the round-robin discussion should also be recorded. Record ALL ATTACKS no matter how bizarre!
- Refine: Once all ideas are exhausted, revisit the list to eliminate any ideas that are not feasible given the environmental parameters.

Source: *NIST, Protection Profile Development Class slides, 1998.*
Available from: http://csrc.nist.gov/cc/info/pp-class-slides-day2.pdf

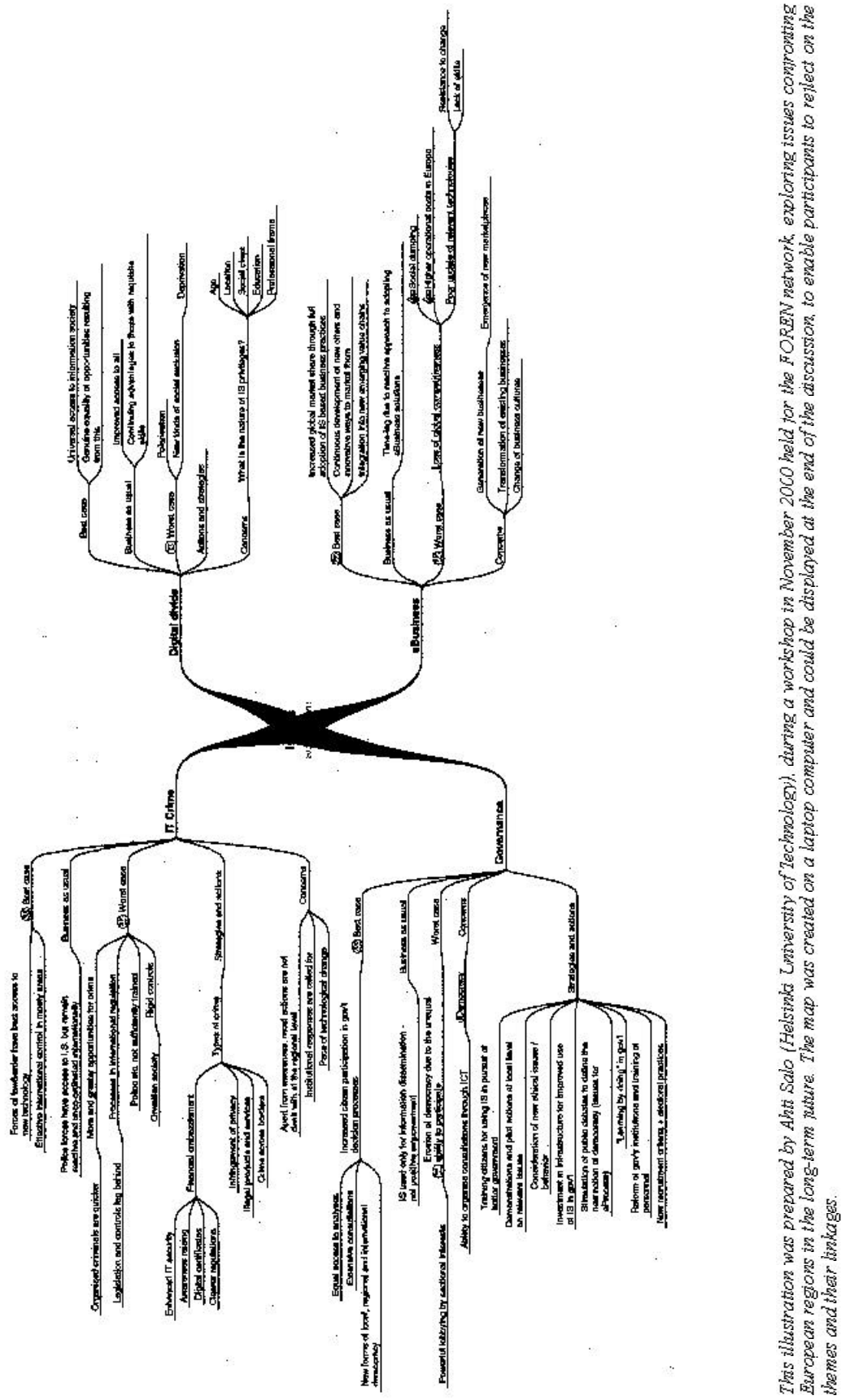
5.3.2 What are mindmapping and argument analysis? How can they be used?

Mindmapping goes by various names, and has a long history of use as a paper-based method for visually representing and organising ideas and their linkages. Often students are taught these methods as ways of taking notes on a lecture or of preparing their own arguments for an essay or a course of study. They are typically suggested to proceed by writing down a central idea (a concept, an argument, etc.), then adding related ideas as links around this like spokes of a wheel, and drawing links between these and the further ideas that stem out from these. The principle is that the process of noting ideas in one's own terms, and thinking through the branches out from them and the connections between them, provides a visualisation of one's implicit mental maps, and helps one articulate these further.

These approaches can also be used to facilitate group deliberations. Since group discussions are often rather disorganised, pencil and paper methods of following the discussion can be quite problematic. On the other hand, these have had the advantage of allowing the use of different coloured pens, of drawing symbols to represent ideas, and coming up with designs that may provide a sense of 'ownership' and make the map easier to remember (if not always to communicate to others).

Software tools to support this are now readily available. Indeed, the 'outline' facility in word processing packages is a very simple tool, though more sophisticated programmes are available both as modules for Word and as stand-alone packages. These dedicated software tools allow for more elaborate visualisation of the subjects of group discussion, presenting them in ways that can help move the discussion forward. Used in groups, they involve grouping and linking ideas expressed in the group. Typically a single member of the group, experienced in use of the technique, acts as a kind of rapporteur or expert note-taker. But the results can be displayed more or less in real-time, fed back to the group, used for communication with other groups in plenary sessions, etc. As with other IT supports, one can expect much development of these methods in coming years. Experience with these methods in foresight processes is still limited. Conclusions as to best practice and best tools remain to be consolidated, but they are evidently promising methods for support of group activities when used skilfully.

Box 5.3.2: *An example of mindmapping output*



This illustration was prepared by Ahti Salo (Helsinki University of Technology), during a workshop in November 2000 held for the FOREN network, exploring issues confronting European regions in the long-term future. The map was created on a laptop computer and could be displayed at the end of the discussion, to enable participants to reflect on the themes and their linkages.

5.3.3 What is simulation gaming? How can it be used?

Simulation games are role-playing exercises. They have two main functions: to enable participants to gain insight about the motives and options of the people or organisations whose roles they are taking; and/or to explore what the strategies and responses of various parties might be to evolving circumstances.

The simulation game requires careful preparation, especially if it is to be at all realistic. It is necessary to establish a 'scenario' – a description of the circumstances that apply, and quite possibly a series of events that may be imposed as 'external shocks' to the actors involved. For example, a simulation focusing on economic affairs may involve shocks such as increases in the price of energy, or a worsening in trade relations. It is also necessary to establish a set of roles that the participants can undertake – to create a list of key actors, with some account of the interests each is pursuing, the resources and knowledge at their command, and so on. (Clearly, the list of agents has to relate to the number of participants in the game, and some ingenuity may be required in establishing a minimum list of agents. It is quite possible for teams of participants to take on the role of an organisation, and this can be very useful for dialogue and deeper understanding.)

Other elements of the framework can include, for example, rules governing when and how the parties communicate, what sorts of decisions they can take and negotiate about, and so on. There are many examples of simulation games available, and these are frequently employed for purposes of management training and general education. To create a simulation that can be useful for a specific foresight exercise, however, is likely to require considerable effort, and thus there is limited experience in using these methods in a foresight context. These methods have been used extensively for educational purposes and for military planning, with some experiments in relating simulation games to simulation models.

Despite the difficulties in scripting the exercise, the process of taking the roles of different agents within a structured framework that has some of the key features of the real system is potentially very useful. It can enable the exploration of possible responses to emerging circumstances, and of the interactions between the strategies of different agents. In military simulations, it has been argued that the procedure can be valuable in identifying when situations may become catastrophic, e.g. war games resulting in nuclear exchanges. The simulation may result in a plausible scenario that can be part of a scenario analysis.

Participants can learn about the contingencies and motives of various agents in the real world, and the enhanced understanding can be used in more conventional formal activities and outputs. However, it will help if the design of the simulation encourages empathy and real examination of the circumstances of different agents, and is not based on prejudice and misinformation. One does not have to pursue military gaming to realise that simulation gaming also needs to be freed of the status relations that may characterise the participants' 'real' roles. These relations led Japanese participants in simulations in the Second World War to be inhibited from undertaking acts that would place their superior officers in difficult situations. The result was unrealistic expectations of the success of certain strategies.

People have become quite used to role-playing simulations through role-playing games, both computer-based ones and 'live' role-playing. While most of these games are set in fantasy or historical worlds, they have often been sophisticated in terms of the attributes and capabilities of the various characters involved, and the features of the environments in which the action is set.

Three results are likely. First, participants will be more demanding of the quality of simulation games; greater efforts will be required to enlist eager participation (though this does not mean too much complication). Second, people are likely to be able to 'get into' their roles more rapidly, though they may need to be weaned off the aggressive play that characterises many commercial games. And third, it can be expected that there will be further development of computer-mediated and even online simulation gaming for more serious purposes in the future.

6 Scenarios in knowledge society foresight

6.1 What are scenarios? Why are they used?

A traditional sense of the term 'scenario' is to describe the circumstances depicted in a dramatic production: the context in which the action takes place. In the context of foresight and futures studies, scenarios are visions of future possibilities. Sometimes the term is used to refer to a very abbreviated description of the future – a 2% or 5% growth rate, a world of high or low political conflict, for example. This is commonly how the term is used in narrow forecasting studies. But in broader futures or foresight exercises, usually scenarios go beyond simply profiling the future in terms of one or two key variables. They present more fleshed out pictures. In such scenarios, many details and variables are linked together. They may be developed through a workshop, by small expert groups, or by other means (genius forecasting, surveys of public or expert expectations, etc.). There is no one scenario methodology: techniques are as diverse as scenarios themselves.

Scenarios may be diachronic: presenting details of a future history, a 'story' of the evolution of affairs, in the form of a sequence of events or developments of trends. Or they may be synchronic: portraying an image of the future, a state of affairs, describing the circumstances at a particular point in future time. Typically the two approaches are combined. Either approach may be presented with a mixture of quantifiable and non-quantifiable components. For foresight activities, it can thus be said that scenarios are internally consistent descriptions of possible future states and development paths, organised in a systematic way.

It is also common to distinguish between exploratory and normative scenarios.

- 'Exploratory' methods essentially involve starting from the present and posing 'what if' questions: what if the growth rate is x% or y%? What if events W or Z happen? What if we pursue one or other strategy? The scenarios result from these considerations. An analysis is taken of the present and a picture of the future is built up from this.
- 'Normative' methods can be seen as starting from a point in the future, and asking 'how' questions: what would it have taken to have reached a future where the parameter of interest is x% greater than its current value? What would have led to situation Y? The scenarios begin with a rough profile of a particular future. It may be a desirable future, but not necessarily. The challenge then is to think how to get there from the present.

6.2 What is multiple scenario analysis? How can it be used?

It is standard practice to work with multiple scenarios, illustrating different possible courses of development into the future. The main reason for so doing is to allow people to understand how different factors may combine together to shape the future. The various scenarios are chosen to reflect the key factors that have been identified, and the key uncertainties associated with them. They are useful tools for communicating major issues identified or priorities emphasised by a foresight activity. Of course, this implies that they have to be presented in ways appropriate to the intended users. They can be used by participants for deepening their understanding prior to working on specific issues in more detail. Scenarios may also be used in modelling exercises to structure the operation of the model; or be derived from different model 'runs', where the model examines consequences of different assumptions. Scenarios can be used to test the robustness of policies and to help define appropriate actions and indicators.

The process of combining factors and generating scenarios can be accomplished in many ways. Here are some of these:

- If a small number of major driving forces have been identified, alternative scenarios can be constituted by combining different paths of each of these, e.g. high levels of social conflict with low levels of economic internationalisation, and vice versa.
- If a small number of parameters capture the main normative concerns of the exercise, then scenarios may be differentiated according to profiles that correspond to outcomes from these. For example, studies have generated four

scenarios by, in one case, starting with profiles in which global economic growth rates and levels of inequality were high or low; and where the uptake of new media by businesses and mass consumer markets were high or low.

- Statistical methods may be applied to discriminate between different views of the future held by different segments of a population. For example, factor and/or cluster analysis can be used to locate sets of opinion in the population, or at least to identify key points of disagreement which can be used to group together the different views that have been expressed.
- Different theories, worldviews, or political programmes can be contrasted. How would theory X say a certain end-point could be arrived at? What would theory Y say? Or, what would these two theories say the most likely events are, or the most likely consequences of putting into place a specific political programme?
- A standard set of 'starter scenarios' can be applied, as in the Institute for Alternative Futures' four archetypal scenarios. This group will often develop for its clients (usually for workshop use) a scenario that is a 'best guess' extrapolation of the issues at hand; a hard times scenario (in which things are going wrong, but not usually catastrophically so) and two 'structurally different' scenarios (at least one of these is to be visionary, marking a paradigm change or an aspirational future).

Again it must be stressed that there is no one universal best way of generating multiple scenarios. The specific approach taken will depend upon the objectives being pursued. There are several drawbacks common to most scenario methods. These include:

- A tendency to perceive the scenarios as the only possible futures, rather as indicative of a spectrum of possibilities. The eventual future is likely to involve some combination of elements of different scenarios. The purpose of presenting multiple scenarios is at least in part to raise awareness of what factors might evolve and how they may be interrelated, not to present several options in the hope that one will prove to be accurate.
- Some scenario studies imply that one scenario is the 'most likely' scenario, and others are minor deviations. This is unhelpful for long-term foresight appraisals. Better understanding will be reached by providing comparable amounts of detail for different scenarios. Conversely, an approach that spends relatively more time elaborating the features of a desirable scenario, and how to achieve it, or an undesirable one (e.g. some catastrophe that may be remote but not implausible) and how to avert or cope with it, may be justified. The latter approach is concerned with informing action so as to bring about a better future, not simply reiterating views about business as usual.
- Users may find it difficult to deal with images of multiple plausible futures. In practice, many studies assume that a maximum of four is all that users can meaningfully relate to, though there are studies that outline a dozen or even more scenarios.

6.3 What are scenario workshops for?

Scenarios are often developed by taking a workshop through a systematic evaluation of trends, drivers, and alternatives, or by smaller expert groups. The focus may be more on 'what if?' (exploratory scenarios), or 'how?' (normative scenarios). Such workshops bring together a range of knowledgeable and experienced participants, usually stakeholders of one kind or another, within a structured framework of activities.

Scenario workshops are frequently used to build (or to elaborate on) scenarios. The aim is not usually just to achieve a finished scenario as a product. There are also benefits from involving members of an organisation or community in futures exercises or more specifically in a foresight process. Scenario workshops can help participants gain 'ownership' of scenarios as well as deeper understanding of issues. The scenarios produced in such workshops are a product of the participants' own inputs and interactions. Thus the participants should understand the logic underlying the choice and the contents of scenarios much better than they would if presented with the material in a standard report. They should be better informed as to the key issues at stake, and better equipped to use the scenarios in decision-making and to

explain them to the outside world. Scenarios produced in this way should also possess greater legitimacy than those produced by a smaller expert group or visionary guru. (Of course, this requires that the workshop should have drawn upon a reasonable range of participants.)

Scenario workshops are relevant for foresight as:

- they allow for sustained analysis of alternative futures that are relevant to the key decisions that are confronted, and allow for the generation of reasonably articulate and consistent visions of these futures.
- they can be used as the trigger for inputs to planning such as identification of priorities, setting of objectives and targets, defining useful indicators of progress, etc.
- they provide a network for people and enable them to integrate their knowledge. Furthermore, by involving key actors in scenario generation, they can mean that decision-makers have a deeper understanding of the underlying processes and key strategies, and a sense of identification with the choice and elaboration of the scenarios.

Accordingly, a scenario workshop should allow the participants to:

- exchange information, views and insights;
- identify points of agreement, disagreement and uncertainty;
- create new shared understandings;
- develop action plans and other instruments to help mobilise future activity.

Scenarios may be generated from scratch in the workshops, or developed, in at least a rough form, in an earlier scenario generation activity. Some workshops use 'off the shelf' scenarios prepared in other work, possibly even published ones, as a starting point for the workshop activity.

In scenario workshops typically there are periods of extensive exchange of ideas and debate about them, and periods where ideas are written down and listed, where different lists are combined, and so on. The process usually involves much dialogue, and use of such instruments as whiteboards and flip charts, though computer-based ('groupware') tools are now beginning to be used effectively. Scenario workshops usually extend over at least one day, and may involve several dozen participants (with 'break-out groups' of six to 12 people exploring different scenarios in detail). The workshop will be conducted with inputs from at least one facilitator. Often other helpers will take notes, record material from flip charts, and deal with logistical issues as they arise. Typically such facilitators have acquired their skills through involvement in these and similar group activities. They may have received some training in workshop methods (from T-groups to management workshops to academic seminars), but to date there has been little analysis of the processes in terms of knowledge development. The skills are typically those of classic groupwork, but a group would be too large to work on a scenario in detail.

6.4 How are scenario workshops organised?

As already indicated, a scenario workshop will usually last for at least a full day, and include some presentation of background material as well as a series of group activities. Often in large workshops these will involve some break-out groups and plenaries. Typically there will have been a design process of some sort before the workshop; this may even take the form of a prior design workshop involving the sponsors of the foresight exercise and other informed parties. (This can help select participants, test the appropriateness of background material, and decide on the precise scenario methodology to follow.) There is no simple recipe of how to conduct the scenario writing that lies at the core of the scenario planning process. Opinions differ on the order and emphasis given to the steps outlined in Box 6.4i, which were

developed for the UK's Open University Business School. There are, in effect, distinct 'schools' of scenario analysis with their own favoured approaches.

For different purposes workshops may be organised in different ways. Here are two of the main alternatives:

- 'Starter scenarios' may be provided or the group may generate its own set of alternatives. Box 6.4ii presents examples of the instructions given to break-out groups in two exercises where the subgroups were considering scenarios whose bare essentials had already been worked up in previous analysis. Box 6.4iii outlines an approach where the only starting point was that the group should develop a vision of a feasible and desirable future (though in the various application areas that this workshop considered, some exploratory forecasts of likely developments in each area were provided as part of the background material).
- There may be an exploratory or normative orientation. Each of the examples in Box 6.4ii has some normative element, though the first example features several more exploratory scenarios. Perhaps the most aspirational in its orientation is the example given in Box 6.4iii, which reproduces instructions given to a workshop intent on building a 'success scenario', a vision of a feasible and desirable future.

Box 6.4i: *One model for the organisation of a scenario workshop*

Scenario development, analysis and use (From Loveridge, Scenarios, Open University Course, *The challenge of the external environment*, 1992)			
Step 1	Set up a preliminary objective for the scenario planning exercise, including time horizon. The objective needs to be simple but this will hide the depth and 'messiness' of the situation.	**Step 5**	Write the scenarios using whatever presentation technique seems to be the most suited to the objective.
Step 2	Establish a broad learning programme under the STEEPV guidelines (STEEPV is an acronym for six fields in which futures thinking takes place namely, social, technological, economic, environmental, political and human values) to enable (i) the boundaries appropriate to the objective to be derived (ii) the broad trends that influence the objective to be identified and (iii) by asking 'who and what' is important to the objective, mapping out specifically the driving forces creating the future.	**Step 6**	Analyse the scenarios with particular reference to turning or branch points that may constitute a crisis implying change.
		Step 7	Derive from the analysis the policies within which the organisation ought to work (the limits of actions the organisation ought <u>not</u> to exceed in seeking to achieve its objective) and the instruments of policy over which the organisation has control and those that are beyond its control.
		Step 8	Using the instruments of policy derive alternative strategies that are robust in the following senses: (a) they are likely to be able to withstand the impact of inevitable disturbances in the future; (b) they will be comprehended by and acceptable to society; (c) they will be relatively intensive to delay.
Step 3	Through a directed learning programme make assumptions explicit and examine them for their relevance, reasonableness and robustness, as they will be used in the scenarios. Through iteration, modify as necessary.		
Step 4	Assemble a framework of alternative event strings and trends that are the skeletons for the scenarios.	**Step 9**	By using some form of computable model, evaluate these strategic alternatives over the chosen time scale, paying particular attention to the strategic allocation of resources, including financing, and the best routes to achieving the desired financial returns.

Box 6.4ii: *Examples of instructions used in scenario analysis during scenario workshops*

Example 1: A scenario workshop was held in January 2002 in an attempt to assess the implications of future developments in genomics for the UK's Economic and Social Research Council. Four breakout groups were set up to focus on each of four different scenarios (produced using the Institute for Alternative Futures' methods). These small groups considered the key contributions that social research might make if the given future were to develop. Each group was requested to discuss its scenario, in particular, orienting its discussion around the questions:

A. ***Assuming this scenario will occur, what is the optimal contribution that social science research can make (list your three to five top priorities)?***

B. ***Signposts: What would indicate movement toward this particular scenario, expressed, for example, as headlines in the media?***

This process yielded a large number of specifications of opportunities for research, as well as some problems that researchers and research organisations might confront.

Example 2: In a workshop held in December 2000 for the European Commissions Information Society Technologies Advisory Group, the focus of study was AmI (Ambient Intelligence, the vision of a future in which people are surrounded by intercommunicating IT devices). Subgroups considering different spheres of application worked with scenarios of the technologies at use in transport, education, working life, and social activities, and were given a checklist of issues to consider, including:

Economic issues

- What is the likely demand for AmI? Is there an obvious driver for demand? Who will be the likely drivers of demand? How will demand be distributed (income, skills, age, regional)? Can we envision likely introduction patterns?
- Will development of AmI be predominantly centralised or decentralised? Will it aim for mass-markets or for niche-markets? Who are the major players to do the necessary investments? How does the AmI project fit into the global economic system?
- What are the kinds of business activities (products and services) needed in the background to make all this front-end technology work?
- What kind of new partnerships are likely to arise? What are likely market structures for AmI? How can we deal with the mixture of technologies being commercialised now and long-term pre-competitive research? What will competition policies look like?
- What is the economic and policy impact of the proliferation of vulnerable networked systems?
- What kinds of political-economic structures can contribute to improve the competitive position of European companies (producers and users of AmI)? Are there obvious strengths that can be built or exploited (e.g. mobile communications or consumer electronics)? Can we define the 'business window' for Europe?
- What types of organisations use AmI? Does AmI presuppose specific kinds of user organisations and specific kinds of business processes? What is the likely impact of AmI on the skills needed in the sectors that develop and deliver the products and services? What skills does it require from users and in using organisations? What will be the impacts on employment?

Socio-political issues

- How does AmI relate to interactions between changing family structures, communities, work organisations and lifestyles?
- How can AmI contribute to bringing greater choice and control over their choices to the users? How will users cope with unlimited choice? How will users cope with increasing 'speed'?
- Do we need specific measures for (technology) literacy? Is there a special role for education? Is 'learning' in itself a good starting point for the introduction of AmI?
- What are the chances for breakthroughs in key social/professional groups' acceptance of technology, i.e., teachers (e-learning), health workers (telemedicine), government (online administration), etc.?
- How will AmI contribute to individualisation trends, or will it reinforce opportunities for collective spaces and community building?
- What are the risks of a potentially very uneven distributed pace of development (niche-markets vs. dropouts, or global economy kernels vs. backward rural areas)? What would a 'design-for-all' approach look like?
- What are the social and political opportunities and problems in balancing the need for open access, choice, etc. on the one hand and the need for privacy and security on the other (including the need to counteract dangers of cybercrime and cyberwar)?
- How does AmI relate to socio-political goals such as sustainable development, quality of life and European integration? How does AmI relate to the development of mobility in society?
- What are the ethical boundaries in the development of AmI? Are there boundaries to how people interact with fully automated environments (think of robots)? Are there boundaries to intrusive use of AmI?

How will AmI change the way people work, think, learn and communicate, and how will it change the settings in which they do this?

What are the main uncertainties? When will they occur?

How do they translate into issues for research?

Sources: *ESRC scenarios*

Available at http://www.altfutures.com and http://les1.man.ac.uk/cric

ISTAG scenarios available at http:///www.jrc.es

Box 6.4iii: *Excerpts from guidance material used in a success scenario workshop*

The text in this example is excerpted from material given to subgroups developing a 'success scenario' for the UK's performance in nanotechnology, held in October 2001. Each numbered set of instructions relates to a different subgroup session.

1. Building a new scenario – the success scenario

The scenarios we have provided are intended to provide stimulus for you to consider what might be realistically achieved if the UK is to be successful in each area of nanotechnology applications. This means, of course, considering what success in each area might be. In order to move toward more concrete and credible analyses of this, we are asking the groups to work systematically through a range of factors that are liable, first, to drive and, then, to shape the development of science and industry in the UK and beyond. In later sessions we will go on to consider relevant indicators and actions needed.

Here is a list of potential drivers:

[…]

QUESTION 1

We would like you to work through and comment on each of these drivers. Please use the flip chart to identify the issues that you consider most important for each, and how they impact on your application area. How far do they promote development of applications in your areas? Are there specific applications that are promoted especially? Please also indicate what each of these might look like by 2006, e.g. will the scenario be driven by large firms or SMEs? For each driver:

- Identify the most important issues.
- Discuss how far the driver impacts on your application area – how important is it as a driver? (could you indicate this on a scale from one (not important) to five (extremely important)?)
- Identify specific applications promoted by this driver.
- What might this driver look like by 2006 – would it be growing or decreasing in importance or its particular type of impact?

QUESTION 2

When discussing these issues, please:

- Consider if your application area has special features here (e.g. different application areas feature very different regulatory environments).
- Consider whether the UK situation is shared by other countries, or if we have specific opportunities or problems.

2. Further building the success scenario

To further move toward a more concrete vision of what success for the UK in each area might be, we are now asking you to work systematically through a range of factors that are liable first to shape the development of science and industry in the UK and beyond. Here is a list of potential shapers:

[…]

QUESTION 1
We would like you to work through and comment on each of these shapers. Please use the flip chart to identify the issues that you consider most important, and how they impact on your application area. Do they impede developments, or push them in particular directions, for example? Please indicate, too, what each of these might look like by 2006, e.g. will the scenario feature a large number of people trained in multidisciplinary teamworking?

For each shaper:

- What are the most important issues (again, can you rate them on a one to five scale)?
- How will those issues impact on your application area?
- What will this shaper look like by 2006?

QUESTION 2
When discussing these issues, please:

- Consider if your application area has special features here (e.g. different application areas feature very different regulatory environments).
- Consider whether the UK situation is shared by other countries, or has specific opportunities or problems.

3. Summarising the scenario

Here we would like you to characterise the scenario developed by your group. It is often helpful to come up with a 'name' for the scenario. Beyond this, how can we succinctly describe it – what does success look like? What are the main drivers and shapers, and how are they being called into play? Remember that the success scenarios need to be both credible and optimistic: this part of the exercise is a chance to see if the different elements of your scenario are consistent.

What would this scenario look like in practice? What is the industrial landscape, the patterns of supply and use of the application? Where is the action taking place? What could we hope for in terms of a UK presence? Please try to characterise the scenario in terms of such features as:

- What level of UK activity is there likely to be in this application area? How much would it have grown in value and employment terms from current levels?
- What sort of presence is this in world markets – what is the UK's market share?
- Inward investment in the application area: how much growth would we expect? From where, what sort of firms? To what level?

- What sorts of UK firms are involved – are the main actors large firms? How many start-ups could we expect in this area? How many SMEs are involved in the supply chain?
- How big are the end-user markets, what sorts of purchasers are there, what is the impact on their performance?
- What would industrial funding of research in universities for relevant nanotechnology look like?

You will have more time this afternoon to address such questions further, but it will help to make a start on them now to characterise the scenario and to see how far members of the group are in agreement about optimistic prospects for such issues.

Please prepare a brief presentation on this, kicking off with the name of the scenario, and then describing it in ways that the other groups can rapidly grasp. This will provide us with an opportunity to contrast the different groups' scenarios, and see if they are consistent or divergent, and what this implies.

4. Indicators for success

In session 2 we asked you to begin to characterise the success scenario. Could you return to the bulleted questions there, and amplify your answers if that seems necessary. Please also give us some further concrete ideas about how you would be able to recognise that the success scenario was becoming a reality. The ideas below are 'off the wall', but are intended to indicate the sorts of things you might want to suggest:

- Share of UK research in EU collaborations in nanotechnology fields
- Number of patents taken out by British innovators in application areas based on nanotechnology
- There is considerable public enthusiasm for nanotechnology, as evidenced by recruitment for courses, media attention, etc

[…]

The big challenge, of course, is to suggest plausible quantitative estimates of such indicators. The closer you can come to suggesting not only indicators, but also ball-park figures, or ranges of figures, that might apply by 2006, the more valuable the exercise will be, not least to clarify where our points of agreement and disagreement are. Another benefit of this part of the exercise is that it can, hopefully, suggest alternatives to the narrow set of indicators that are currently used to drive policies for research.

5. Critical success factors and actions

The task now is to provide suggestions for steps that need to be taken to maximise the likelihood of your success scenarios. Please do so by discussing them in your groups, and writing points down on the wall posters. We invite each group to proceed round the posters in turn. Feel free to read and comment on other groups' suggestions. Please indicate on your suggestions if they are specific to certain application areas. If there is a suggestion that divides your group, it is probably best to write it up and indicate the lack of consensus. Please try to indicate who might be responsible for seeing particular actions through. You might also be able to indicate what types of systems, indicators, feedback, etc., they could be using to see if actions are having the desired effects.

Source: *Author's notes. For scenario report see New dimensions for manufacturing: a UK strategy for nanotechnology, London*: DTI, available at:www.dti.gov.uk/innovation/nanotechnologyreport.pdf

6.5 What is STEEPV?

Social, technological, economic, environmental, political and human values (STEEPV) analysis is essentially a system for classifying relevant trends and potential developments. The set of categories is comprehensive, so that participants do not stay fixed on a small number of topics. STEEPV is also the basis of a little known group method of identifying crucial long-term issues. The process is demanding and time consuming, but it is known to have been successful in identifying, in the 1970s, long-term issues for the UK in the 1990s and early 2000s, issues that remain relevant today. However, it is not a method that should be undertaken outside a closely-knit team that can meet frequently.

Used outside the process just indicated, the STEEPV themes guide the learning processes needed for any foresight programme. Often working groups, panels and workshops lack the framework that STEEPV provides and can degenerate into *ad hoc* discussions in which the appropriate learning is minimal; these sessions are akin to brainstorming rather than structured learning. Use of the STEEPV themes requires substantive knowledge in the working group as well as information, including numerical data, in each of the six themes, in this case appropriate to a knowledge society foresight. The most difficult area lies in the way in which values may shift over a long period into the future; in this field the most advanced ideas and numerical data are not in the public domain.

Some STEEP themes (the V theme is absent, which is often the case) are illustrated in the following examples. However, it has to be said that in none of these examples is it clear how the issues were identified. The impression of ad hoc lists cannot be avoided. Perhaps the greatest error is to mistake the STEEPV process for a simple set of guidelines for group discussions that veer towards brainstorming rather than to use them as a disciplined basis for learning about the themes themselves and their inter-relationships.

Box 6.5i: *STEEP analysis*

The following list of STEEP issues, developed with the San Diego Red Cross, is from a template prepared by the Waitt Family Foundation for workshops encouraging communities to think about their possible futures:

Social trends

- Population growth and urbanisation
- Youth is king
- Increasing literacy and gender equity in education
- Living longer, but disease stays a problem

Technology trends

- Proteomics
- Desktop manufacturing
- Space technologies
- Peer to peer networks
- Wireless broadband
- Personal energy devices
- Biometric security
- Sensors - MEMS
- Wildcard: the singularity spike

Environmental trends
- Addicted to fossil fuels
- Renewable energies
- Global warming
- Water shortages
- Pollution

Economic trends
- Globalisation
- Efficiency
- Rising GDP

Political trends
- Democracy is expanding
- New types of democracy are building at the grass roots level

Increasing dysfunction between the speed of technology change and the ability of government to regulate.

Source: *Waitt Family Foundation, Community scenario planning: a power generator for civic action.*
Powerpoint presentation available at: http://www.waittfoundation.org/resources/Tech_Scenario_Planning.ppt

Box 6.5ii: *A STEEP-type analysis and its use in scenarios*

Using a slightly different classification, a study of the 'green heart' of the Netherlands, looking at environmentally sustainable scenarios, used the following questions to differentiate scenarios:

Social developments
- Will the Europe of the future be affected by social chaos as a result of cultural resistance to European integration, etc?
- Will there be large differences between the rich and poor or will Europe be characterised by a fair distribution of wealth?
- Will the European society of the future be characterised by individualism or will there be social security, solidarity and cohesion?
- How will the labour market develop? Will there be large-scale unemployment or full employment?
- Will demographic developments lead to a stable population composition or will the population of the future mainly consist of older people?

Economic developments
- Will the European market be free or will there be government intervention in the form of import and export restrictions, etc?
- Will the Europe of the future be characterised by low or high economic growth?
- To what extent will institutions, companies and organisations be privatised in the Europe of the future?
- Will there be a harmonised system of taxation or will different taxation systems be in force?

Ecological developments

- Will there be environmental regulations in the Europe of the future or will there be no limits set on the use of nature, space, natural resources, etc?
- To what extent will environmentally friendly technology be used and will environmentally polluting technology be abandoned?
- Will the average European citizen become more or less materialistic in the future?
- Will Europe be characterised by environmental degradation in the future or will the environment be in a good condition?

Institutional developments

- Will European integration be successful or will the Europe of the future be characterised by nationalism?
- Will the Europe of the future be politically stable or not?
- Will Europe operate actively and constructively as a global player in the future or will it retreat into the so-called European Fortress?

The four scenarios are depicted below:

Scenarios	Money maker	Think green	Wait and see	The doom monger
Ecological dimension	High employment Individualism Inequality Competitive labour market Unequal distribution of wealth	Rising employment Regional employment Equality Solidarity Cohesion	High unemployment Cultural limits to integration High social security Cultural and social stability	Social and cultural chaos High unemployment Ageing
Ecological dimension	Job uncertainty High CO_2 emissions No extra environmental policy Materialistic life style Environmental degradation	Extra environmental policy Integrated European environmental policy Immaterial life style Low CO_2 emissions Environmental technology	Environmental degradation High CO_2 emissions	No extra environmental policy Environmental degradation High CO_2 emissions
Economic dimension	Competitive market mechanism High economic growth Free trade Privatisation Global market	Import-export restrictions Business as usual growth Local economy Ecological levy	Privatisation National economy Government finances under pressure Moderate economic growth European market Free trade	Large economic growth National economy
Institutional dimension	EMU is a success Deregulation Globalisation	Decentralisation EU leads the way in environmental policy	Expansion of EMU Liberalisation of Eastern Europe National energy policy Political instability	EMU a failure Nationalism EU countries become protectionist sovereign states Political conflict

Source: *Van Asselt, M.B.A., de Niet, R., Peters, S.S.M., Rijkens-Klomp, N., Rotmans, J., Slooff, W. The Green Heart in broader perspective, initiation report scenarios and indicators for the VISIONS workshop, International Centre for Integrative Studies, Maastricht, Netherlands, 1998.* Available at: http://www.icis.unimaas.nl

6.6 Further resources on scenarios

Godet, M., *Creating futures: scenario planning as a strategic management tool*, Economica, 2001.

Van Der Heijden, K., *Scenarios: the art of strategic conversation*, 1996.

Ringland, G., *Scenario planning: managing for the future*, 1998.

Schwartz, P., *The art of the long view: paths to strategic insight for yourself and your company*, 1996.

Planning and action 7

7.0 Introduction

This chapter focuses on what methods are used in foresight processes for defining key actions and priorities – ensuring and effecting the link to planning and policymaking. In some ways the separation from the preceding chapter is an artifical one, because often the 'visioning' and action-oriented activities are intimately related, for example, they may well both be steps in a scenario workshop. But it is useful to highlight the approaches and methods that can be adopted here, not least because it will again help undermine the notion that foresight methods are all simply a matter of futures and forecasting techniques.

See Annex A for further discussion of foresight's links to decision-making.

7.1 What outputs and deliverables can be expected from knowledge society foresight?

Foresight exercises can produce formal and informal outputs:

- Typical formal outputs are reports (containing scenarios and visions, critical technology lists, priorities, action plans, etc; some of these are discussed below), dissemination activities such as workshops, newsletters, press articles, web sites, demonstrator projects, etc. These are often what some people refer to as 'codified' knowledge, in that the knowledge generated through the process has been turned into information that can be circulated widely, without necessarily requiring face-to-face interaction.
- Informal outputs are more difficult to grasp, because these typically take the form of knowledge embodied in people's practices and approaches to issues. Although these may be harder to identify and quantify than documentation, they represent a very important aspect of the benefits. Typical informal outputs are the development of new networks, and the integration of foresight methods and results into the strategy and the projects of organisations (e.g. companies, trades unions, government agencies, etc.).

Table 7.1 outlines some of the types of outputs that can be expected. In general, the outcomes of knowledge society foresight activities are likely to address different audiences. In starting a foresight exercise, project managers need to be able to define who the interested groups are that might benefit from the outputs. Thus, and to reiterate, it is useful (and essential) to involve members of various user groups in the foresight process. Members of user groups can help to define the targeted outcomes that should be foreseen for the various user groups.

Table 7.1: *Some types of output from foresight*

	Formal outputs	Informal outputs
Material for long-term reference and dissemination activities beyond those organisations directly involved in knowledge society foresight	Reports, books, electronic records (videos, web resources)	Networking with foresight activities and actors in other settings, etc.
Dissemination within those organisations directly involved	Workshops, newsletters, press articles, web sites	Visions developed in workshops, results and evaluation circulating within networks
Networking	Institutionalisation of networks e.g. through formation of permanent organisations and meeting places	Development of new networks or new links established within existing ones
Strategic process	Formal incorporation of results within strategic processes, e.g. through use of lists of key priorities as a framework for assessing projects and plans.	Informal incorporation of results and knowledge of networks and key sources of knowledge, within strategic processes

Source: *Adapted from FOREN Practical guide to regional foresight, 2001*

7.2 What sorts of publications should be prepared?

Among the main formal methods of disseminating knowledge society foresight results are reports, books, newsletters, and an ever-expanding range of web-based publications. More rarely TV and radio programmes may play a role. These are most commonly produced either by the sponsoring organisation or (with more independence) by the foresight team itself. Existing media such as journals and newspapers may be activated to carry appropriate material.

Such outputs need to be carefully tailored to their intended audiences, and professional skills in preparing the publications appropriate to specific media and audiences are required. It is especially important to keep journalists 'on side', since there is nothing they love more than problems and failures.

It is important not to let such 'formal' outputs displace more informal means of communication, and not to assume that the capturing of results in publications is more important than informal outputs in the form of improved networks and the embodiment of new knowledge in people's practices and organisations' approaches to issues. These may be harder to identify and quantify than documentation, but represent very important benefits.

7.3 What are critical technologies?

The concept of criticality is an essential part of foresight since it helps to mark out trends, issues and events, including specific inventions and scientific breakthroughs that may need particular attention. However, until recently the notion of criticality has remained fuzzy and has been applied differently in individual studies. Recent work by Bimber and Popper of the RAND Corporation (see Box 7.3i) removes much of the ambiguity that is present in earlier studies claiming to identify critical matters, usually technologies.

Critical technology studies involve panel work, drawing on interviews with industrial and research experts in the technologies concerned; though in reported studies it is unclear how these interviews were undertaken or how the experts were selected. The interviews often lack transparency, not indicating the interviewee's level of expertise. Moreover, unless the criteria used are well specified, the basis of a panel's judgments (or prejudices) in determining criticality will remain unclear.

Critical studies can be applied to the social sphere but to do so will need development of Bimber and Popper's criteria to avoid over-emphasis on technological issues at the expense of broader socio-economic concerns. Bimber and Popper have suggested definitions for criticality as outlined in Box 7.3i. The important aspects are that a critical technology should:

- Be relevant to policy or decision-making. It should not leave decision-makers asking 'Critical to what?'
- Discriminate unequivocally between what is and is not critical.
- Be likely to yield reproducible results so that the definition enables users to develop tests and methods that work, and that are robust and understandable by non-involved users.

Box 7.3i: *Definitions of critical technologies*

Bimber and Popper proposed four alternative definitions of criticality, the first two of which fulfil the three criteria set out above as they are discriminating, relevant to decision-making and likely to be reproducible. The four definitions are:

1. Critical technology as generic and pre-competitive recognises the technology concerned as useful in many applications and likely to produce a wide array of returns not tied to any specific application. The technology is likely to have a synergistic or catalytic effect elsewhere.
2. Critical technology defined as the rate-determining factor for specific applications connects the technology directly to some process or product. Criticality is then not inherent in the technology itself, but relates to the output from the system and the enabling role of the technology. The response to the question 'Critical to what?' and similar questions is explicit. The definition is not without its problems of measurement, but can be useful in many prospective instances, but is not, according to Bimber and Popper, '.... universally applicable'.
3. Critical technology viewed as a component of national (or company) self-sufficiency treats the technology in a wider context and relates particularly to 'competitiveness'. The underlying theme here is control over the technology that in any business system is uncertain and has many strands. For this reason this definition does not lead to clarity and ease of application.
4. Critical technology as 'state-of-the-art'; this equates 'critical' with 'advanced' and by implication high technology. However, this definition relates only to judgements about the technology itself without reference to applications or objectives. Consequently, it passes the third requirement for a definition of criticality but not the first.

Definition 3 is particularly seductive to policymakers but, because it draws so heavily on notions of control that go beyond that available in free societies, it has to be rejected. Even in situations where a company can secure protection for its technology through patents, it may not be able to retain complete control over the wider use of the technology because of anti-trust law or simply through commercial pressures that encourage licensing the technology to competitors. The reasons for the rejection of Definition 4 are self-evident and need no further comment.

In a similar vein, studies in France, Germany and Australia have used sets of criteria to determine lists of 'key technologies' that have often varied between technologies that are generic and highly specific.

Usually panels work to draw up these lists of critical or key technologies. However, the possibility of transposing these notions of criticality into the social sphere is untested and should be treated with much caution if such methods were proposed. In practice, this approach may tend to over-emphasise technology issues at the expense of broader socio-economic concerns. The method often lacks transparency, with the criteria that are used not being particularly well specified or clearly ranked against each other. This allows more flexibility for the panel to exercise its judgements (or prejudices).

Source: *Denis Loveridge*

Prioritisation is not always a feature of foresight but a relationship between criticality and prioritisation is suggested in Box 7.3ii.

Box 7.3ii: *Criticality and prioritisation*

How are the notions of criticality melded together with prioritisation? Most assuredly they are, even if it is done unconsciously. It is suggested that the following are important elements that bind criticality to priority setting:

1. Criticality depends on information that must be gathered, but not indiscriminately. There needs to be an element of 'knowing what is being looked for', a statement that is full of internal contradictions, but which is aimed at the resolution of Whitehead's dilemma of the 'welter' described earlier. Priority setting needs similar information to be created during the institutional foresight process.
2. To resolve the dilemma of (1) above there need to be observers or groups of observers skilled in the art of identifying the weak signals of change amongst the welter of trivia. It is these weak signals, typical of real foresight, that orient the more conventional information gathering, as in institutional foresight programmes, and its interpretation into intelligence. These signals need to be cast in the framework defined by the STEEPV acronym, since policy will be determined by all six of the themes.
3. The processes used in interpreting common information will lead to different forms of intelligence or knowledge each with an equal claim to attention for policy purposes. Conventional bargaining and negotiation become inevitable; this must be recognised. The notion of some process that circumvents this inevitability is not sustainable. Prioritisation processes that typify the above negotiations inevitably involve some form of voting in which the 'will of the majority' prevails, but this will not circumvent the objection to the Benthamite dictum of '... the greatest good for the greatest number ....' as that leads to a significant dissatisfied minority.
4. As the prioritisation process is conducted, the notion of criticality needs to be applied judiciously and constantly to enable policy to be relevant, discriminating and robust.
5. The application of criticality should acknowledge the gap between the selective listening and looking of the different communities involved. No one side should prevail exclusively; both need to hear and appreciate unwelcome or unusual indications of phenomena, trends and issues that need to be encompassed by policy.

Perhaps the greatest paradox for the 'prioritisers' lies in (3) above. It is there that all pretences of the appearance of structure, logic and rational thought of an institutional foresight programme are abandoned and the full power play of politics enters as voting processes are resorted to in the prioritisation process. Criticality and prioritisation are tightly interlocked. Where the first depends on the examination of specific questions that occur in interrelated sets, prioritisation too frequently occurs at high levels of aggregation that either ignore or hide inter-relatedness with a consequent loss of reality and relevance, and a rising degree of vagueness.

Source: *Denis Loveridge*

7.4 What are action plans and demonstrators? What is their role?

Action plans are common outputs from foresight exercises. These are simply lists of actions that should follow from the identification of problems and possible solutions through knowledge society foresight. Action plans should not be 'wish lists', nor should they simply specify end points and objectives. They should indicate actions and responsible agents, ways of monitoring progress, and indicators with which to assess the degree of success attained ('verifiable objectives').

Considerable skill and inside knowledge may be required to formulate these in terms that can be accepted by decision-makers. Yet it is important to link actions to the people responsible for executing them, but at the same time avoid setting

goals that are unrealistic (either because of being too ambitious, or due to an absence of either political will or effective sanctions on the part of those responsible). Of course, successfully linking decision-makers with actions is more likely to be achieved if they have been involved in the foresight process.

Rather than (or in addition to) providing a list of numerous actions, it may be possible to incorporate a number of actions in a demonstrator project. This can be a highly visible instance of the application of foresight, and may arguably be particularly effective where technology or infrastructure issues are concerned. However, the time taken to establish a demonstrator, and for its impacts to become visible, may mean that the success of the demonstrator in increasing the visibility of knowledge society foresight may be limited. There are also dangers of putting eggs in one basket, as well as having people associate the foresight activity with only the demonstrator. (This happened in the first UK national foresight exercise, where a competition for demonstrator projects distracted attention away from other important dissemination and implementation initiatives.)

7.5 How could the outputs be followed up?

Many foresight activities do not end with the publication of reports and action plans. For one thing, the networks formed are likely to develop further. But it is also possible for more planned activities to be set in motion: these include the continuation of panel activities, the delivery of training courses, and the establishment of a dedicated knowledge society foresight unit. Each of these possibilities is briefly discussed below. It is important to build in opportunities for such action in the design of knowledge society foresight, rather than hope that they will emerge spontaneously in late stages of the exercise. These activities should be as interactive as possible, rather than appearing as pronouncements about the future or the necessity of various courses of action.

Panel embedding

The fostering of a 'foresight culture' means that a wide range of organisations recognise the relevance of longer-term perspectives, and can initiate relevant foresight processes as needed to guide action. Panel members can play significant roles in embedding foresight in their own organisations. They can also contribute to the development of knowledge society foresight capabilities by liaising with other organisations to see how far they are adopting the messages of the exercise. For example, panel members could share out responsibilities for monitoring the implementation of action plans, etc, by relevant agencies and organisations. They can also provide briefings and inputs of other kinds. However, too much should not be expected of panel members in this regard, since it can be very demanding of panel members, especially unpaid ones, to maintain such a level of activity. They may benefit from the support of more 'centralised' activities of one sort or another: foresight units, mini-knowledge society foresight exercises, etc.

Outreach and further training

Panels and other parties involved in knowledge society foresight will normally seek to hold public meetings, participate in regional and other workshops and conferences, and the like. They may also 'roll out' knowledge society foresight more widely, to schools and colleges, and to other interested organisations. They may recruit intermediaries – trade and industry associations, NGOs, trades unions, educationalists, consultants, etc. – to play roles in disseminating their messages, in training people to undertake their own foresight, etc.

Training can be an extremely important medium through which to embed a foresight culture. Training courses for knowledge society foresight facilitators (future practitioners) can be organised, as well as awareness sessions that inform potential users of the benefits of knowledge society foresight.

Foresight unit

A foresight unit (or more than one such unit) is a repository of knowledge and agent of training and advice on knowledge society foresight. It may provide information and analysis to update the reports and conclusions of knowledge society foresight activities. It may conduct smaller-scale knowledge society foresight exercises or provide training activities for particular sets of users (agencies, cities, etc.) on a more or less continual basis. It can organise regular meetings to support networks set up in the course of knowledge society foresight. Such units can help to maintain foresight capabilities in a given community.

There are dangers here, however. A unit requires substantial commitment, and may be overly dependent on a volatile source of funding. It may become moribund or proprietorial of knowledge society foresight in its area of operation/concern. One approach to forestalling this is to set up more than one centre of expertise on foresight. This can have its own problems: the two may become locked in bitter rivalry and attempt to discredit each other's work and approaches, or they may form a cosy club, dividing work among themselves to suit their convenience more than the clients' interests. Whatever strategy is adopted, management procedures need to be in place to reduce such problems. Efforts must be made to ensure that the unit(s) are less dependent on one sponsor, and more open to funding from multiple sources. This cannot guarantee independence but can increase its chances.

7.6 Further resources on using foresight-type processes

The Euforia web site (http://les.man.ac.uk/PREST/euforia) will be continually updated with further resources on this topic. The following are worth looking at (see also Annex A):

Bryson, J.M., *Strategic planning for public and nonprofit organisations. A guide to strengthening and sustaining organisational achievement*. Revised edition. Jossey-Bass, Wiley, New York, 1995.

Brown, N., Rappert, B., Webster, A., *Foresight as a tool for the management of knowledge flows and innovation* (FORMAKIN), available from the Science and Technology Studies Unit, University of York, UK, 2001.

Evaluating outcomes and developing foresight capacity

8

8.0 Introduction

Often neglected, evaluation of foresight activities has much to offer practitioners and participants alike. In this chapter, consideration is given to how knowledge society foresight might be evaluated for the purposes of learning and accountability. This is followed by a look at the options for building upon knowledge society foresight, in particular, the establishment of 'continuous' foresight through the embedding of a foresight 'culture'.

8.1 How can knowledge about foresight impacts and processes be collected?

To build upon knowledge society foresight, it is important to have sound knowledge of the impacts and processes of such activities. Evaluation is a good way of systematically collating information on the processes and achievements of foresight activities, which can be used for other purposes (dissemination, planning follow-ups, etc). This information is often found to be very useful by those participating in the activity, as well as by those managing it. Evaluations also provide a good opportunity for participants to express their views about what worked and what did not.

The evaluation of foresight has to be designed carefully. It must not be too obtrusive as to disrupt operations and annoy stakeholders; not too cursory as to fail to be useful to the majority of these stakeholders; and must be sufficiently independent to provide a credible and legitimate overview of the activity. Impact evaluations focus on relating achievements to objectives, and a 'logic diagram' (see Box 8.1i) can be useful for thinking about this. Process evaluations are concerned more with practices and efficiency of an exercise, with a view to their improvement.

Evaluation can take place in 'real-time', while the activity is underway, or 'post hoc', when it is completed. Real-time evaluation can provide feedback to those responsible for an activity, so that they are able to identify shortcomings more rapidly and address problems. However, it should be differentiated from the routine monitoring of an activity. The latter is a management task: making sure that tasks are performed on time, reports received when expected and by the relevant people, money is being spent as allocated, etc (see chapter three).

Evaluation, on the other hand, is oriented towards examining whether such tasks are accomplishing their objectives. But it should be borne in mind that the ultimate objectives that foresight is aimed at are mostly long-term ones. Real-time evaluation will be best suited to identifying unfolding processes (many of the processes of interaction between people are hard to identify and assess after the event), and perhaps early impacts (these are most likely to revolve around process issues, e.g. networking, increased orientation of players to long-term futures, etc).

Most evaluations are post hoc, working in hindsight. These are often conducted to provide a 'closure' to the activity, a drawing up of a final balance sheet. Even this is problematic when the ultimate objectives involve effecting very long-term change. An evaluation of this sort, within a few years after the exercise has been initiated, can examine follow-up activities, e.g. the enactment of new policies and programmes, and even the emergence of social and technological innovations. There may be some scope for evaluating such process-type impacts and capability development issues, as an indicator of the extent to which foresight has become 'embedded' in an organisation, sector or community. The problem with attempting such evaluations is one of 'weak signals': developments and outcomes after some time will have been dependent upon a great number of factors, with foresight being just one of them. Moreover, it may be that the part played by a foresight exercise will remain unacknowledged, even if it has actually been catalytic. While this is

problematic for accountability, foresight is at its most effective when meshed with other activities, so a combination of influences is only to be expected.

A wide range of data may be relevant in evaluation. Some of this may be 'by-product' data – records of meeting attendance, press reports, publication lists, etc. But often it will be necessary to generate new data, by surveying people participating in or potentially being influenced by the activity. Examples of the topics which data might be generated include:

- Are there improved linkages? Are participants (especially the stakeholders who might be more peripheral to existing networks) more aware of, and better known by, relevant organisations and experts? Are they involved in meetings and discussion groups, do they have access to sources of knowledge and assistance when faced with problems and opportunities? Such benefits can be assessed by asking participants directly about their experiences, or by examining data on meetings, websites, help lines, etc.
- Have new activities or initiatives been undertaken, and have priorities been shifted as a result of knowledge society foresight? This involves examining what the sponsors of these activities claim, and what the other people involved in collaboration or implementation believe to be the case, how far reference is made to foresight in supporting documents, etc.
- Is there evidence of the creation of a 'foresight culture', with longer-term perspectives being taken seriously by a wider spectrum of actors? Have other bodies undertaken foresight activities of their own, and is there evidence of the results of foresight being discussed within user organisations?

Box 8.1i: *Evaluation relates achievements against the intended objectives: the 'logic diagram' approach*

Step in logic diagram	Relevance to evaluation
Overall policy objectives	Identifying overall mission of organisations sponsoring knowledge society foresight, leading to a specific foresight exercise and a range of other activities. Evaluation focuses on the relationship between these different activities.
Objectives of foresight exercise	The main goals selected for the foresight activities, implicit goals remaining implicit, as well as goals added to the exercise during its operation. Evaluation examines how well all goals have been accomplished.
Main activities pursued in foresight exercise	The exercise will have a number of major activities that are being pursued. **Evaluation** examines how well the activities have contributed to achieving the foresight objectives. **Monitoring**, in contrast, examines the detailed operation of the activities, how far milestones are being met, etc.
Immediate effects	Evaluation examines the extent to which formal outputs have been achieved (e.g. reports produced and circulated, meetings held and attended).
Intermediate impacts	Evaluation, using methods such as interviews and surveys with participants in the projects, with the 'users' of their results, etc., asks questions such as: Have new networks been formed, have people changed their behaviour, have other organisations incorporated foresight methods or results?
Ultimate impacts	Evaluation *will try to identify* effects of the exercise on regional performance as a whole, although effects of diverse foresight and other interventions may be difficult to disentangle.

Source: *Foren, Practical guide to regional foresight, 2001.*

Box 8.1ii: *A foresight programme evaluated*

In the Netherlands, the National Council for Agricultural Research (NRLO) is an independent foresight organisation whose network involves about 800 persons who participate in workshops, brainstorming sessions, panel groups and foresight committees. The main goal of the NRLO as a foresight organisation is to improve the long-term strategic orientation of government, business and research organisations by identifying future challenges, opportunities and strategies at the level of the agricultural sector, the rural areas and the relevant fields of science and technologies. An important aspect of the Council's work is its emphasis on developing appropriate social change strategies for the agricultural sector and the rural areas. The NRLO's foresight programme was started in 1995 and completed in 1999. It focused on three different, but interrelated sectors: agribusiness, rural areas and the fishing industry. The agribusiness exercise was evaluated in terms of its effects and possible longer-term impacts of the process. 35 persons were interviewed, and these interviews indicated three major impacts of the overall foresight process:

1. It contributed to a transition of the agricultural sector, which the respondents felt to be necessary. It has been effective in indicating which innovations are really necessary, the options for research and policy, and the coalitions necessary for the transition.
2. In relation to these coalitions, a major impact of the foresight process was to create an arena in which actors with different interests and positions in the agricultural system could discuss their views, mitigating potential tensions implicit in the crises of the agricultural sector.
3. About 70% of interviewees think that the process contributed to shared visions of innovation in the agricultural system, and indicate that they have increased their network. Innovation strategies and policies have shifted from organisational to inter-organisational strategies.

Some of the respondents were, however, sceptical about the impact of the foresight process. They would rather have had results of the foresight process translated into concrete recommendations for specified actors to follow up. Several respondents wanted the results to be fed into a regular policy trajectory, contrary to the bottom up strategy behind the foresight process. Others felt that, despite the large number of people involved and the efforts of the NRLO to include actors outside the agricultural sector in the foresight process, the results were still too much inward looking.

Source: *Jan de Wilt, Foresight as a social learning process: the NRLO-case*, Paper presented at a meeting of IOFCO, 9 November 2001, Brussels; see also http://www.agro.nl/nrlo/

8.2 How can stakeholders' expectations be managed?

The outcomes desired from knowledge society foresight may vary across actors. Some may hope for a focus on certain types of work, others on particular sectors of the economy or on certain social groups, and so on. Some expectations of outcomes can be unrealistic, in that they will be informed by too optimistic a view of how great an emphasis will be placed on certain issues, how far decision-makers are likely to heed the inputs from knowledge society foresight in dealing with such issues, and how rapidly to expect change.

For these reasons, it is helpful to have a clear notion of the sorts of benefit that can reasonably be expected. This needs to be conveyed as part of the foresight activity. It needs to be communicated by capturing relevant information, and putting it into a form suitable for stakeholders to examine. As the foresight activity proceeds, and better understanding is gained as to what it can and cannot hope to accomplish, there may need to be some modification of these expectations, too.

Gaps in implementation can be very discouraging. These may occur where recommendations have been prepared, but there has been no mechanism to check on their follow-up; and where networks that were working productively have been

allowed to dissolve. This is why this handbook has stressed the need to link foresight to action: fully-fledged knowledge society foresight is not a matter of free-floating visions. It is a participatory process of constructing better understanding of what desirable and feasible futures could be, and how different socio-economic partners need to work together to create them. This is a demanding task, and it cannot be achieved without serious inputs of time and effort from many parties. Perhaps the most crucial message in managing expectations is the following: foresight is not a quick fix.

8.3 How and why could knowledge society foresight become a continuous activity?

A single foresight exercise may inform decisions for a period of time. As well as informing the particular policy need that led to the initiation of an exercise, it can contribute to a succession of subsequent activities, often in marginally related areas. But after a while, there is every chance that reports will be seen as old and of decreasing relevance. The personal links forged in networks may have decayed as people move around within and across organisations. Even the skills acquired for doing foresight may grow rusty through disuse. And, in any case, it is likely that other topics will arise which require longer-term perspectives being brought to bear, and some new foresight will be necessary.

Consequently, some continuous knowledge society foresight activity is bound to be of value. This does not necessarily mean that a full-blown foresight programme should be run on a permanent basis. (This is not inconceivable, as long as plenty of room is built into it for renewal and reorganisation to deal with changing circumstances.) Far more modest things may be achieved, such as setting up a foresight unit, with the task of conducting small-scale foresight exercises or training activities with particular agencies or sets of users on a continual basis. Such a unit could also play a valuable role in organising regular meetings to maintain and reinvigorate the networks set up in the course of an original knowledge society foresight activity, and in providing information and analysis that can help update reports and considerations that such networks may have generated.

In many ways, the critical task is one of fostering a ‘foresight culture’, in which social and economic organisations recognise the relevance of longer-term perspectives, and can engage in knowledge society foresight as and when it is needed. This amounts to embedding foresight, and the development of relevant capabilities, deeply within those organisations with an interest in and responsibilities for living and working conditions and industrial relations. To achieve this ‘decentralisation’ of foresight, it may still be valuable to have ongoing centralised activities of one sort or another. For example, a major foresight exercise organised by the European Foundation for the Improvement of Living and Working Conditions cannot probably be sustained for long periods of time. But such an exercise could be envisaged as taking place every three to five years (or even less frequently if there is a rolling programme of knowledge society foresight, targeting different sectors and/or problems at different times).

Concluding remarks 9

This handbook constitutes an introduction to knowledge society foresight, and should be useful to readers seeking to brief themselves as to what foresight is (and is not). However, it constitutes neither a recipe book nor a toolbox. The reader will not be able to pick and choose a set of techniques and instantly apply them like an expert after reading through it. No one handbook can provide all one needs to know about choosing and implementing particular foresight methods. But the handbook does set out the critical principles and issues associated with knowledge society foresight, so that the reader should be able to understand:

- How and why knowledge society foresight can be used,
- What the different approaches to foresight are,
- When and where they may be appropriate,
- How the local situation has to be taken into account in the design of a foresight process.

Clearly, knowledge society foresight is not a panacea for all related policy problems, or a substitute for established policymaking processes. But the movement towards foresight recognises that, in complex societies, knowledge relevant to longer-term policymaking is typically widely distributed, rather than centralised in government – or even a few academic or corporate – offices. New approaches are required to fuse decision-making with longer-term perspectives and wider networking. In this regard, foresight tools are highly relevant to a fast-changing, knowledge-driven world. They can help policymaking be better informed and more proactive. However, it is necessary to achieve effective links between the technical elements of foresight and its practical application. For this reason, this handbook is intended to inform the strategic use of foresight.

Only through knowledge society foresight practice will knowledge be accumulated, and it is to be hoped that knowledge society foresight experiences are not only initiated, but also evaluated and documented so that practice may be improved. In the meantime, the present authors welcome feedback on readers' experiences in using this handbook, and in taking forward the practice of knowledge society foresight in their own environments.

The handbook is available online and will be updated in light of new experiences and accumulated knowledge. The European Foundation for the Improvement of Living and Working Conditions has funded pilot knowledge society foresight exercises in three EU Member States (Germany, Greece and Finland) during 2002-03. Known as 'Euforia', the project has involved the use of many of the approaches and methods outlined in this handbook. If deemed successful, the project will be scaled-up to cover all Member States. For more information, see http://les.man.ac.uk/PREST/euforia.

Annex A: Foundations of futures and foresight research

Introduction

People make many decisions each day, and the great majority of them refer to future events. Thus, knowing what is almost certain or likely to happen in the future can help people avoid making incorrect decisions and improve the quality of chances for success. In order to succeed in decision-making processes it is not enough to study the past. Foresight research and different kinds of foresight methods are also required. This article is complementary to chapter section 2.2, and chapters four and five in the handbook of knowledge society foresight.

Futures studies and foresight research are still very young fields in comparison with some other disciplines in the field of science. However, strong claims can and are being made about their contribution to improving the efficiency of public and private sector organisations and the quality of their decision-making.

The purpose of this article is to provide some background information on futures studies and foresight research. This article underlines the importance of holding realistic assumptions and expectations about foresight research. For it to be beneficial, the limitations and advantages of foresight research must be understood and accepted. Facing up to the future and the uncertainty that surrounds it in an intelligent and pragmatic way is a critical necessity for today's political decision-makers, business managers and ordinary citizens, alike.

According to Wendell Bell (1997), the basic tasks of futures studies are the following:

1. The study of possible futures,
2. The study of probable futures,
3. The study of images of the future,
4. The study of the knowledge foundations of futures studies,
5. The study of the ethical foundations of futures studies,
6. Interpreting past events and orientating the present,
7. Integrating knowledge and values for designing social action,
8. Increasing democratic participation in imaging and designing the future,
9. Communicating and advocating a particular image of the future.

Bell's list of the tasks of futures studies clearly indicate that futures studies and foresight research should be seen as conceptually broader ideas that are not confined within one scientific discipline. In a way, futures studies can be seen as a 'common knowledge area' of natural and social sciences. Furthermore, futures studies can be understood as a broad methodological 'umbrella', under which researchers can use forecasts made in different disciplines as well as make statistical analyses, perform expert surveys and use other empirical material. A very good book on forecasting tools is J. Scott Armstrong's *Principles of forecasting: a handbook for researchers and practitioners*, (2001). This is a valuable source for all kinds of forecasting activities. There are many other good books available for economic and business-forecasting purposes, such as Elia Kacapyr's (1996) book *Economic forecasting: the state of art*.

Theories of truth, basic concepts and foresight analyses

Decision-makers need foresight research only if there is uncertainty about the future. Thus, there is no need to make a foresight study on whether the sun will rise tomorrow. Many decisions, however, involve uncertainty and, in these cases, formal foresight research may be useful. People try to manage uncertainty in many alternative ways. For example, some buy insurance (leaving the insurers to do foresight analyses), hedge their bets, or use 'just-in-time' systems (which pushes the forecasting problem onto the supplier). Another possibility is to be flexible about decisions.

Foresight analyses can include the element of forecasting. Forecasting is related to the principle of 'what if' or 'what will happen if'. Usually forecasting is confused with planning. Planning is concerned with what the world should look like, while forecasting is about what it will look like. In foresight research both these elements of human knowledge are present. Foresight can include both the activities of forecasting and planning. Planners can use forecasting methods to predict the outcomes of alternative plans. If the forecast outcomes are not satisfactory, planners can revise the plans, then obtain new forecasts, repeating the process until the outcomes are satisfactory. These kinds of processes are typical of pragmatically oriented foresight processes. Forecasting as a part of a foresight process can help people and organisations plan for the future, or at least make informed, rational decisions. It can help in deliberations about policy or decision-making variables.

Much has been said and written about public expectations from within the sciences. Typically science and especially foresight analysis is expected to resolve uncertainty, or reduce the amount of uncertainty. Usually decision-makers also expect that scientists can give definite answers to societal questions. There are simple and one-dimensional questions that can be unambiguously answered by science, such as the effects of smoking on lung functions. Today, however, the majority of urgent social questions or business decisions pertain to complex issues, such as increasing poverty, terrorism, the globalisation of economic activity, climate change and European integration, etc. Such complex issues involve inherent uncertainty. Uncertainty has many political and ethical implications. Hence there is actually a gap between what society in general expects and what science can provide. Therefore, a challenge for foresight research is to try to help decision-makers in analysing and eliminating this gap between science and society.

In the field of science both post-modernism and social constructivism have raised many interesting questions about truth, objectivity and certainty. The main points to come out of these discussions are:

- Science is not a purely objective, value-free activity of discovery. Instead it is a creative process in which social and individual values interfere with observation, analysis and interpretation.
- Knowledge is not equivalent to truth and certainty.

It must be realised that uncertainty is not simply the absence of knowledge. Uncertainty can still prevail in situations where a great deal of information and knowledge are available. Furthermore, new information can either decrease or increase uncertainty. Often new knowledge on complex processes may reveal the presence of uncertainties previously unknown or understated. More knowledge does not mean less uncertainty and vice versa. This is important to understand, especially in the context of foresight research. Heisenberg explained another dimension of the problematic relationship between knowledge and uncertainty. The Heisenberg uncertainty principle sets out that people can not, in fact, obtain all the information that is required, since the act of getting information often changes the phenomena being studied. Thus, no amount of information will ever be able to entirely eliminate uncertainty (see e.g. Heisenberg, 1970) In other words, there are inherent limitations to the reduction of uncertainty. In consequence, the notion that scientific knowledge, including foresight knowledge, is inherently imperfect is becoming more common.

The interest in uncertainty is heightened by the recognition that the world around us is becoming more and more complex. There are different causes for this increasing complexity:

- An increase in scale due to global and international processes increasingly interacting with developments on national and regional scales and vice versa;
- Technological developments in various fields of technology (information and communication technology, biotechnology, material technology, nanotechnology, etc.)
- An acceleration of socio-economic and technological processes, which implies that turnover rates of action decrease.

The resulting social fabric in combination with economic, technological and environmental processes forms a complex system that is beset with new uncertainties. This does not mean that reality is fully indeterminate. Frechtling (1996, p. 6) has noted that there are three basic ways of seeing the future:

1. The future is totally predictable (i.e. unalterable) implying sound forecasts are useless.
2. The future is totally unpredictable (i.e. random) implying sound forecasts are impossible.
3. The future is somewhat predictable and somewhat alterable implying sound forecasts are useful and feasible.

Conventional wisdom in futures or foresight studies is that the third way is the most relevant way to think about future events.

In science, there are three important theories of truth: the correspondence theory, the coherence theory and various versions of the pragmatist theory. According to the correspondence theory, truth is a relation between a belief and reality. In this account, the bearers of truth are considered sentences, statements, judgements, propositions, beliefs and ideas. They are true to the extent that they 'correspond' to reality, the world of facts. A statement of science is a description of a 'possible state of affairs'. It is true if the state of affairs is 'actual' or exists in the 'real world', that is, if it expresses a 'fact'. Otherwise it is false. The fundamental idea behind the correspondence theory is that there is a stable 'real world'. According to the correspondence theory, the purpose of science is to find the stable features of reality.

The truths of the scientific correspondence theory are objective in the following sense (Niiniluoto, 1980, p. 13):

1. The truths concerning the features of an object are independent of the opinions of the researcher.
2. Scientific knowledge arises in interaction between the researcher and the object of study.
3. Truths cannot be based on dogmas, beliefs, revelations, authorities or intuitions. In the final analysis, the source and criterion of knowledge is based on direct evidence concerning the object of study.
4. There is a possibility of reaching truthful knowledge about the object of study and a research community can become unanimous about the quality of the knowledge.

According to Niiniluoto (1987, p. 135) the coherence theory postulates that a judgement cannot 'correspond' to any extra-linguistic reality: truth has to be defined in terms of the relations that judgements bear to each other. Thus, a scientific judgement is true if it forms a coherent system with other judgements. Niiniluoto has claimed that this kind of

theory does not propose an adequate definition of truth.[1] The fundamental problem of the coherence theory is that an evaluator of truth can never be sure that s/he has enough items in her/his list of observed truths.

The third major theory of truth is pragmatism. Niiniluoto (1987, p. 136) has postulated that pragmatists think that it is not meaningful to speak of truth and reality as divorced from human practical and cognitive activities. Consequently, the reality as such of the correspondence theory is replaced by reality for us (truth-as-known-by-us). Truth is defined in terms of the results of human knowledge seeking. A true statement means the same as 'proved', 'verified', 'warranty asserted', successful', or 'workable' in practice, the ideal limit of scientific inquiry. A strong formulation of the pragmatist programme is made by Jürgen Habermas who states: 'the ideal consensus is reached in 'free' or 'undistorted' communication' (Habermas, 1984).

It is obvious that the possibilities of achieving objective knowledge concerning the future are limited, if one accepts the criteria of objectivity given by Niiniluoto (1980) above. Truths concerning the future are often not independent of the opinions of the researcher, because the researcher can still have an impact on decisions which shape the future. Actually, a foresight researcher cannot have direct contact with the object of the study in the future. The contact is always based on the echoes of the past or on the current situation. It is important to notice that many scientific objects in the past are only indirectly attainable in the present. (Kuusi, 1999)

In the world of human beings, norms, dogmas, revelations, authorities and intuition have some role in shaping future events. In a similar way they are also important in explaining the past. It is seldom possible that the scientific research community can become totally unanimous regarding knowledge about the future because it is 'unfinished'.

If the unfinished nature of the future, or the role of beliefs in the process of its formation is considered to make foresight research unscientific, then very many explanations of historical studies made by historians are equally unscientific. Wendell Bell (1997, pp. 140-157) presents the basic assumptions of futures studies in the following way:

1. Time is continuous, linear, unidirectional and irreversible. Events occur in time before or after other events and the continuum of time defines the past, present and future. ('The meaning of time' assumption)
2. Not everything that will exist has existed or does exist. ('The possible singularity of the future' assumption)
3. Futures thinking is essential for human action ('Futures thinking and action' assumption)
4. In making our way in the world, both individually and collectively, the most useful knowledge is knowledge of the future. ('The most useful knowledge' assumption)
5. The future is non-evidential and cannot be observed: therefore there are no facts about the future. ('Future facts' assumption)
6. The future is not totally predetermined. ('Open future' assumption)
7. To a greater or lesser degree future outcomes can be influenced by individual and collective action. ('Humans make themselves' assumption)

[1] In ordinary logic, the condition that a sentence A is compatible with a consistent set X of true sentences is not sufficient to guarantee the truth of A. Still, this condition is necessary for the truth of A. Otherwise, one contradicts the rule of logic that X&A cannot be true at the same time as Y & -A. Thus, according to Niiniluoto, compatibility is not enough for the truth, because it may happen that neither A nor -A follows from X.

8. The interdependence of the world invites a holistic perspective and a transdisciplinary approach, both in the organisation of knowledge for decision-making and in social action. ('Interdependence and holism' assumption)
9. Some futures are better than others. ('Better futures' assumption)

These nine key assumptions are relevant for foresight research, too. The list is useful because it reminds us that there are some general starting points in futures studies and/or foresight research.

Bell has also presented three additional general assumptions, which are widely shared by many scholars in the field of futures studies and also in other disciplines. These general assumptions are (Bell, 1997):

1. People are creative project pursuers: they are acting, purposeful and goal-directed beings. ('People and their projects' general assumption 1).
2. Society consists of the persistent patterns of repetitive social interaction and the emergent routines of human behaviour that are organised by time and space, expectations, hopes and fears for the future and decisions ('Society as expectation and decision' general assumption 2).
3. An external past reality did exist and a present reality does exist, apart from the human knowing of them, and in principle they can be objectively known by humans more or less accurately. Additionally, futurists assume that a future reality will exist; apart from the human consciousness of it, and in principle assertions can be made about it that can be objectively warranted more or less accurately. ('The existence and knowledge of external reality' general assumption 3).

These general assumptions are necessary for carrying out the futurist enterprise that is shared by many other scholars and scientists. In this sense futures studies can be seen as a science, because these assumptions are special characteristics of futures or foresight studies (see e.g. Beckwith, 1984; Malaska 1995). Masini has noted though that whatever has an experiment that is repeatable and verifiable is considered scientific. In referring to or examining the future, one refers to or examines something that has yet to occur and which therefore, cannot be verified nor repeated. (Masini, 1993, p. 23).

On the other hand, in the social sciences, it is not easy to conduct experimentation. In the natural sciences, experimentation can be more easily organised. Olaf Helmer (1983) has noted that in futures studies one can speak of pseudo-experimentation, i.e. experimentation through models or simplified representations of reality. This methodology of pseudo-experimentation has been used in many different sciences, for instance in the political sciences, biology, psychology and economics.

On the other hand, many scholars think that futures studies is an art, which requires a creative mind, intuition, imagination, insight and spiritual understanding.

Some futurists seem to take a somewhat intermediate position and postulate that futures studies is something between science and art (see e.g. Hahn, 1985; Coates, 1987, p. 133; Amara, 1981a, 1981b).

Some key concepts relevant in foresight research

Roy Amara has specified the paradigmatic features of futures research in the following three statements (Amara, 1981):

1. The future is unpredictable. From this thesis follows that conceptions of future should be based on the description of possible paths of development. 'What is possible/feasible?' is the key question in future and foresight studies.
2. The future is not predetermined. From this thesis it follows that the possible alternatives of future and paths to them have to be studied carefully: 'What is probable?' is the key question in futures and foresight studies.
3. Choices have an impact on the future. From this it follows that choices should be made between alternatives, and the realisation of the paths to the selected alternatives should also be studied. 'What is desirable?' is the key question in future and foresight studies.

A further key question can be added to this list.

4. In the societal discussion, one important aspect of decision-making is related to the different kinds of interests of people. People see the importance of things in different way. 'What are the important issues in the future?' is a key question in future and foresight studies.

Thus, it can be concluded that in many futures and foresight studies it would be useful to analyse the:

- Feasibility of future events,
- Probability of future events,
- Desirability of future events,
- Importance of future events.

Futures studies have always worked with three problem fields: the probable, the possible (feasible) and the desirable futures. They naturally demand somewhat different methods. The Copenhagen Institute for Futures Studies has summarised, on the basis of Roy Amara's ideas, the synopsis of the field of futures studies in Table 1 (The Copenhagen Institute for Futures Studies, 1996, p. 8; Amara 1981a, 1981b):

Table 1: *Synopsis of the futures studies* (The Copenhagen Institute for Futures Studies, 1996, p. 8)

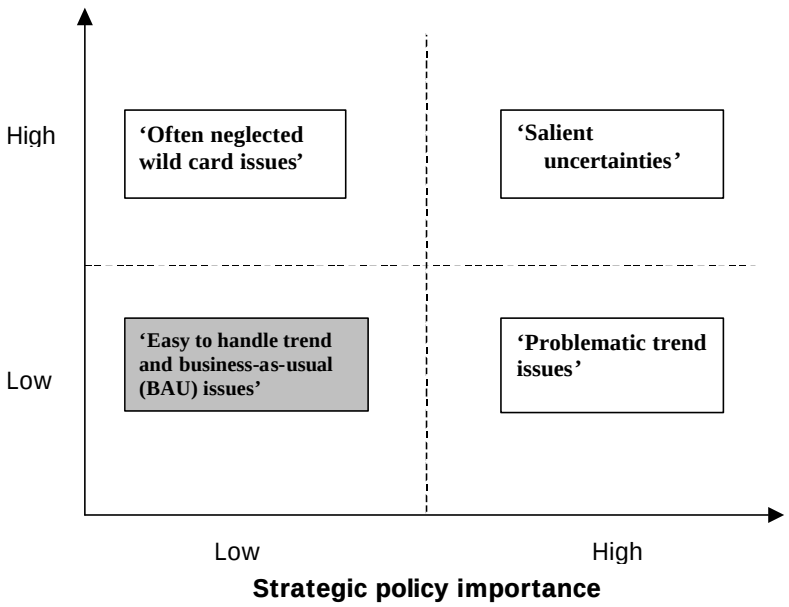
	Possible	**Probable**	**Desirable**
Goal	Open up Wake Stimulate	Analyse Evaluate Systematise	Preparing preferences Winning support Supporting choice
Roles	Driven by images Visions	Driven by analysis	Driven by values
Tools	Realisable	Structural	Participation-oriented
Agents	Visionaries Geniuses Writers Futurists	Analysts Methodologists Futurists	Charismatic leaders Social reformers Writers Futurists
Organisational form	None or one-person dominated Think tank	Think tank	Lobby group Idea organisation Businesses Companies

Actually, it is not easy to analyse these basic questions of the future. Therefore it is useful to create a larger picture of futures issues and challenges. As already noted, Masini has underlined the importance of the key concepts of futures studies. Masini (1993, p. 17) has postulated that the special characteristics of futures studies are that it is trans-disciplinary, complex, global, normative, scientific, dynamic and participatory. Below these concepts are defined by carefully following Masini's definitions, except for the scientific concept, which was already discussed in the previous section.

In foresight studies, it is important to reserve enough time to interpret outlined foresight analyses. In the following sections, the four-dimensional maps can be used in the interpretation and classification of obtained foresight results. Some issues are very easy to handle (the shaded boxes), while others are very problematic (the white boxes), and some issues occupy a middle ground between easy and difficult to handle (the dark boxes).

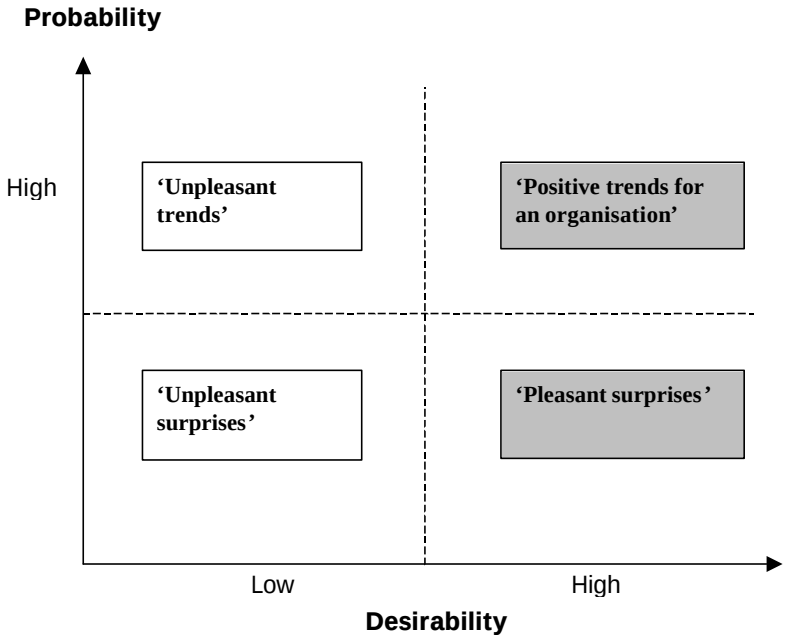
Firstly, in foresight studies it is always important to discuss the strategic importance of analysed issues. In Figure 1, four critical dimensions of uncertainty and strategic organisational importance are illustrated. For an organisation making foresight analyses, it is important to evaluate the strategic implication of different issues. Figure 1 may help an organisation to discuss evaluated issues critically.

Figure 1: *Uncertainty in a strategic organisational importance map*



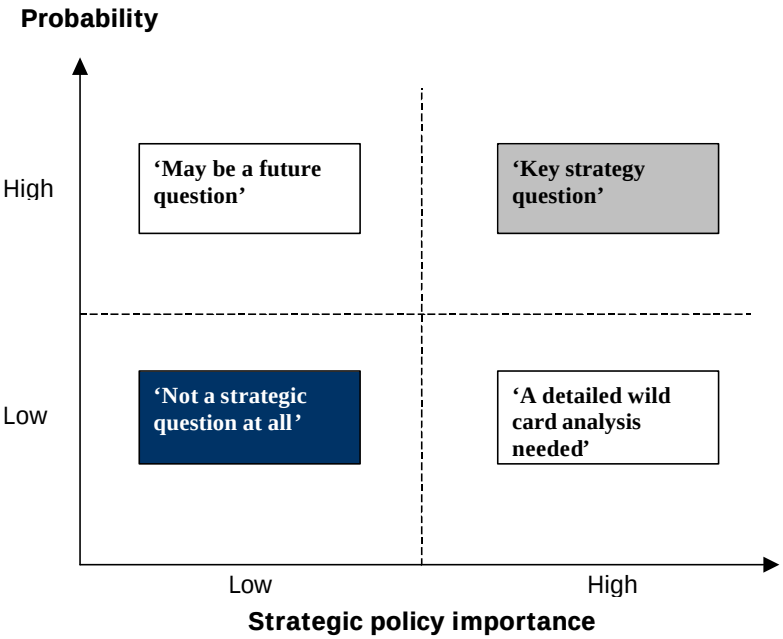
Secondly, desirability and probability are typical basic dimensions in foresight studies. In Figure 2, four critical dimensions of desirability and probability are illustrated. Figure 2 may help an organisation to discuss an evaluated issue critically, if the foresight analyses provide information on desirability and probability.

Figure 2: *Desirability-probability map*



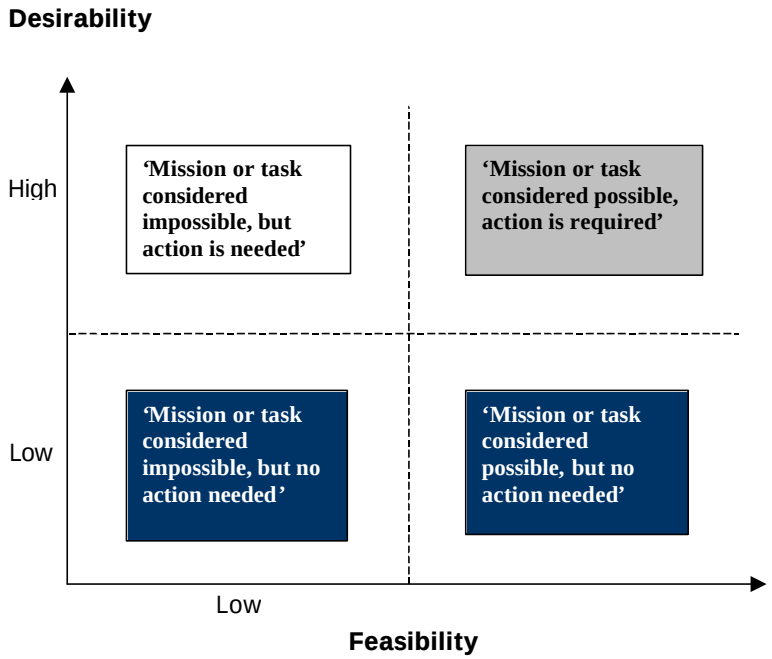
Thirdly, probability and strategic importance are typical basic dimensions in foresight studies. In Figure 3, four critical dimensions of probability and strategic importance dimensions are illustrated. Figure 3 may help an organisation to discuss evaluated issues critically, if the foresight analyses provide information based on probability and strategic importance.

Figure 3: *Probability-strategic importance map*



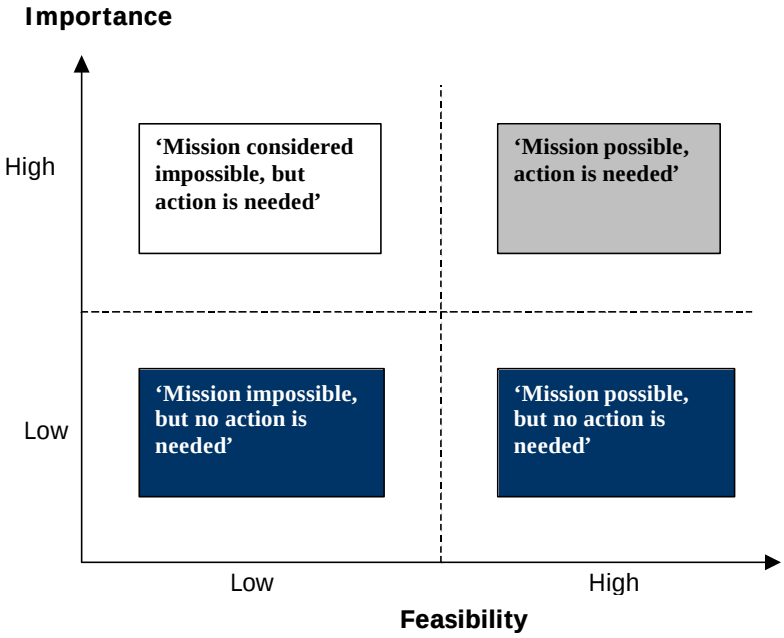
Fourthly, desirability and feasibility are typical basic dimensions in foresight studies. In Figure 4, four critical dimensions of desirability and feasibility dimensions are illustrated. Figure 4 may help an organisation to discuss evaluated issues critically, if foresight analyses provide information based on desirability and feasibility.

Figure 4: *Desirability-feasibility map*



Fifthly, strategic importance and feasibility are basic dimensions in foresight studies. In Figure 5, four critical dimensions of strategic importance and feasibility dimensions are illustrated. Figure 5 may help an organisation to discuss evaluated issues critically, if foresight analyses provide information on strategic importance and feasibility.

Figure 5: *Strategic importance-feasibility map*



Futures studies as now practised by many futurists encompasses scientific activity. That is, nearly all futurists make some knowledge claims and try to give some objective reasons for them, which in the broadest sense of the term is 'science'.

Complexity is connected to a trans-disciplinary approach. The concept of complexity refers to issues of content. The content of futures studies and foresight analyses is clearly complex. That is why trans-disciplinary and multidimensional approaches are essential in foresight analysis. It is especially important to understand the concept of complexity in relation to foresight research, particularly how it is related to uncertainty. The more complex a problem is, the greater the level of uncertainty. The more variables required to describe a problem, the greater the level of uncertainty. The more the future of a problem is deterministic, the less uncertain it becomes. The more possibilities the future of the problem has, the greater the level of uncertainty involved. (Masini, 1993, pp. 19-20).

The future of the knowledge society is a typical example in this sense: it is a complex problem. Many studies of the future have focused on the possibility of managing complexity. This is an extremely difficult task since complexity constantly increases. Donald Michael (1973) noted already at the beginning of the 1970s that futures studies should contribute by teaching us to live in complexity and with complexity rather than to manage complexity. Complexity is a positive quality of reality, but it can be seen as a limitation in relation to the management of human systems. It is also important to understand that in different cultures and societies time and space are seen in different ways. Sohail Inayatullah has called this phenomenon 'a cultural interpretative mode', which is one way to see issues of complexity (Inayatullah, 1990).

The global concept is also related to the trans-disciplinary approach. The space and time between people is diminishing because of the enormous and rapid changes taking place in transport, mass communication and information and communication technologies. Hence questions on globalisation should not only consider technological or economic processes. Added to those should be cultural coherence, multiculturality and the tolerance of difference. Thus many of today's and tomorrow's problems have to be seen at a global level. However, many consequences and solutions to global problems are actually local and regional or national. Also in different societies solutions and problems may vary. Similarly, problems may emerge as local, regional or national, for example economic crisis in a country X, can become global because of the networks and interdependence with other nations, regions and continents. Such an example occurred in the events surrounding the September 11 crises.

Local crises have already had enormous impacts on the whole world. Today it is important to understand the consequences of globalisation. Globalisation has led to a situation where most of the societies in the world with all their dimensions (economy, technology, politics, culture etc.) belong to a system that has global interactions. Regional processes like European integration happen concurrently and form an intermediate phase as well as being a part of the globalisation process. Foresight research is a powerful research tool in this sense. (Masini, 1993, pp. 20-21). Globalisation is also accompanied by regionalisation (the European, American and Asian blocks, for example) and fragmentation, the desire to be independent like the nations of the former Soviet Union. At best globalisation processes offer improved possibilities to learn from different cultures and to live peacefully in a global multicultural community. However, conflicts between cultures and nations also remain possible.

In futures studies, the normative concept is considered in slightly different terms to how it is generally considered in the social sciences, where norms are considered as codes of behaviour related to values. In the field of futures or foresight studies it indicates the relationship of these studies to specific values, desires, wishes or needs of the future. For example, in futures studies, extrapolative studies are related to knowledge of the past and the present, from which one looks into the future. On the other hand, normative studies are proposals for action or for postulating a future. Having a normative concept means that futures studies will often search for transition paths from the present to the future or analyse such transitions occurring in the present, and work out how to realise or prevent something happening. Finally futures studies

and foresight analyses are very often value-loaded, hence they are normative, although futures studies can include very strong positivist and hermeneutic starting points. (Masini, 1993, pp. 21-23).

The dynamic concept refers to the fact that no other discipline is required to change, in relation to changes in reality, as much as a futures study is. Kuusi (1999) has underlined the importance of variance and invariance concepts in the field of futures studies. The invariant behaviour of non-learning beings means it is possible to make deterministic predictions about the future behaviour of these beings. A weaker form of this type of prediction is a prediction based on the assumption that some learning beings will mostly behave as they always behave. In contrast the learning capacity of human beings makes forecasting and foresight studies a very dynamic area of scientific inquiry. In different societies the capacity and capability limits of learning of different people are interconnected. To understand that interconnection, it is important to understand how different kinds of experts analyse data, information and knowledge. Osmo Kuusi has postulated the classification of experts about the future in the following way. (Kuusi 1999, p.36)

Table 2: *Three types of scientific expertise about the future*

Expert type	Types of expertise
Scientists	Knowledge on invariance: permanent invariance: the criteria of sameness of non-learning beings
Decision-makers	Real and perceived capacity limits; perceived interests and routines, real and perceived capability limits
Synthesisers	Relevant variance and invariance, relevant capacity limits, relevant interests and relevant capability limits

Thus, traditional scientists can usually provide very useful forecasts and predictions concerning non-learning beings. In addition, the behavioural sciences have tried to find invariance in learning beings and their empirically supported criteria of sameness, learning possibilities (for example memory), capacity limits, interests and capability limits of behaviour. Thus, learning characteristics of human beings make forecasting difficult.

According to this expert classification decision-makers are those actors who have a large supply of relevant resources (wide capacity limits) and relevant interests. Usually these kinds of actors want to widen their capacity limits to achieve different targets or to promote certain economic or political interests. A decision-maker's power to shape the future depends on his/her expertise and on the interests and decision-making routines of other relevant decision-makers. However, no decision-maker can change a genuine invariance.

The third group of experts is synthesisers. These people are usually experts with regard to matters of policy. Their ability to make good syntheses means that they are able to understand which variances, capacities and decisions are the most important ones, and how they can anticipate the interplay of factors that shape the future.

Usually it is best to use all these different kinds of experts in foresight studies in order to manage dynamic issues, as different kinds of experts can make complementary analyses during the foresight process.

A further crucial part of futures studies and foresight processes is participation. It is also part of the continuing debate on whether futures studies are scientific or not. Participation as a specific characteristic of futures studies and foresight processes is based on the values of democracy and the participation of citizens in decision-making. It is a characteristic that at this point in the development of futures/foresight studies is highly utopian because there is a strong fear of authoritarianism. (Masini 1993, p. 26)

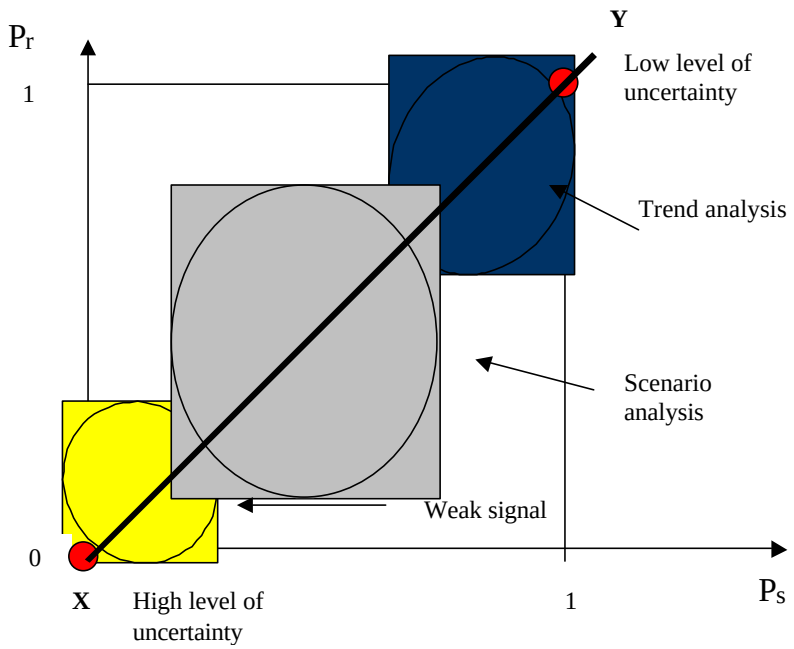
Decision-making and foresight research

As stated before, in reality people cannot predict events with 100% accuracy, or even say what the probability of an event X in the future is. They can give subjective probability estimates. In economics, engineering and psychology, the probability concept as the formal representation of uncertainty can be dealt with in a mathematical manner. Probability though is not uniquely defined. The most frequently used probabilistic approach in the field of social analysis is the Bayesian approach, in which probabilities are interpreted as subjective 'degrees of beliefs'. This approach is often used in futures and foresight analyses, where the analyst or a group of experts considers a particular value for the different variables. (Savage, 1962; Marshak,1965). Probability-based methods thus give an indication of the likelihood of outputs dependent on the subjective likelihood attached to the uncertainty model input or parameters. Probability-based methods only address uncertainty in model quantities and ignore uncertainty in model structures.

Following on from that, if people could make well-defined predictions, they would be always on a line X-Y, as shown in Figure 6, where subjective probability equals real probability (Ps = Pr). People and decision-makers are usually outside of the line X-Y, where Ps ≠ Pr. The effect of this is that agents are usually too pessimistic or too optimistic. Therefore it is rational to make foresight studies when agents are rationally grounded. The introduction of a debate around wild cards and weak signals can foster lateral thinking, which can help decision-makers evaluate different aspects of a decision and business environment. The objective of foresight methodologies is to create a convergence of the belief in the subjective probabilities held by different individuals on a particular subject. The end result of this type of discussion is that the overall subjective probability should get closer and closer to the real probabilities of the external world, i.e. it is a learning process.

Conceptually speaking, typical foresight systems (trend analysis, scenario analysis, weak signal analysis) can be seen as part of organisational intelligence, which serves knowledge creation in an organisation. Typical aspects, which are relevant for futures oriented decision-making, are probability, feasibility, desirability and validity (see e.g. Amara, 1981; Rubin & Kaivo-oja, 1999). And this is the link between positive knowledge and normative intent. Knowledge increases the capability to mobilise attention and effort within an organisation and, in the end, the ability to undertake correct action (see Figure 6).

Figure 6: *Subjective probability, real probability and foresight analysis tools*



In this case, and specifically building on the weak signal approach, a list of proposals can be derived to answer questions about the policies, which could be put in place in order to manage unforeseen events, as well as the desirability and expected effectiveness of these measures. Figure 6 illustrates the first step in linking the first component of the wild-card system introduced above to concrete action. When a list of wild cards is identified and interpreted, they serve as a basis on which a conscious decision about action or inaction is made. The probability that a true, real world wild card appears in such a list approaches zero, but the process of building such a list is not neutral for the future. Listed wild cards and their interpretations can provide the basic notes and chords for strategic innovation (see e.g. Petersen, 1999). When a decision is to be made, the practice of improvisation, which relies on bias for action, can be helpful.

Summary

This article has discussed some important issues which are usually an essential part of futures studies and foresight research. As a research area it is understood to study the present and the past in order to present well-argued scientific assessments of the future. Usually the purpose of these arguments is to offer a basis for organisational decision-making and societal planning. Additionally futures studies are usually a basis for more general discussion and activities, which take place in the present. There is normally an empirical element to futures studies, although futures issues are studied from a multidisciplinary viewpoint with the aim of building or highlighting well-founded future development paths for society on the basis of empirical and theoretical research. In consequence, futures studies can be seen as an area of scientific research, but very often it includes characteristics of art in its creative process.

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Annex B: Seeking foresight intelligence: knowledge management challenges and tools in foresight research

Introduction

One can easily disagree whether knowledge can be managed in today's knowledge intensive society. Knowledge is largely cognitive and highly personal, while management involves organisational processes. Many knowledge workers do not like to be managed in the traditional sense. However, knowledge is increasingly recognised as a crucial organisational resource and a key variable in the activities of a knowledge economy. Knowledge is considered the most strategically important resource, and learning the most strategically important capability for successful organisations.

Often the basic motivation of foresight research is to know something in an organisation that uniquely complements newly acquired knowledge, providing an opportunity for knowledge synergy not available to its competitors. New knowledge is integrated with existing knowledge to develop unique insights and create even more valuable knowledge. This means that organisations should therefore seek areas and forums of learning and experimentation that can potentially add value to their existing knowledge synergistic combination. Foresight and efficient knowledge management are complementary activities.

Knowledge management is too important to be left to chance in foresight research. In a general sense, knowledge management can be defined as the explicit and systematic management of vital and important strategic knowledge and its associated processes of creating, gathering, organising, diffusion, use and exploitation. It requires turning personal knowledge into organisational knowledge that can be widely shared throughout an organisation and appropriately applied.

This article analyses the role of knowledge management in successful foresight activities. This article is complementary to the chapter section 2.3 and chapter 3 in the handbook of knowledge society foresight.

Basic challenges of foresight intelligence

What are the basic challenges of foresight intelligence? Knowledge management in foresight projects typically have one or more of the following activities:

- Appointment of a knowledge leader – to promote the agenda, develop a framework for foresight data, information and knowledge;
- Creation of knowledge teams in foresight project. People from all disciplines develop knowledge management methods;
- Development of knowledge bases – best practices, expert directories, market intelligence etc., which are relevant for foresight activities;
- Active process management – of knowledge creation, gathering, storing etc;
- Knowledge and data centres for foresight activity – focal points for knowledge skills and facilitating knowledge flow;
- Collaborative technologies – Intranets or groupware for rapid information access;
- Intellectual capital teams – to identify and audit intangible assets such as knowledge;

- Knowledge webs – networks of experts who collaborate across divisions;
- Shareware – occasions and locations that encourage knowledge exchange in various networks and planning processes, which are part of foresight activity.

One crucial challenge in the knowledge management of foresight activities is that information technology needs to be integrated into foresight processes, especially the planning process and networking process. This requires that systems cut across different organisational divisions, which is usually solved by using different kinds of collaboration tools to create integrated knowledge management systems. The integration between information technology and planned foresight processes does not happen automatically. The integration requires a knowledge management strategy for foresight study. Sometimes knowledge management strategies can be very simple but sometimes, in larger foresight projects or systems, more complex knowledge management systems are needed.

In foresight research, when knowledge is used intensively, it creates more added value for the stakeholders. The more knowledge is used, the more valuable it becomes, creating a self-reinforcing cycle. Very often, knowledge is only as good as the organisation's ability to share the learned things. According to Michael Zack (1999), organisations that can manage knowledge effectively:

- understood their strategic requirements,
- devised a knowledge strategy appropriate to the organisation's strategy,
- implemented an organisational and technical architecture appropriate to the knowledge processing needs of the organisation,
- applied maximum effort and commitment to creating, explicating, sharing, applying and improving their knowledge.

If one thinks of critical issues within foresight intelligence, the contexts of knowledge management are important. Knowledge architectures exist within primary contexts that influence the impact that knowledge management will have on the organisation's performance. Usually strategic context addresses an organisation's intent and ability to exploit its knowledge and learning capabilities better than its competitors (Hamel and Prahalad, 1989; Prahalad and Hamel, 1990; Roth, 1996). On the other hand, knowledge context addresses the competitiveness of an organisation's knowledge. Existing knowledge can be compared to what an organisation must know in order to execute its strategy. In this sense it is important to discover what is known and, especially, what is not known inside a foresight project and network. Where there are current or future knowledge gaps, knowledge management efforts should be directed towards closing them, assuring a strategic focus.

The organisational context reflects the organisation's role and structure, both formal and informal, as well as the socio-cultural factors affecting knowledge management, such as culture, power relations, norms, reward systems, and management philosophy. Effective knowledge creation, sharing and leveraging requires an organisational climate and reward system that values and encourages cooperation, trust, learning and innovation, and that provides strong incentives for engaging in those knowledge-based roles, activities and processes. Usually these kinds of aspects can be major obstacles to effective knowledge management (Zack, 1999).

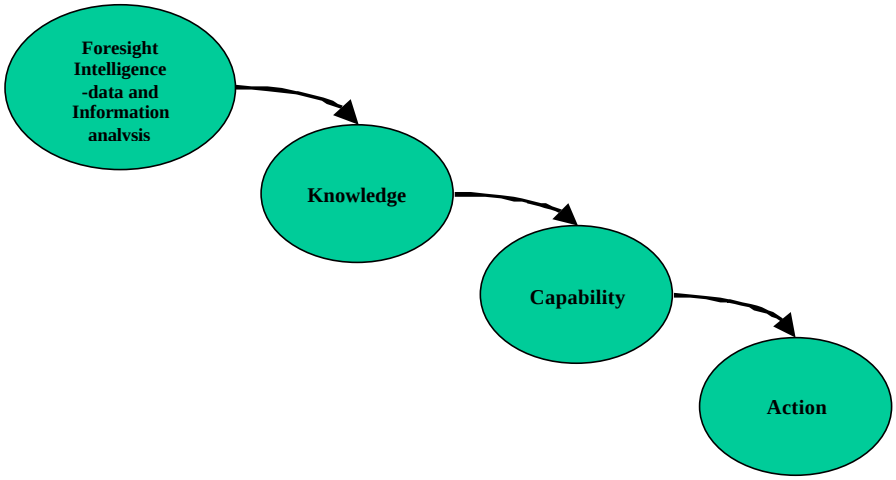
The technology context or technological architecture addresses the existing information technology infrastructure and capabilities supporting the knowledge management architecture. Many experts estimate that knowledge management is 10% technology and 90% human relations. However, without the ability to collect, index, store and distribute explicit knowledge electronically and seamlessly to where it is needed when it is needed, the organisational capabilities in incentives will not be fully exploited (Zack, 1999). This is a relevant point in the context of foresight research, because

the knowledge, insights, understanding and practical know-how that all people possess, is the fundamental resource that allows humans to function intelligently. Knowledge is one, if not the most, important factor that makes personal, organisational, and societal intelligent behaviour possible (see e.g. Hamel and Prahalad, 1994; and Hamel, 2000).

Tools for knowledge management

In foresight studies the basic idea of research is to have special foresight intelligence, which leads to knowledge. Knowledge is the precondition for capability, which leads humans to action. (See Figure 1)

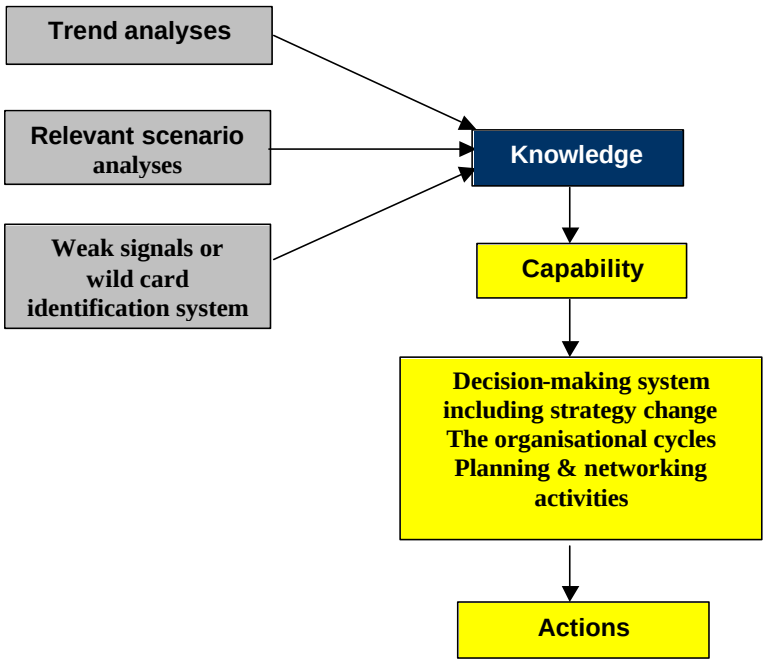
Figure 1: Foresight intelligence as a generator for selective action (a modification of Tuomi, 1999, p. 122)



It is important to examine how foresight intelligence is used in the knowledge management process. It is especially important to connect foresight intelligence and produced knowledge to capability training and action oriented processes.

Usually in the planning process it is useful to analyse three highly relevant things: (1) global trends, (2) relevant scenario families and (3) wild card factors or weak signals. In this case, the planning process has the following structure for decision-making (Figure 2):

Figure 2: *The foresight intelligence system*



According to Bryson (1995, p. 23), the strategy change cycle has 10 critical steps. The 10 steps are as follows:

1. Initiate and agree upon a strategic planning process.
2. Identify organisational mandates.
3. Clarify organisational mission and values.
4. Assess the organisation's external and internal environments to identify strengths, weaknesses, opportunities and threats.
5. Identify the strategic issues facing the organisation.
6. Formulate strategies to manage these issues.
7. Review and adopt the strategic plan or vision.
8. Establish an effective organisational vision.
9. Develop an effective implementation process.
10. Reassess strategies and the strategic planning process.

As part of the strategy process in foresight studies, it is important to identify input, outputs and by-products of the knowledge management process. In Table 1, typical inputs, outputs and by-products of foresight/futures studies are outlined.

Table 1: *Description of inputs, outputs and by-products* (Mendonca, 2001, p. 98 with additional remarks by the author)

Inputs	Outputs	By-products
Data	Scenario reports	Books
Hunches and informed guesses	Tacit scenario-building knowledge	Articles
Tacit knowledge	Statistical trend information and knowledge	Workshops
Multi-disciplinary expertise	Workshops and training	Planning documents
Simulation models and other planning models	New managerial perspectives	Plans
Reports, articles, surveys, books	Creation of networks	Vision, mission and strategic development programmes
Planning expertise Other futures studies methods (Delphi, Trend analysis, Regression analysis, Expert interviews, Brainstorming, Weak signal/Wild Cards analysis, Simulation analysis, S-curve analysis)	Quantitative and qualitative analyses Direct action based on inputs	Consultancy spin-offs Indirect action based on inputs

Data mining

Data mining can be an important part of the knowledge management process. Data mining is the automated extraction of hidden predictive information from databases.

Usually data mining is used at the beginning of the foresight process, but sometimes it can be a central part of the entire foresight research. Data mining tools predict future trends and behaviours, allowing decision-makers to make proactive, knowledge-driven decisions. The automated, prospective analyses offered by data mining move beyond the analyses of past events provided by retrospective tools typical of decision support systems. They answer business questions that traditionally were too time consuming to resolve, scour databases for hidden patterns, find predictive information that experts may miss because it lies outside their expectations.

Data mining is a large area of expertise and the typical knowledge mining issues related to data mining are:

- Development of data warehousing and databases
- Web mining
- Data analysis and data mining on large databases
- Data mining methodologies
- Knowledge discovery and data mining

- Fraud detection
- Neural networks
- Decision trees
- Genetic algorithms
- Parallel processing techniques
- Applications in different fields of science
- Visualisation in data mining
- Clustering and classification techniques
- Tools for pattern discovery
- Text mining, structure mining and context mining
- Financial credit scoring
- Case studies

In this article it is impossible to provide detailed insights into data mining methods. There are many good information sources for those people who are interested in using data mining techniques as part of foresight activity. Some basic material which can be recommended includes:

- Tufte's *The visual display of quantitative information* (1983)
- Tufte's *Visual explanation: images and quantities, evidence and narrative* (1997)
- Berthold's and Hand's *Intelligent data analysis: an introduction* (1990)
- Wildbur's and Burke's *Information graphics* (1998)
- Bishop's *Neural networks for pattern recognition* (1995)
- Berry's and Linoff's *Data mining techniques: for marketing, sales and customer support* (1997)
- Berry's and Linoff's *Mastering data mining* (1999)
- Edelstein's *Introduction to data mining and knowledge discovery* (1999)
- Hastie's, Tibshirani's and Friedman's *The elements of statistical learning: data mining, inference, and prediction* (2001)
- Delmater's and Hancock's *Data mining explained* (2001)
- Clegg's *The professional's guide to mining the Internet: information gathering and research on the Web* (2001)

Problem-solving techniques in foresight studies

Very often decision-makers face complex problems and challenges. Futures oriented decision-making requires both elements of science and art. Creative problem solving and innovation techniques can help decision-makers in very complex decision-making situations. A typical way to see the creative problem process is to:

1. Analyse the environment in question
2. Recognise a problem
3. Identify a problem
4. Make assumptions
5. Generate alternatives
6. Choose from among alternatives
7. Implement decisions
8. Control the output of the decision-making process.

Most strategists believe that organisations must be prepared to respond quickly to problems and opportunities in order to be successful in the future. Thus, being able to recognise problems and opportunities as soon as they occur, or even before they occur, is vital to success. Techniques for analysing the environment that are used in many foresight studies are:

- Benchmarking (Camp, 1989; Port and Smith, 1992; Pande, Neuman and Cavanagh, 2000)
- Best practice analysis (Higgins, 1994, p. 37)
- Phantom competitor analysis (Johnston, 1988)
- Speed reading (Buzan, 1989)
- Trend analyses (Armstrong, 2001)
- Weak signal monitoring (Mendonca, Cunha, Kaivo-oja and Ruff, 2002)
- Environmental scanning (Mendonca, Cunha, Kaivo-oja and Ruff, 2002)
- Opportunity searches (Higgins, 1994, p. 38).

One can easily study these methods by reading Higgins's guidelines (Higgins, 1994, pp. 36-38). In the foresight process one needs to be aware that a problem or opportunity exists before it can be solved or taken advantage of. Techniques for recognising problems, which are used in many foresight studies, are:

- The camelot method (Higgins, 1994, p.40)
- Checklists (Husch and Foust, 1987)
- Inverse brainstorming (Small Business Report, 1984)
- Limericks and parodies (Higgins 1994, pp. 40-41)

- Listing complaints (Skagen, 1991)
- Responding to someone else (Stone, 1988)
- Role playing (Higgins, 1994, pp. 41-42)
- Suggestion programmes (Mortia, Reingold and Shinonrma, 1987)
- Workouts and other group approaches (Creative Group Techniques, 1984).

One can easily study these methods by reading Higgins's guidelines (Higgins 1994, pp. 38-42).

The problem identification stage involves making sure that efforts will be directed toward solving the real problem rather than merely eliminating symptoms. This stage also involves establishing the objectives of the problem-solving process and determining what will constitute evidence that the problem has been actually solved. Often the outcome of this stage is a set of decision criteria for evaluating various options. Techniques for identifying problems used in many foresight studies are:

- Bounce it off someone else (Higgins, 1994, p. 44)
- Consensus building (Higgins, 1994, p. 44)
- Draw a picture of the problem (Higgins, 1994, p. 44)
- Experience kit (Mattimore, 1991)
- Fishbone diagram (Majaro, 1988)
- The king of the mountain (Higgins, 1994, p. 48)
- Redefining the problem or opportunity (Higgins, 1994, pp. 48-49)
- Rewrite objectives in different ways (Higgins, 1994, p. 49)
- Squeeze and stretch (Higgins, 1994, pp. 49-50)
- What do you know? (Higgins, 1994, p. 51)
- What patterns exist? (Higgins, 1994, p. 51)
- Why-why diagram (Higgins, 1994, pp. 51-53)

One can easily study these methods by reading Higgins's guidelines (Higgins 1994, pp. 43-53).

It is necessary to make assumptions about the conditions of future factors in the problem situation. For example, what will the state of knowledge society development be at when new policies are launched? One function of the foresight research is to provide realistic assumptions for the decision-making processes. A technique for making assumptions which is used in many foresight studies is:

- Assumption reversal (Michalko 1992; Higgins 1994, pp.54-55).

One can easily study this method reading Higgins's guidelines (Higgins, 1994, p.54).

Generating alternatives involves cataloguing the known options and generating additional options. It is at this stage that the majority of the creativity processes are most helpful. Individual techniques for generating alternatives, which are used in many foresight studies are:

- Analogies and metaphors (Higgins 1994, pp.61-63)
- Analysis of past solutions (Higgins 1994, p.64)
- Association (Higgins 1994, pp.64-66)
- Attribute association chains (Mattimore 1988, Higgins 1994, pp.66-67)
- Attribute listing (Higgins, 1994, pp.67-70; Whiting, 1955)
- Back to the customer (Higgins, 1994)
- Back to the sun (Higgins, 1994, pp.70-71)
- Circle of opportunity (Higgins, 1994, p.71; Michalko, 1991, pp.181-188)
- Computer programmes (Higgins, 1994, pp.72-74; Brody, 1990)
- Deadlines (Higgins, 1994, p.74)
- Direct analogies (Higgins, 1994, pp.75-77)
- Establish idea sources (Higgins, 1994, p.78)
- Examine IT via the senses (Higgins, 1994, pp.78-79)
- The FCB grid (Higgins, 1994, pp.79-82)
- The focused-object technique (Higgins, 1994, pp.82-83)
- Fresh eye (Higgins, 1994, p.84)
- Idea bits and racking (Higgins, 1994, p. 84; Gregory 1962, pp.45-50)
- Idea notebook (Higgins, 1994, p.84)
- Input-output (Higgins, 1994, pp.85-86)
- Listen to music (Higgins, 1994, p.86; Rosenfield, 1985)
- Mind mapping (Higgins, 1994, pp.87-90; Neimark, 1986; Wycoff, 1991)
- Name possible uses (Higgins, 1994, pp.90-91; Stone, 1988)
- The Napoleon technique (Higgins, 1994, p.91; Mattmore, 1988, p.48)
- Organised random search (Higgins, 1994, pp.91-92)
- Personal analogies (Higgins, 1994, pp.92-93)
- Picture simulation (Higgins, 1994, pp.93-94)
- Product improvement checklist (Higgins, 1994, pp.94-95)
- Relatedness (Higgins, 1994, p.95)

- Relational worlds (Higgins, 1994, pp.95-100)
- Reversal re-reversal (Higgins, 1994, p.100; Glassman, 1989, pp.14-18)
- Rolling in the field of ideas (Higgins, 1994, p.101)
- The 7 x 7 technique (Higgins, 1994, pp.102-103; Gregory, 1962, pp.45-50)
- Sleeping/dreaming on it (Higgins, 1994, p.104)
- The two-words technique (Higgins, 1994, pp.105-106)
- Using the computer to stimulate creativity (Higgins, 1994, p.106)
- Verbal checklist for creativity (Higgins, 1994, pp.106-109)
- Visualisation (Higgins, 1994, p.110; Hall, 1990, pp.79-81)
- What if…? (Higgins, 1994, p.110)

One can easily study these methods by reading Higgins's guidelines (Higgins 1994, pp.61-113; Osborne, 1953, pp.297-304).

Group techniques for generating alternatives, which are used in many foresight studies are:

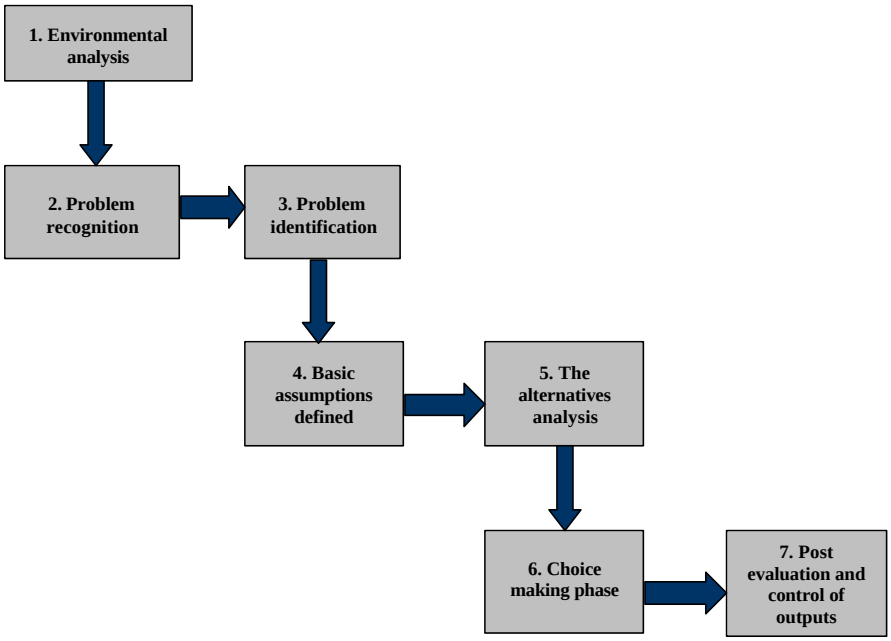
- Brainstorming (Higgins 1994, pp.118-125; Epstein; 1995, Plsek, 1997)
- Brainwriting (Higgins, 1994, pp.125-126; Van Gundy, 1987, pp.131-144; Plsek, 1997)
- Brainwriting pools (Higgins, 1994, pp.126-128; Van Gundy, 1987, pp.131-144; Epstein, 1995)
- Brainwriting 6-3-5 (Higgins, 1994, p.129; Greschka, 1979, pp.51-55)
- Creative imaging (Higgins, 1994, pp.129-130; Hall, 1990, pp.79-81)
- Creative leaps (Higgins, 1994, pp.130-131; Bandrowsky, 1990, pp.34-38)
- Creativity circles (Higgins, 1994, p.131; Tatsuno, 1990, pp.136-142; Majako, 1988)
- Crawford's slip method (Higgins, 1994, pp.132-135; Fiero, 1992, pp.40-43)
- Delphi technique (Higgins, 1994, pp.135-136)
- Excursion technique (Higgins, 1994, pp.136-139)
- Gallery method (Higgins, 1994, pp.139-140; Greschka, 1979, pp.51-55)
- Gordon/Little technique (Higgins, 1994, p.140; Van Gundy, 1987, p.136)
- Group decision support systems (Higgins, 1994, pp.140-141; Cambell, 1990, pp.47-50)
- Idea board (Higgins, 1994, p.142; Glasman, 1989, pp.17-18)
- Idea triggers (Higgins, 1994, p.142)
- Innovation committee (Higgins, 1994, p.142; Case, 1991, pp.89-93)
- Inter-company innovation groups (Higgins, 1994, p.143; Holt, 1990, pp.347-353)

- Lion's den (Higgins, 1994, p.143; Bookman, 1988, pp.67-71)
- Lotus Blossom method (Higgins, 1994, p.144; Tatsuno, 1990, pp.109-113)
- Mitsubishi brainstorming method (Higgins, 1994, pp.146-147; Tatsuno, 1990, pp.109-113)
- Morphological analysis (Higgins, 1994, pp.147-149;Gregory, 1967, pp.200-202)
- NHK Method (Higgins, 1994, pp.149-150; Tatsuno, 1990, p.110)
- Nominal group technique (Higgins, 1994, pp.150-153; Delbecq, Van de Ven, Gustavson, 1975)
- Phillips 66 (Discussion 66) (Higgins, 1994, p.154; Group Techniques, Part II 1981, pp.15-17)
- Photo excursion (Higgins, 1994, p.154)
- Pin card technique (Higgins, 1994, p.155)
- Scenario writing (Higgins, 1994, pp.155-160; Schoemaker, Cornelius and van der Heijden, 1992, pp.41-46)
- SIL Method (Higgins, 1994, p.160; Geschka, 1979, pp.51-55)
- Storyboarding (Higgins, 1994, pp.161-176; Lottier Jr 1986, pp.421-427; Barakat, 1989)
- Synetics (Higgins, 1994, pp.177-178; Gordon, 1961; Stein, 1975, pp.172-175)
- Take five (Higgins, 1994, p.178; Thiangarajan, 1991, pp.37-42)
- TKJ Method (Higgins, 1994, pp.179-180; Tatsono, 1990, pp.104-106; Michalko, 1991, pp.308-311)

One can study these methods by reading Higgins's guidelines (Higgins, 1994, pp. 116-181) or some other good creativity books (Thompson, 1992; De Bono, 1985, 1990a, 1990b, 1991, 1992, 1996; Kao, 1996; Birch and Clegg, 1995; Cooper, 1993; Gardner, 1993; Kao, 1996; Kirton, 1994) and action learning books (see e.g. Bennis and Biederman, 1997; Revans, 1998). The basic character of the new knowledge society is the new strategic role of innovations (see e.g. Hamel, 2000).

Management support systems and especially decision and group decision support systems may help in choosing from among alternatives. The next section discusses this topic. In summary, Figure 3 describes part of the integrated foresight process.

Figure 3: *Foresight process after pre-foresight*



It is important to plan the foresight process before the actual foresight study is implemented. Usually a lot of time is saved if the use of different foresight methods and tools is planned in the pre-foresight phase.

Management support systems

Decision-making should be based on a systematic evaluation of the alternatives. Often a key part of this process involves determining the possible outcomes of the various alternatives. This information is vital in making a decision. The better the job done in generating alternatives and determining their possible outcomes, the greater chance that an effective choice will be made. The choice process is mostly rational, but skilled decision-makers rely on intuition as well. According to Simon (1997), most human decision-making, whether organisational or individual, involves a willingness to settle for a satisfactory solution that is 'something less than the best'. In a 'satisfying' mode the decision-maker sets up an aspiration, goal, or desired level of performance and searches the alternatives until one is found that achieves this level.

A related concept is that of bounded rationality. Humans have a limited capacity for rational thinking; they generally construct a simplified model of the real situation in order to deal with it. Knowledge, which is gained from foresight analyses usually, makes decision-making more rational and informed.

Decision situations are frequently classified on the basis of what the decision-maker knows (or believes) about forecast results. It is customary to classify this knowledge into three categories:

- Certainty
- Risk
- Uncertainty

In decision-making under certainty, it is assumed that complete information is available so that the decision-maker knows exactly what the outcome of each course of action will be. The decision-maker is viewed as a perfect predictor of the future, because it is assumed there is only one outcome for each alternative. In the case of well-structured problems, this kind of situation is possible. Some problems of certainty are not structured enough to be approached by standard management science; they require a decision support system (DSS) approach.

A decision made under risk (a probabilistic or stochastic decision situation) is one in which the decision-maker must consider several possible outcomes for each alternative, each with a given probability of occurrence. In addition, it is assumed that the long-run probabilities of the occurrences of the given outcomes are known or can be estimated. Under these assumptions, the decision-maker can assess the degree of risk assumed. Risk analysis is usually executed by computing the expected value of each alternative and selecting the alternative with the best expected value. (See Stern and Fineberg, 1996.)

In decision-making under conditions of uncertainty, the decision-maker considers situations in which several outcomes are possible for each course of action. In contrast to the risk situation, the decision-maker does not know, or cannot estimate, the probability of occurrence of possible outcomes. Decision-making under uncertainty is more difficult to evaluate due to insufficient information. The decision-maker's attitude toward risk should be assessed in this kind of situation in order to help decision-making. In this kind of uncertain situation foresight analyses can provide useful insights for decision-makers. Usually scenario analyses are conducted for different kinds of basic situations, for example for

- the worst possible case scenario
- the best possible case scenario
- the most likely case scenario.

A scenario is a statement of assumption about the operating environment of a particular system at a given time. In foresight studies it is usually necessary to make some scenario analyses.

Several different kinds of management support system technologies are available. Turban (1993) has classified them in the following way:

1. Decision support systems (DSS)
2. Group decision support systems (GDSS)
3. Executive information systems (EIS)
4. Expert systems (ES)
5. Artificial neural networks (ANN)

These technologies are generally known as computerised management support systems and appear as independent systems but they are sometimes integrated. (see e.g. Turban, 1993).

Implementation and control

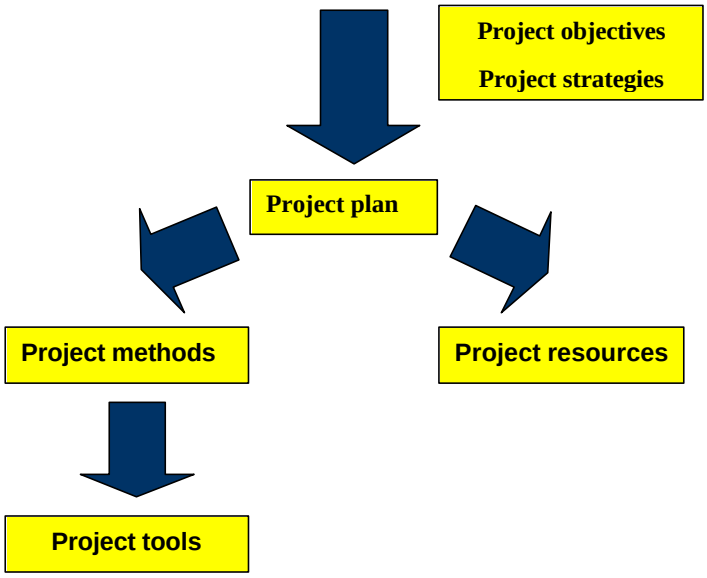
Once a decision-maker has a clear idea of what they want to do and a plan for accomplishing it, they can take action. Implementation requires persistent attention. This means accounting for details, and anticipating and overcoming potential obstacles. Generally it is beneficial to use a certain kind of vision with specific targets and to set reasonable deadlines for action and future action. In short, implementation is a series of problems and opportunities.

Controlling and evaluating results is the final and often overlooked stage in the creative problem solving process. The purpose of the evaluation is to determine the extent to which the actions people have taken helped solve the problem.

During the implementation and control phase, it may be useful to use project and programme management tools, which include strong knowledge management elements (Lientz and Rea, 1998).

In the implementation phase of foresight studies, it is helpful to have different project management methods and experience of dealing with projects in many different settings. A project can be seen as the allocation of resources directed towards a specific objective following a planned, organised approach. Figure 4 shows the components or parts of a project. One should define all these elements of a project carefully before the implementation phase.

Figure 4: *Components of a project*



The difficult questions in project management are those of estimating time accurately, resource use, scheduling tasks and deliverables, identifying the critical stages of a project, using different kinds of planning cycles and the division of work among project team members. In order to help solve these kinds of practical problems, many software programmes and tools for project management are available. Recommended project management reading books are Lientz and Rea (1998) and Billows (1999).

Summary

This article describes some basic challenges of the knowledge management of foresight studies. A general statement of this article is that it is almost impossible to make successful foresight studies without proper knowledge management systems. If an organisation wants to make competitive foresight analyses, it must efficiently create, locate, capture and share knowledge and expertise.

The real knowledge management process of foresight studies includes scientific operations, but often the element of 'creative art' is present. Without some kind of creativity it is not possible to foresee future development, although knowledge management types of activities provide a starting point for foresight analyses. This is especially true if creative problem solving techniques are used in the foresight process. One important part of knowledge management is the careful analysis of key problems, which are analysed in the foresight process. Problems such as recognising and identifying, as well as making, assumptions are often neglected in many foresight studies. The tools available to make foresight analyses have been outlined here.

It is considered pertinent to think carefully about knowledge management issues before the foresight process is started. Although knowledge management is becoming widely accepted, few organisations today are fully capable of developing and leveraging enough critical organisational knowledge to achieve an excellent foresight knowledge performance. In fact, knowledge management systems are not very well specified in foresight studies and this can decrease both the effectiveness (doing the right thing) and efficiency (doing the thing right) of foresight activities. However, by using the systematically advanced tools of knowledge and project management methods, many problems can be avoided.

It is recommended that in all foresight activities one should create knowledge management architecture for a foresight project and utilise modern project management methods and tools.

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Further resources

Good articles on the topic of knowledge management:

http://www.bus.utexas.edu/kman/kmprin.htm

http://www.skyrme.com/insights/22km.htm

Collaboration Tools

http://directory.google.com/Top/Reference/Knowledge_Management/Knowledge_Flow/Collaboration/Tools/

Datamining

Datamining
http://directory.google.com/Top/Computers/Software/Databases/Data_Mining/Tool_Vendors/

Knowledge discovery
http://directory.google.com/Top/Reference/Knowledge_Management/Knowledge_Discovery/Tools/

Concept mapping

http://directory.google.com/Top/Reference/Knowledge_Management/Knowledge_Creation/Concept_Mapping/Tools/

Inspiration: Visual thinking and learning software
http://www.inspiration.com/

The IHMC concept mapping software
http://cmap.coginst.uwf.edu/

Decision explorer
http://www.banxia.com/demain.html

Axon idea processor: a visualization tool for thinkers
http://web.singnet.com.sg/~axon2000/

QuestMap™
http://www.gdss.com/omq/

Brainstorming tools

Brainstorming toolbox
http://www.infinn.com/toolbox.html

ParaMind brainstorming software
http://www.paramind.net/

IdeaFisher workstation
http://www.ideafisher.com/salemarch.htm

Statistical software tools

Analyse-it® -- the most popular statistical software add-in for Microsoft Excel
More information: http://www.analyse-it.com/

AMELIA (A program for substituting reasonable values for missing data (called 'imputation'): Harvard-MIT Data Center
More information: http://gking.harvard.edu/stats.shtml

Binomial Probability Program (BPP is a menu driven program which performs a variety of functions related to the success/ failure situation): Open Channel Foundation
More information: http://www.openchannelfoundation.org/projects/BPP/

CART (flagship decision-tree software, combines an easy-to-use GUI with advanced features for data mining, data pre-processing and predictive modeling): Salford Systems
More information: http://www.salford-systems.com/

Curve Expert 1.3: a comprehensive curve fitting system for Windows
More information: http://www.ebicom.net/~dhyams/cvxpt.htm

Automatic Forecasting Systems, AUTOBOX
More information: http://www.autobox.com/

Forecast PRO Software
More information: http://www.forecastpro.com/

ForecastX
More information: http://www.forecastx.com/

Mathematica
More information: http://www.wri.com/

MATLAB
More information: http://www.mathworks.com/

NCSS STAT SYSTEM (Number Cruncher Statistical System)
More information: http://www.ncss.com/

ORIGIN (technical graphics and data analysis software for Windows. Includes 3D and contour plotting, FFT filtering; works closely with Excel): ORIGIN Lab
More information: http://www.microcal.com/

OX, PC-Give: J. Doornik, University of Oxford
More information: http://hicks.nuff.ox.ac.uk/Users/Doornik/

RATS: Estima
More information: http://www.estima.com/

SAS, JMP: SAS Institute Inc.
More information: http://www.sas.com/

SHAZAM, Econometrics Software: University of British Columbia, Canada
More information: http://shazam.econ.ubc.ca/

S-PLUS: Insightful Corporation
More information: http://www.insightful.com/default_class0.asp

SPSS, BMDP, SigmaStat: SPSS Inc.
More information: http://www.spss.com/

Statistica: StatSoft, Inc
More information: http://www.statsoft.com/

Statistix for Windows: Analytical software
More information: http://www.statistix.com/home.html

STATA, Statistical Software: STATA
More information: http://www.stata.com/

TSP: TSP International
More information: http://www.tspintl.com/

XL Statistics: Rodney Carr
More information: http://www.deakin.edu.au/~rodneyc/XLSTATS.HTM

Future research tools

Scenario Software: RPM Software
More information: http://www.reliablemeters.com/html/products_software_scenario.html

VENSIM: Ventana Systems
More information: http://www.vensim.com/

SIMUL8: SIMUL8 Corporation
More information: http://www.simul8.com/

Project management software packages

Project Kickstart: experience in software
More information: http://www.projectkickstart.com/

Open Plan: Welcom
More information: http://www.welcom.com/

Primavera Software: Primavera
More information: http://www.primavera.com/

Planview PM Software: Planview
More information: http://www.planview.com/

Microsoft Project®: Microsoft
More information: http://www.microsoft.com/office/project/default.asp

Turbo Project: IMSI
More information: http://www.imsisoft.com/store/turboproject.cfm

Nexxiom: SAP Stäfa Partner
More information: http://www.nexxiom.com/english/quicklook.htm

Future research tools

Decision Explorer™ : Banxia Software
More information: http://www.banxia.com/demain.html

DecisionSite 7.0: Spotfire Inc.
More information: http://www.bio-itworld.com/products/040702_decisionsite.html

Frontier Analyst® for Data Envelopment Analysis: Banxia Software
More information: http://www.banxia.com/famain.html

Impact Explorer™ : Banxia Software
http://www.banxia.com/impact/index.html

Sustainable development decision support tools
More information: http://www.sustainable.doe.gov/toolkit/toolkit.shtml

Team2000 & Professional2000 for Analytic Hierarchy Process: Expert Choice
More information: http://www.expertchoice.com/software.htm

Annex C: Technological determinism and the critical role of social fabric in knowledge society

Introduction

The aim of this article is to analyse the critical role of social fabric in foresight research. This article is complementary to the chapter section 2.1 in the handbook of knowledge society foresight. Social fabric includes all human dimensions of the knowledge society. In the field of foresight research, the tradition of technological foresight is very strong. Often many foresight analyses expect that all available technologies will be used in the future. The idea of this article is to provide broader perspectives on the innovation and technological processes and to critically discuss the problems of technological determinism.

When trying to understand the future factors of the knowledge society, the role of social fabric in the shaping of futures societies cannot be neglected. In the field of futures studies, special areas of research have been:

- the work of the future
- the future of demographic change
- migration and leisure time
- the effects of virtualisation on a society
- population dynamics in the world (migration movements expected cultural tensions)
- social dynamics (virtual communities, exclusion vs. inclusion)
- technological trends (the chaos caused by innovations and applications?), interaction of social change and technology (man-machine interaction, networks), plus others.

All of these issues are interconnected to the technological questions. Furthermore, a lot of research has been conducted concerning the future of companies and the welfare state. These fields of social foresight research are important, and especially important, in an analysis of the future of knowledge societies, including crucial questions of industrial relations, working conditions and the quality of life.

Social issues and foresight research

Bell (1997, p. 73) has postulated that the most general purpose of futures studies is to maintain or improve the freedom and welfare of humankind. Some futurists would add the welfare of all living beings, plants, and the Earth's biosphere beyond what is required for human well-being. The goals of futurists are to contribute toward making the world a better place in which to live, benefitting people and the life-sustaining capacities of the Earth. A distinctive contribution of futurists and foresight researchers is prospective thinking. Through prospective thinking, futurists aim to contribute to the well-being of both people alive today and the as-yet-voiceless people of future generations. The idea of sustainable development has always been a natural part of futures studies activities. In foresight studies, researchers explore the possible, the probable and the preferable alternative futures. In this sense the basic idea of foresight research is to discover or invent, examine, evaluate, and propose possible, probable and preferable futures. Typical research questions are (Bell, 1997, p. 73):

- what can or could be (the possible)
- what is likely to be (the probable) and
- what ought to be (the preferable).

Bell has defined nine major tasks of futures and foresight studies. These tasks are:

1. The study of possible futures,
2. The study of probable futures,
3. The study of images of the future,
4. The study of knowledge foundations of futures studies,
5. The study of ethical foundations of futures studies,
6. Interpreting the past and orientating the present,
7. Integrating knowledge and values for designing social action,
8. Increasing democratic participation in imaging and designing the future,
9. Communicating and advocating a particular image of the future.

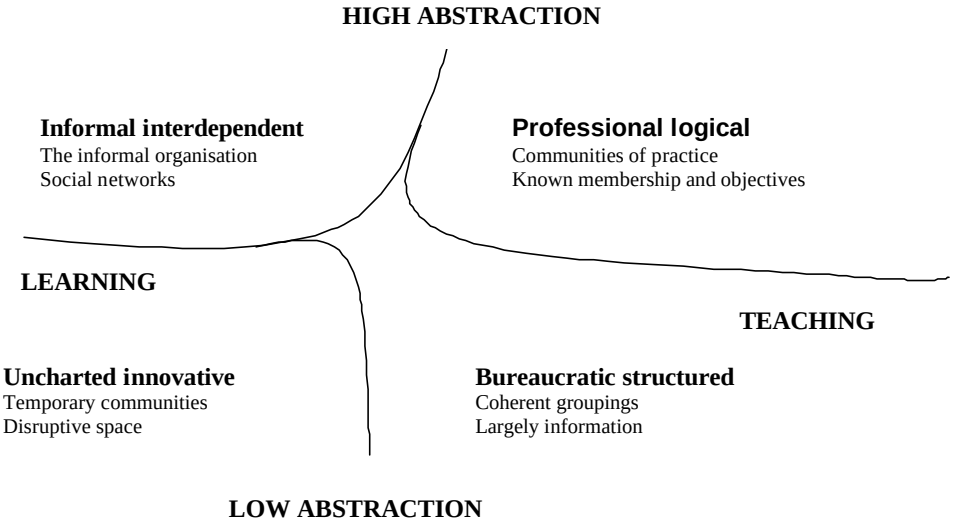
When one is planning different kinds of foresight activities, it is useful to discuss the role of these tasks in a foresight research project.

For most people, the future is a rich and inexhaustible source of distraction as well as of serious attention, of intention and settlement, of progress and inertia, and of hope and fear. Given the time spent contemplating it, the future is as much part of people's life as the past and the present and in many instances probably even more so. However, as common and inspiring as the future can be in people's lives, collective thinking and talking about the future does not seem to come naturally to many organisations. Truly probing the future appears to be the exception rather than the rule in many organisations.

People implement foresight activities in various kinds of social organisational structures. In all foresight activities, social fabric questions must be analysed, because sense making is impossible without such an analysis of society's social fabric. Sense making is an approach to thinking about and implementing communication research and practice and the design of communication-based systems and activities. It consists of a set of philosophical assumptions, substantive propositions, methodological framing and methods (see Weick, 1995).

Today in many organisations foresight activities are connected to different kinds of sense-making systems. In Figure 1, the dimensions of abstraction (high and low abstraction) and culture (teaching vs. learning) create the sense-making model. This model includes four open spaces or domains of knowledge, all of which have validity within different contexts. (Snowden, 2002, pp. 5-7)

Figure 1: *Typical sense making in organisations* (Snowden, 2002, p. 5)



They are domains not quadrants as they create boundaries within a centre of focus, but they do not pretend to fully encompass all possibilities. The domain where teaching and low abstraction are integrated, is a bureaucratic and structured organisation domain. This is the formal organisation, the realm of company policy, procedures and controls. It is a training environment. Its language is known, explicit and open. It is the legitimate domain of the corporate Intranet and its shared context is the lowest common denominator of its target audience's shared context. In this domain it is possible that some things are certainly known and there are legitimate best practices. The behavioural model of this domain is to categorise and respond (Snowden, 2002, pp. 6-7).

The professional/logical domain integrates teaching and high abstractions. Commonly, they are professional individuals who, through defined training programmes, acquire a specialist terminology, codified in textbooks. This is one of the most important domains because knowledge communication is at its most efficient due to the high level of abstraction. In this domain it is possible that some things are knowable. The behavioural model of this domain is to sense and respond. (Snowden, 2002, pp. 6-7).

In the informal/interdependent domain, learning and high abstraction are integrated parts. In this domain, the abstraction of shared experiences, values and beliefs are found. This is usually the domain of the shadow or informal organisation, that complex network of obligations, experiences and mutual commitments without which an organisation could not survive. Trust in this domain is a naturally occurring phenomenon as all collaboration is voluntary in nature. Common understanding of the symbol structure and its sequence provides shared context in this domain. Pattern management is the best way to try managing issues in this domain of complex issues. The behavioural model of this domain is to probe, sense and respond. (Snowden, 2002, pp. 6-7).

There is also an uncharted/innovative domain, for which there is neither experience nor expertise because the situation is unknown. Low abstraction and learning are integrated in this domain. The organisation will tend to look at such problems through the filters of past experience. The history of economic life is littered with companies who failed to realise that the world had changed. Usually in hindsight such foolishness is easy to identify, but at the time the dominant language and belief systems of the organisation concerned make it far from obvious. This domain is turbulent, chaotic and unconnected. The behavioural model of this domain is to act, sense and respond. (Snowden, 2002, pp. 6-7).

Foresight is rooted in a deep understanding of social interaction and culture. It is very important to understand that there are different kinds of sense-making domains (Snowden, 2002; Weick, 1995). All organisations tend to study past events to create predictive and prescriptive models for future decisions, based on the assumption that they are dealing with a complicated system in which the components and associated relationships are capable of discovery and management. Humans, acting consciously or unconsciously, are capable of a collective imposition of order in their interaction that enables cause to be separated from effect and predictive and prescriptive models to be built. However, such imposed order is not an absolute or universal structure. That is a reason why it is often difficult to find 'universal truths' in foresight studies.

To demonstrate the importance of a social fabric analysis, it should be noted that, in the knowledge society, some interesting trends appear to influence potentially far-reaching changes in social status as a result of the salience of new social markers and processes of differentiation. Neice (1998) has summarised the trends that produce potential shifts in status consciousness in the following way:

- Trajectories in which the use of information and communication technologies emerge as a dominant mode of development.
- A general perceptual shift towards the valorisation of information and knowledge work.
- Displacement and adjustments involving a reordering of the meanings of phrases such as 'laid off', retrained, contingency worker, contractor, part-timer, home-based teleworker and flexible worker.
- Growing – though uneven – access to, or ownership of, information and communication technologies and digital resources, often aided by institutional support.
- Specific behaviours and orientations towards a range of services and applications involving digital technologies and resources.
- Advanced skills that allow work at various degrees of efficiency and productive complexity.
- Values and lifestyles that reinforce patterns of social closure based on status distinctions through the expansion of digital work cultures and linkages with new forms of cyber-leisure.

These kind of social changes become extremely interesting in an analysis of working conditions, industrial relations and quality of life issues.

Technological determinism of knowledge society: the field of competing interests and strategies

In the knowledge society, companies play a key role as creators, developers and exploiters of process and product innovations. The effectiveness of a company's innovation activities is primarily dependent on the internal factors of a company's organisation. Research-based innovations are an important part of knowledge society development. However, a company's ability to collaborate and interact with customers, subcontractors and other knowledge intensive organisations like universities and research institutes, is essential.

The hallmark of modern market economies has always been change. Technological and organisational innovations are in turn the primary driver of change, shaping, reshaping and sometimes overturning the existing order. Historically there have been long waves and successive industrial revolutions of capitalist development. One of capitalism's foremost characteristics has been its capacity to generate and to diffuse a torrent of technical innovations (see Freeman and Louca, 2001).

Technological development has also proceeded rapidly and continues to accelerate. At the same time, competition has tightened. The success of companies in the free market is based more and more on their fast adoption and utilisation of available technology. As markets open up in the current economic climate, companies have to be capable of competing with the best in the world to gain a share of the market. In order to develop a competitive edge in this kind of environment, companies have to be familiar with the changes that are occurring around them as well as with the latest technological developments.

There is an obvious threat that so-called technology push strategies are adopted in different knowledge societies and the technology pull approach is neglected. Critical technology foresight means that scientific results and the implementation of technology as well as its impact and implications for an entire society are systematically analysed. This follows from research that shows technology is understood as a large-scale action, which is widely being abused by individuals and organisations. Technology foresight as a certain kind of foresight activity is a policy-oriented research.

Currently, the collective prediction of technological development is much more complex and non-linear than simply creating a technological vision for a knowledge society, although many foresight and futures studies take this kind of approach as a given (see e.g. Canton, 1999; Cetron and Davies, 1997). However, in knowledge society analyses, it would be useful to analyse the co-evolution of technology, industrial structure and supporting institutions together (see e.g. Dosi, Teece and Chytry, 1998; Mansell and Steinmuller, 2000).

It is important to bear in mind that the full implications of new technologies are rarely well understood during their formative years (Marvin, 1988). Even with a more sophisticated understanding of the interactions between social and technological developments, new and unanticipated implications emerge because the processes of learning and social interaction are continuously producing surprises and novelties.

This profound technological change is generally known as the information revolution. The process through which information and communication technologies are becoming ubiquitous artefacts follows the widespread commercialisation of the personal computer during the 1980s. Yet, it is only during the last decades of the twentieth century that the cascade of innovation in information and communication technologies has accumulated to yield complex social and economic interrelationships. Perplexingly, it is not yet known where those new technological innovations will lead.

One vision is that of the ‘knowledge society’: the idea that the information revolution opens a path to new opportunities for sustainable growth and development, creating the potential for social inclusion and representation, and new ways to achieve social and cultural expression. However, one should be critical, when making technology foresight analyses of new information and communication technologies, because only certain kinds of technologies can make this vision possible. It is obvious that the course of these technological developments may not be a smooth and easy passage. There are many potential obstacles and threats, but also many interesting possibilities.

The European information society vision has been reinforced by a consideration of the actual initiatives, which fall into four categories: (1) information highways, (2) interconnected advanced networks, (3) general electronic services and (4) telematics applications (European Commission, 1993, p. 27). The Bangemann plan (1994) suggested the following priorities for action plans: (1) promoting the use of information technologies, (2) providing basic trans-European services, (3) creating an appropriate regulatory environment, (4) developing training for new technologies, and (5) improving industrial and technological performance. In this plan, promoting the use of information and communication technologies was linked to fostering teleworking, public service uses of telematics applications, and the closer involvement of users in drafting and implementing technology policies. The Bangemann Action Plan (1994) has quite successfully established a first official framework for the European Union information society policy.

If social fabric questions are to be taken seriously, the relevant actors in knowledge society development and their interests must be analysed. Progress towards the knowledge society depends fundamentally upon the degree and nature of user engagement within this process. Social communities, access factors and users' capabilities cannot be neglected, although the existing conception of the knowledge society is the idea that rapid changes in technological capability alone will suffice to meet the needs of people in that society (see e.g. Tapscott, 1995).

Different stakeholders have different and specific knowledge society strategies, priorities, visions and missions, which are connected to distinct economic incentives and social motivations involved in developing information society resources. For example, some stakeholders emphasise the technology push type of knowledge society strategies and some are in favour of the technology pull kind of knowledge society strategies. Some knowledge society strategies are competitive strategies and others are anti-competitive, emphasising cooperation between stakeholders. Certain actors may be tightly or loosely associated with these specific knowledge society strategies.

Four critical questions of the information age

1. Digital divide

Simply put, the digital divide means that, between countries and between different groups of people within countries, there are wide divisions between those who have real access to information and communications technology and are using it effectively, and those who do not.

Since information and communications technologies (ICTs) are increasingly becoming a foundation of our societies and economies, the digital divide means that the 'information have-nots' are denied the option to participate in new ICT jobs, in e-government, in ICT improved health care, and in ICT enhanced education. More often than not, the 'information have-nots' are in developing countries, and in disadvantaged groups within countries. Thus, the digital divide has both global and local characteristics (Bridges, 2002).

Definitions of the digital divide range from the very narrow 'the digital divide is the lack of access to Internet between racial groups' to a wide definition including training, education systems, meaningful content and cultural norms that facilitate effective use between regions, age groups and genders (Bridges, 2002).

When actions are being developed to redress social exclusion, it is helpful to ask a series of questions: Which social groups are excluded from what? What are the mechanisms or reasons for that social exclusion? How widely or narrowly can the boundaries of such groups be drawn? To what degree are they excluded? Are there multiple forms of marginalisation? How temporary or permanent is the exclusion, and what are the chances of a change in circumstances?

Thus, usually the digital divide is understood to mean a lack of physical connections and training – computer hardware, software, network access. A classic way to solve the digital divide is to provide education and training by the government, NGOs and private initiatives (Bridges, 2002).

Another perspective is to note that the digital divide is a lack of computers, but say this problem will solve itself in time, as market and selective development projects will steadily lower prices, foster IT training sectors and extend the infrastructure to underdeveloped regions and communities (Bridges, 2002).

The third perspective on the digital divide is as a lack of computers, access and training, exacerbated by ineffective government policy, government actions or inaction, which hinder the development and use of computers. According to this perspective, the digital divide cannot be solved, unless government policies are solved (Bridges, 2002).

Other thinkers propose that the digital divide is a lost opportunity, with disadvantaged groups being unable to effectively take advantage of ICT to improve their lives. According to this approach, the issue that really matters is how the technology is used, and its potential to improve the quality of life for disadvantaged groups. In practice, effective use requires computers, connections, training, locally relevant content and real applications of the technology to fit immediate needs (Bridges, 2002).

A further approach postulates that the digital divide is a reflection of the lack of basic literacy, poverty, health and other social issues. According to this view, computers are useful but nothing will enable a society to bridge the digital divide until basic literacy, poverty and healthcare issues are addressed (Bridges, 2002).

The explanations of why the digital divide exists follow (Bridges, 2002):

- The digital divide comes from the normally slow diffusion of new technologies.
- The digital divide occurs because people do not know how to use the technology, or it is not made relevant to their lives.
- The divide mirrors the existing landscape of technology infrastructure and wealth distribution.
- The digital divide results from the real difficulties in 'rolling out' the technology around the world.
- Government policies have failed to support, or even have discouraged information technology growth, exacerbating the digital divide.
- The digital divide is a matter of personal choice. Some people simply do not want to use modern information technology and thus the digital divide is partly an illusion.

It is quite obvious that the digital divide is one of the most problematic issues in the knowledge society. There are significant social and economic benefits for everyone if the people of different nations are able to take full advantage of the modern information technology for improving their lives.

2. Technology push or pull?

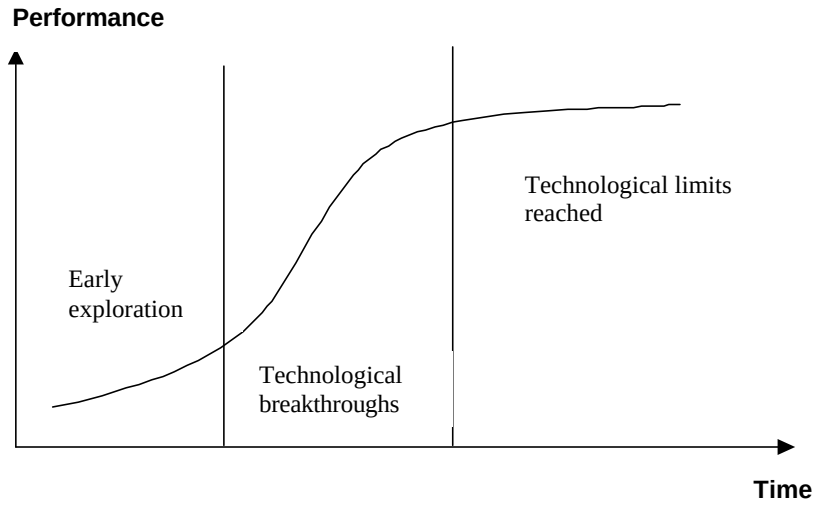
Technology push could be the most important economic driving force in science and technology today. The high-speed development of new technologies means they are being 'pushed' on to the market. Accordingly, people are getting technologies and features that they are told they need for some reason, but are not really sure that they want them.

One significant knowledge society policy issue is whether new technological solutions are developed on the basis of the technology push strategy or the technology pull strategy. The emphasis of the technology strategy has large-scale impacts on industrial relations, working conditions and the quality of life. The central future oriented question in the technology push strategy is how can user confidence be increased to make the transition towards the world of information technology. This question is related to concepts of acceptability, usefulness or utility. (Davis, 1993).

It is typical that, as a technology matures, additional research expenditures on that technology begin to produce diminishing returns. This is the familiar S-curve, which shows significant performance improvements at the early stages of discovery, then declines as the technology improves (Figure 1). Managers and decision-makers must be cognisant of this basic law and commit funding to new technologies as existing ones reach the top of the S-curve. They can determine their position by estimating the limits of a technology early and charting their performance improvements against these limits. Some practical ways of identifying that a technology will give way to a newer one are by observing the emergence

of new competitors using different technologies, different researchers, disharmony among research staff and a general lack of 'new breakthroughs'.

Figure 1: *Technology S-curve*



In the 1950s, the innovation process was modelled on a technology push type of process. New technologies drove the products that were created. During the 1960s and 1970s innovation was considered to occur due to market pull: fashions and user requirements were the impetus behind new products. From the late 1970s to the early 1980s a new model developed, which identified a combination of technology push and market pull, taking place with continual feedback to product developers.

Today the world is in the middle of a period of technological, economic, social, cultural and political transition, being changed by new forces that have a global influence. The traits of the information society – networking, virtual communities, e-commerce, knowledge-based industries, technology standards, new revolutionary technological innovations, the increasing role of intellectual and social capital – create new problems. Complexity in the interwoven nature of problems as well as in the inflow of information is growing, and creating new challenges. Social order and practices emphasise different kinds of strategies for adapting to an uncertain future: (1) hopelessness: nothing can be done to change the coming, inevitable misery; (2) helplessness: something could be done, but we are not capable of doing it; (3) worthlessness: we are not worthy of a better future, and we deserve all we get; and (4) limited scope: we cannot break the laws/rules/boundaries that prevent us from changing our future. (Rubin, 1998, p.37)

There are many alternative ways to approach the problem of transition. For instance, emphasis can be given to socio-economic, time-related, cultural, or philosophical indicators. Pantzar (1994) divides the approaches from a scientific-philosophical point of view into three predominant forms of determinism: (1) the determinism of market forces, (2) technological determinism, and (3) ecological determinism. On the other hand, Hautamäki (1996) divides the alternative approaches into seven main types:

1. information society (emphasis on knowledge as the predominant 'force of production');
2. communication society (emphasis on people connected by new communication technologies);
3. post industrial society (emphasis on the changing of paradigms of production);

4. service society (emphasis on services instead of industry);
5. expert society (emphasis on the growing impact of scientists and experts or 'brainworkers');
6. learning society (emphasis on the ability to learn as a critical skill); and
7. post-modern society (emphasis on modernisation leading to pluralism and individualisation).

It is not possible to evaluate these approaches by comparing them with one another objectively, or to assess which of these approaches is actually the best, because they are not commensurable (Rubin, 1998, p. 45). Of course it may be interesting and useful to make comparisons of different knowledge societies (see e.g. Castells and Himanen, 2001).

Attempts are made to approach the 'big knowledge society issue' by dividing society and its practices into different sub-sectors and then analyse their changes. For example, Webster (1995) describes five analytical conceptions that characterise an information society. Each of these present a criterion for identifying what is new. These basic approaches according to Webster (1995, pp. 6-23) are:

1. Technological. Breakthroughs in information processing, storage and transmission have led to the application of information technologies in all corners of society. This causes upheavals and changes in social realms, practices and structures.
2. Economic. Information has the critical tendency to change an economy into an information or knowledge economy and create the so-called knowledge industries. Their contribution to economic growth of their countries grows rapidly, and this causes problems when new categories in the information-related economic sectors are constructed.
3. Occupational. The numbers and importance of information-related professions, information or knowledge workers, grow, while the number of professions dealing with agriculture and the manual labour force decline. The problems here result from deepening class divisions due to unequal information.
4. Spatial. The limitations caused by place and time lose their meaning together with the growth of networking, the so-called information highway and global communication networks.
5. Cultural. The impact of new media becomes more and more pronounced and important in everyday life, as culture is produced and consumed by the media. The problems created by it are related to new dimensions, or definitions of reality vs. virtual reality, simultaneity, simulations, etc.

It is important to understand that these alternative conceptions do not exclude one another, but the point is rather that alternative scholars seem to emphasise different social variables and aspects in their knowledge society analyses.

3. Innovation or imitation policy options

In the knowledge society, to have an innovation policy is very important. For companies, it is essential to compete to dominate the future and thus control, create and dominate emerging opportunities or stake out a competitive space. Creating a future for a company in the knowledge society is more challenging than playing catch-up, in that a new road map of innovations must be created. However, the rewards are greater as the goal is not just to benchmark a competitor's products and processes and imitate its methods, but to be ahead of it. Of course, imitation can sometimes be used as the starting point for an innovation policy, but many successful companies rely strongly on knowledge creation and science and technology policy strategies as a starting point for a company's performance. One does not get to the future first by letting someone else blaze the trail. (Hamel and Prahalad, 1994, p. 22).

The new strategy paradigm of companies is described by Hamel and Prahalad (1994, p. 24) in the following way:

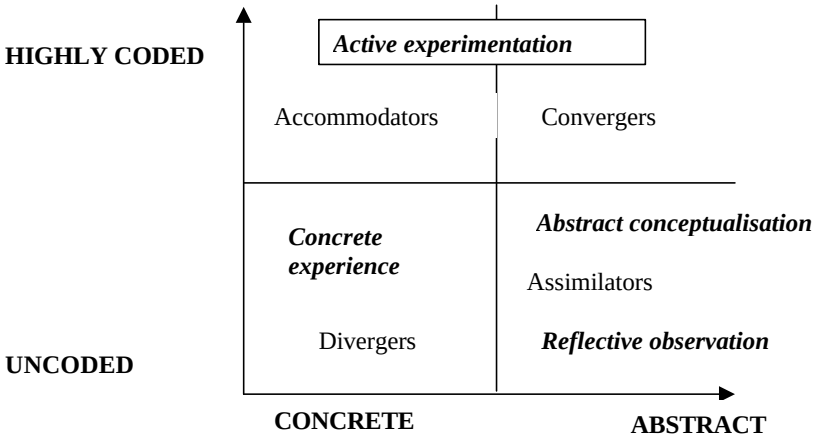
The new strategy paradigm	
Not only	**But also**
The competitive challenge	
Reengineering processes	Regenerating strategies
Organisational transformation	Industry transformation
Competing for market share	Competing for opportunity share
Finding the future	
Strategy as learning	Strategy as forgetting
Strategy as positioning	Strategy as foresight
Strategic plans	Strategic architecture
Mobilising for the future	
Strategy as fit	Strategy as stretch
Strategy as resource allocation	Strategy as resource accumulation
Getting to the future first	
Competing within an existing industry structure	Competing to shape future industry structure
Competing for product leadership	Competing for core competence leadership
Competing as a single entity	Competing as a coalition
Maximising the ration of new product hits'	Maximising the rate of new market learning
Minimising time-to-market	Minimising time to global pre-emption

Because of this kind of general orientation, innovative environments play a larger role than before in knowledge societies. More than any time before, science will provide the key to creating new jobs, providing better health care systems, ensuring a cleaner environment and tackling crime. To realise these opportunities, society must build on the existing science and technology base. Stronger links between universities and business community are an important element of this knowledge society development. Today, all companies need to innovate, to constantly develop new products and services and find new ways of doing things. In many societies, the role of government is to help companies by supporting networks, at a local or regional level, which will enable business to share ideas and learn from each other and from universities (see e.g. Saxenian, 1994; Porter, 2000; and Sherwin, 2000).

4. Education and digitalisation in the knowledge economy

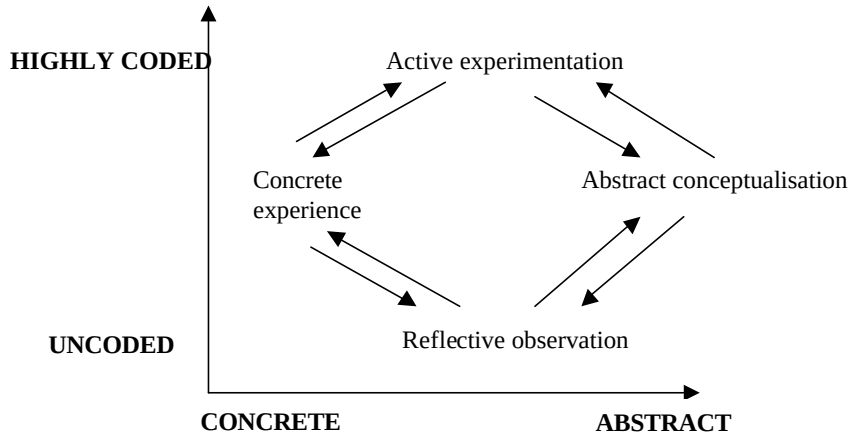
In the knowledge society, the role of education and digitalisation are remarkable. Kolb's learning cycle theory (Kolb, 1976) is the most consistent with the structure of human cognition represented by the epistemology space (E-space), as well as by accepted theories of human growth and development. Kolb has been able to identify four statistically prevalent types of learning styles based on the two dimensions. He calls them, respectively, the converger, the diverger, the assimilator and the accommodator. These are located along his dimension and in the E-space as shown in Figures 2 and 3.

Figure 2: *Kolb's learning typologies in the E-space* (Boisot, 1995, p. 78)



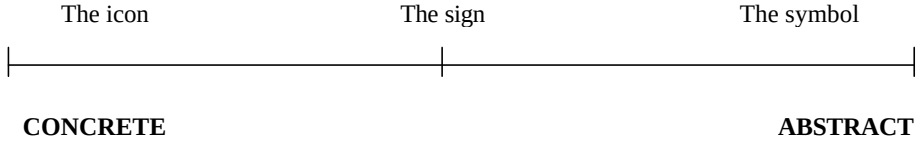
In Figure 2 two dimensions (coded–uncoded and concrete–abstract) represent the major directions of cognitive development.

Figure 3: *Kolb's learning typologies in the E-space* (Boisot, 1995, p. 76)



In the knowledge society various forms of abstraction scale are needed (Figure 4).

Figure 4: *The abstraction scale* (Boisot 1995, p. 60)



Many cognitive psychologists have identified the concrete-abstract dimension as a primary source for aiding cognitive growth and learning. In the knowledge society, organisations must perform different kinds of actions: (1) make active experiments, (2) make abstract conceptualisations, (3) make reflective observations and (4) utilise concrete experience.

In the knowledge society the very considerable data processing economies offered by symbolic knowledge are only available to those who invest the necessary time and effort in mastering relevant coding skills and the associated concepts. In the knowledge society there are different kinds of knowledge. In Figure 5, the basic forms of knowledge, tacit knowledge, semi-tacit knowledge and sophisticated knowledge are presented. Tacit knowledge cannot be put into coded form at all. It is the ineffable domain. The semi-tacit domain of knowledge is the space where natural discourse occurs, drawing upon a repertoire of non-specialised symbols and concepts acquired through a process of collective socialisation. This knowledge is widely shared. The domain of sophisticated knowledge is typically pure text or speech, drawing mainly on highly coded and abstract categories. Tacit and explicit ways of knowing are separate. In the knowledge society these three modes of knowing, and especially semi-tacit and explicit knowledge, can only be mastered with some effort.

Figure 5: *Different modes of knowing* (modified from Boisot, 1995, p. 61)

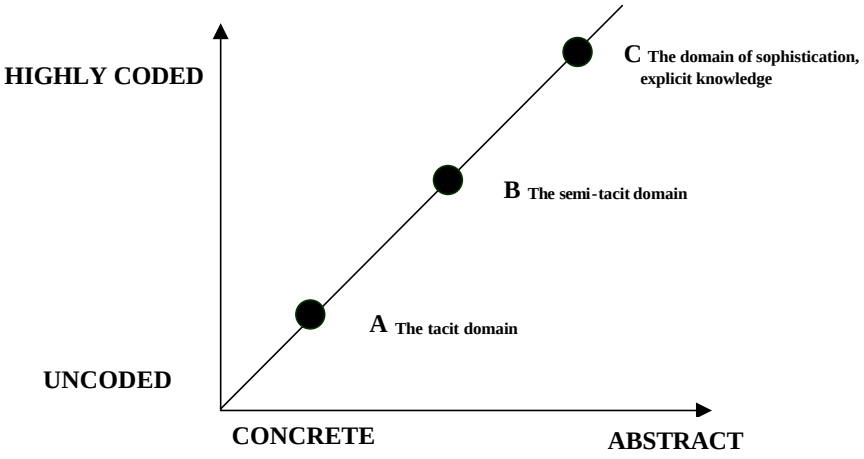
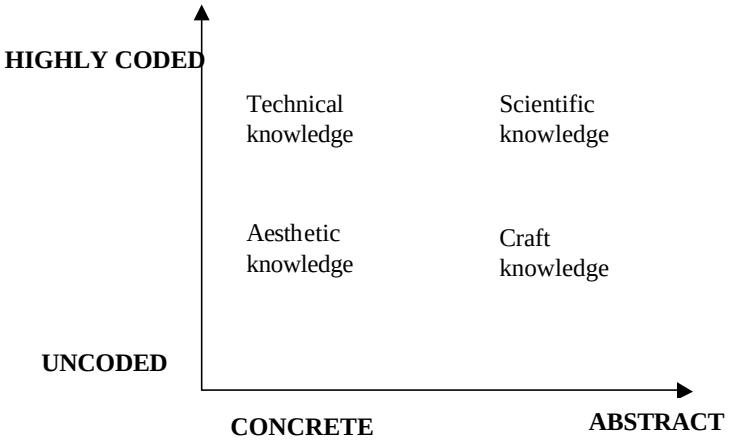


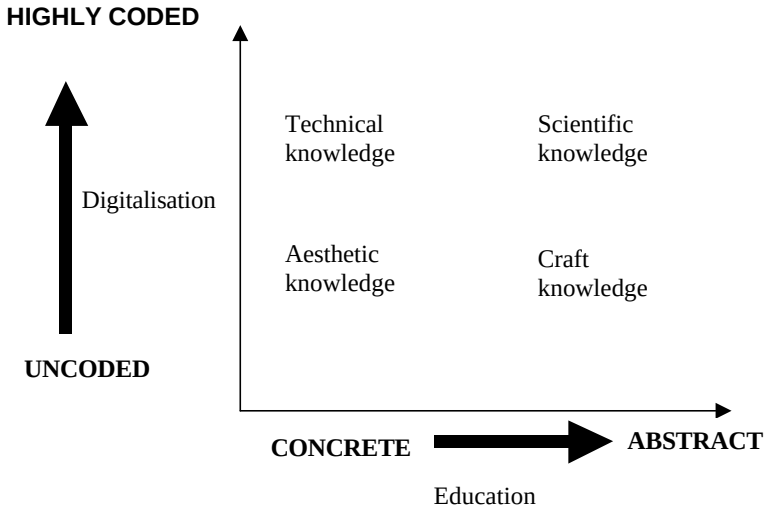
Figure 6 locates a variety of epistemological forms of knowledge. The way that a culture's forms of knowledge are distributed in the E-space largely determines the learning opportunities that will be made available to its members.

Figure 6: *Artefacts in E-space* (Boisot, 1995, p. 73)



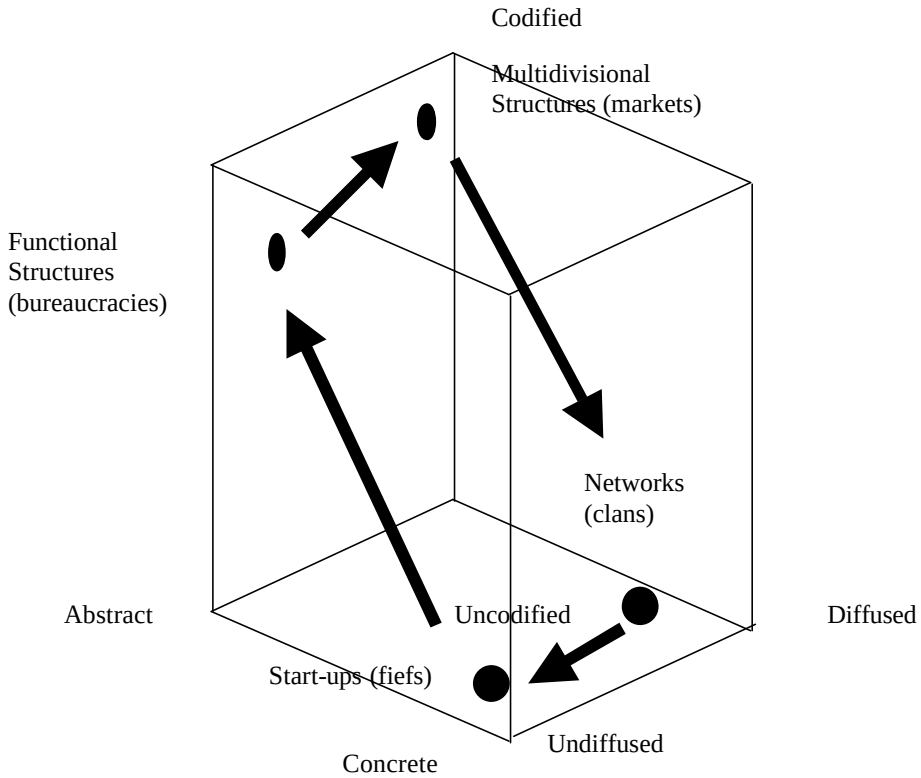
Digitalisation and education are the critical driving forces, which determine the future of learning possibilities (see Figure 7).

Figure 7: *Digitalisation and education in E-space*



Boisot has also presented an analysis of the so-called I-space, which can identify cultures and institutions. Figure 8 identifies four different types of transaction in the I-space, each of which is capable of giving rise to a distinctive institutional order.

Figure 8: *Organisational evolution in I-space* (Boisot 1999, 134)



In Table 1 some of the cultural characteristics associated with each type of transaction are listed. These transactions are essential for the function of the knowledge society. It can be seen that the:

- market transactions are codified, diffused and abstract,
- bureaucracy's transactions are codified, undiffused and abstract,
- networks' transactions are uncodified, diffused and concrete, and
- start-up's transactions are uncodified, undiffused and concrete.

Table 1: *Transactions in the I-space*

Bureaucracies	**Markets**
*Information is codified and abstract *Information diffusion is limited and central control *Relationships are impersonal and hierarcial *Submission to superordinate goals *Hierarchical coordination *No necessity to share values and beliefs	*Information is codified and abstract *Information is widely diffused, no control *Relationships are impersonal and competitive *No superordinate goals - each to themselves *No necessity to share values and beliefs
Fiefs or start-ups	**Clans**
*Information is uncodified and concrete *Information diffusion limited by lack of of codification and abstraction to face-to-face relationship *Relationships are personal and hierarchical (feudal/charismatic) *Submission to superordinate goals *Hierarchial coordination *Necessity to share values and beliefs	*Information is uncodified and concrete *Information is diffused, but still limited by lack of codification and abstraction to face-to-face relationships *Relationships are personal but non-hierarchical *Goals are shared through process of negotiation *Horizontal coordination through negotiation *Necessity to share values and beliefs

The arrows in Figure 8 demonstrate the kind of organisational evolution process that typically occurs in knowledge societies. The specific nature of social institutions and transactions is an important characteristic of the knowledge society.

Summary

In summary, the following can be noted:

- There are competing interests and strategies in a knowledge society, and different stakeholders have different roles in knowledge society developments.
- It is obvious that the digital divide is one of the most problematic issues in a knowledge society and there is a threat of social exclusion on a large scale.

- Companies are facing global competition. Benchmarking and imitation of other competitors' performances is not enough for the successful development of business operations. Due to this notion, innovative environments, R&D policies and creative ideas play a larger role than before in knowledge societies.
- Digitalisation and education are the key driving forces of modern knowledge societies.
- There are different kinds of social institutions in modern knowledge societies. The specific nature of these institutions should be understood in knowledge society foresight studies.
- The tradition of foresight studies is dominated by the old idea of 'technology push'. However the role of social fabric is central to the proper management of knowledge societies in the field of industrial relations, working conditions and the quality of life.

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Further resources: Web-resources on digital divide issues

Bridges.org
http://www.bridges.org/

The bridges.org toolkit offers information on how to solve specific problems, or achieve specific goals in putting ICT to practical use. New tools will be continually added to the toolkit. Currently the contents are:

- **Telecentre resources** – links to how-to guides, analyses, and other resources on telecentres and community technology centres
- **E-Readiness resources** – information on how to assess a community's or country's ability to benefit from ICT
- **E-Literacy materials** – training documents to help improve ICT skills and knowledge
- **Database of online resources** – a detailed list of ICT organisations, reports, and other resources on the Internet

Bridges Toolkit
http://www.bridges.org/toolkit/

Digital Divide Network
http://www.digitaldividenetwork.org/content/sections/

Falling through the Net: toward digital inclusion
http://www.ntia.doc.gov/ntiahome/fttn00/contents00.html

A nation online: how Americans are expanding their use of the internet. Washington, D.C., February 2002
http://www.ntia.doc.gov/ntiahome/dn/

Campaigns: digital divide
http://www.oneworld.net/campaigns/digitaldivide/

DigitalDivide.org
http://www.digitaldivide.org/

Digital Divide Project
http://www.washington.edu/wto/digital/

Digital divide's new frontier: strategic audit of activities and opportunities
http://www.childrenspartnership.org/pub/low_income/

Bridging the digital divide (Internet Access in Eastern and Central Europe)
http://www.cdt.org/international/ceeaccess/

The digital divide: a resource list
http://www.gseis.ucla.edu/faculty/chu/digdiv/

E-Europe: information society for all
http://europa.eu.int/information_society/eeurope/index_en.htm

Benchmarking E-Europe
http://europa.eu.int/information_society/eeurope/benchmarking/index_en.htm

Research resources on the digital divide
http://ksghome.harvard.edu/~.pnorris.shorenstein.ksg/DIGITALR.HTM

QuickLinks - digital divide
http://www.qlinks.net/quicklinks/

World Bank - data & statistics
http://www.worldbank.org/data/

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