

sation of knowledge and the linking to policy-making should take place as well as the cultural diffusion of foresight. In the near future, a call for ideas will follow, also events that should address geo-political challenges, e.g. the European model of society, and a guide to foresight exercises in FP6. Instead of strict rules of doing foresight, which should secure quality and reputation, he preferred the “learning by doing” approach and the accumulation of experiences. Here, the key issue is the evaluation of foresight impacts to legitimate foresight exercises. In particular, the learning impacts in decision-making should be elaborated and demonstrated.

At the end of the conference, the revised “*Ioannina Manifesto*” was presented and agreed upon by the participants (see conference website quoted at the beginning of this article). It mainly describes the will to cooperate in foresight and its different types.

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Integrating Technological and Societal Aspects of ICT in Foresight Exercises

by Barend van der Meulen, University of Twente, The Netherlands

This article reports on the analysis of past foresight activities with respect to the integration of social dimensions of technology in the domain of ICT. Special emphasis was given to the conceptualisation of the relation between social and technological dimensions and to the balancing of impacts. Good examples for the integration of aspects are provided for each of the major foresight methods (panels, scenarios, Delphi surveys). Conclusions are drawn on the factors that made some studies more successful in integration than others.

1 Introduction

In January 1994 one of the first European Digital Cities went online in Amsterdam. The initiators, a mix of progressive commentators and computer “nerds”, aimed at providing *all* Amsterdam citizens access to the infrastructure of Internet, and via Internet to public information and public debate. The experiment was a great success: within a week, the new “city” had already 3,500 residents and 2,000 visitors a day. Modems were sold out in Amsterdam, and the infrastructure to enable access had to be doubled. In their proposals for the Digital City, the initiators had emphasised that they wanted to include especially the traditional non-users of ICT: women, elderly people and even the homeless. Terminals were installed in buildings for the elderly and in public places like pubs, the city hall and on the street. Amsterdam Digital City really started with an idealistic view of opening the new communication channels for everyone, and gave them access to political information and power.

After a few months, the success of the experiment made the City Council and the national government decide to continue their support. Despite the policy of accessibility the users did however not represent the Amsterdam population in terms of age, gender, income, social status etc. A survey showed that most of the residents of the Digital City were young, highly educated men. For this group, the Digi

tal City created new opportunities to meet others, to discuss policy and other issues and to access public information. For all the others, Internet was just as far away and inaccessible as before with the Digital City (Rommes 2002).

The example of the Digital City is not a case on its own, but exemplifies a broader pattern in the co-evolutionary development of ICT, ICT applications and society as well as in the politics of new ICT applications. In Foresight these kinds of dynamics are hardly made visible.

2 Social Dimensions of ICT

Academic studies on ICT and society show that there is a range of issues which make clear that the Information Society like any society will have winners and losers, beneficial consequences of ICT and harmful applications. A review of these academic studies shows that there are no simple and straightforward effects of ICT on society. Mostly effects are multiple and contradictory. New positive developments are accompanied by neutral and negative effects (cf. Spears, Postmes et al. 2000). Complemented by other studies (among others: Mansell, Schenk et al. 1998; Mansell and Wehn 1998; Garson 2000; Sharpe 2000; Wyatt, Henwood et al. 2000; Rommes 2002), and information we obtained from experts on ICT and Society we arrived at a list of ten issues. (cf. Box 1)

Box 1: ICT and Society – Ten Issues

1. Social Cohesion, isolation and exclusion
2. Social Norms and antisocial behaviour
3. Criminal and terrorist activities using ICT
4. Identity manipulation and self management within communications
5. Shifting power relations and politics
6. Cognitive consequences, mental health, addiction
7. Education and life long learning
8. Work and organisation
9. E-business, e-commerce and entertainment
10. ICT and privacy

We cannot fully elaborate on these ten issues here, but it is important to note that for each of them societal dimensions are ambiguous. Communication technologies create new forms of social relationships and new forms of isolation and exclusion. The bonds that are formed through the new communication media can affect traditional social relationships both positively and negatively (see also European Commission 2001). With the new forms of sociality, new norms are developed (“netiquette”), which, when not fully embedded, shared and understood, also create new areas of dispute about norms, social behaviour and, as a result, of social learning. A specific example of antisocial behaviour is of course the use of ICT to prepare or facilitate criminal and terrorist activities.

In S&T policy, probably the most frequently mentioned new *opportunities* ICT creates are in the field of learning, work, e-business and services. For education, however, literature reports many failures especially if the new technologies are implemented in traditional educational situations. To be successful design activities are required which include the vital aspects of the communicative aspects of ICT such as collaborative learning. Likewise, whilst the use of ICT within offices is by now seen as evident, the impacts for boundaries between office and home, between work life and private life, urge for organisation specific solutions to cope with negative consequences. In the field of e-business the new commercial practices give added value to existing markets, replace markets or open up new markets, but the viability of such new relations is still uncertain.

Within the literature on ICT and society Spears et al. found four typical biases (Spears, Postmes et al. 2000):

1. On the one hand an over-generalisation of the benefits of ICT takes place, presenting the Information Society as an utopia in which most of the current societal, economic, environmental issues are solved.
2. On the other side, harmful aspects of ICT might be over-emphasised as well, presenting the new activities as anti-social and an indication of the end of society. The result is a dystopian society where individuals are suppressed by or through the ICT.

Next, two simplifications are often made dealing with the relationships between the ICT technology and social developments.

3. Some studies display an overly technological determinism, which implies that future developments within society are completely dependent on and determined by the technological possibilities of new ICT.
4. In the other simplification society fully determines technological developments. Needs and strategies of society and social actors will make up the new Information Society.

3 Integration of Technological and Societal Aspects in the Austrian Delphi

Delphi studies are one of the most prominent methods for technology foresight studies. For quite a long time these Delphi studies focussed on technological developments. The most profound step towards integrating social and technological aspects in a Delphi foresight was made by the Austrian foresight study. From the very beginning it tried to integrate social and technological dimensions through organising the Technology Delphi according to specific societal sectors and needs, and to complement it with a Social Delphi (ITA 1998a, b, c; ITK 1998a, b; Rust 1998). Objectives of the Society/Culture Delphi were to map social, cultural, economic and political trends within Austrian society; to assess the societal and political significance of each of the trends; to assess impacts of societal trends on research and development as well as in terms of priorities for politics; to identify conflict potentials of societal trends and finally, to assess the desirability of trends as perceived by Delphi experts.

Crucial for the integration of social dimensions, however is the integrated analysis, in which is examined how several developments in technology and in society reinforce each other, are contradictory or may create second order effects. The analysis shows for ICT, that Austria will hardly play any role in development of new hard- and software, and that the importance of ICT lies in the application. The main applications (in terms of economic, political importance and socio-technical likelihood) are those around issues like teleshopping, telelearning and teleworking, with the important implication that the distinction between private and public will be

blurred. Items and conclusions emphasise *opportunities* of ICT, rather than possible threats, risks and possible negative impacts. The specific questionnaire technique related to Delphi, which requires that items need to be formulated into clear statements, makes it difficult to analyse socio-cultural dynamics in-depth. In that vein the Austrian Delphi shows at the same time the possibilities to go beyond the Technology Delphis, but also the inherent limitations of the Delphi technique.

One can think of two ways to overcome this problem. One is by moving away from the large scale Delphi techniques and having a number of heterogeneous foresight activities that may complement each other by shifting foci. The Netherlands provides an example. The other is to have scenarios where the worlds behind the expectations packed in Delphi statements are made accessible through stories and data.

4 Integration of Technological and Societal Aspects in Dutch ICT Foresight

Foresight in the Netherlands is characterised by a patchwork of foresight activities in different policy contexts and organised by different ministries, agencies and other organisations (Van der Meulen 1996). As a consequence most foresight activities are rather focussed, either in terms of the technological or scientific scope of the foresight activity or in terms of the policy contexts. We looked at three foresight activities to see whether integration was accomplished in such focused foresight.

The first foresight activity we looked at, the *Technology Radar*, commissioned by the Ministry of Economic Affairs, started as a strong industry oriented foresight activity, but follow-up activities in a. o. ICT and multimedia were organised to address implementation issues (RAND Europe and Coopers & Lybrand Technology Consultants 1996 a-e).

The foresight study relied heavily on input from experts from industry and universities. In its first phase, 40 strategic technologies for the Netherlands were identified, and assessed for their economic value and their competitive advantage. Subsequently, for fifteen of these an analysis was made of the existing knowledge infrastructure. Because of some dissatisfaction with the final results and the impact of the

study, the Ministry added a third phase to the foresight process in which workshops were organised with the main stakeholders for several of the strategic technologies. The workshops aimed at bringing together key actors within the specific technology field and to define appropriate policy actions. Social issues of ICT were used solely to determine the importance of a technology. This information came from international reports and was presented to indicate *the relevance of technology for development or social need*, but references to Dutch societal developments were missing. In the workshop, discussion ignored social issues and focussed on technological ones.

A second foresight exercise we looked at was done by a *panel* from industry and university, set up by the *Advisory Council for Science and Technology Policy*, which in its foresight activities wanted to look explicitly at the development of societal demands for research. The aim of the foresight exercise was to formulate a vision for the role of ICT in the Dutch economy and identify research priorities for the next 10 years (Verkenningcommissie Kennis voor de Netwerkeconomie 2001). However, the commission did not fulfil these aims. Instead it concluded, with previous foresight studies as a background, that it was inappropriate to set priorities considering the strong dynamics in ICT. It recommended that attitudes in the knowledge infrastructure had to be changed from mainstream R&D towards what they called a “yearning for an endless sea”. The report mentions the importance of ICT for our current and future society, but, though it looked at other foresight reports including the Netherlands Digitaal study we discuss below, it does not attempt to foresee social and technological developments, let alone in an integrated way.

5 Integration of Technological and Societal Aspects in Scenario Based Studies

In contrast to Delphi studies which de facto provide forecasts about the scientific and technological developments (although their interpretations are often more modest), scenario techniques consider the future as uncertain. Scenario techniques try to overcome the uncertainty by mapping different possible developments

which can offer strategic help in decision making.

There is a wide range of scenario-techniques, which differ in the extent to which they consider developments as uncertain and the normative level of the scenarios. Despite these differences, scenario techniques have some similar phases which are necessary to focus the content, assure the quality and logic of the plots. In terms of integration of technological and socio-economic dimensions of future developments, scenarios provide through their story telling ample opportunities for realising this integration. Critical issues however, are to what extent socio-economic dimensions are an integral part of the scenario, or are used only to make up the stories, and whether the integration can be continued in defining the strategic implications. In the Dutch scenario study *Nederland Digitaal* the first issue was realised, but unfortunately it did not have an impact on other foresight activities and RTD policy areas.

5.1 Nederland Digitaal

Nederland Digitaal is a scenario study of KPMG for the Dutch Government, and part of a series of studies on spatial planning and economic policy (KPMG 2000). In a series of White Papers the Dutch government had published at the end of the nineties on spatial planning, environment, infrastructure, some references had been made to ICT, but none of them included a serious analysis of the consequences of ICT. The scenario study *Nederland Digitaal* presents consequences of ICT for society and specifically for the economic infrastructures, environment and mobility.

The scenario study was conducted by a team of KPMG, assisted by some internal experts and advised by an advisory committee of the main ministries involved.

The scenario study started with the development of two ICT scenarios based on two kinds of driving and inhibiting forces: technological functionalities and acceptance of actual possibilities. The two scenarios reflected an “ICT high” and an “ICT low” society respectively. In these scenarios, the digital revolution is characterised as the availability of more and more free information, the growth of mobile

and wireless applications, and the standardisation of hardware and software.

Subsequently, these two scenarios were combined with four existing scenario studies on the economy, infrastructure and mobility, spatial planning and the environment, which had been published in the years before. From the combination of the scenarios a list of three driving forces, eight inhibiting factors and four ICT specific factors could be obtained. Combination of and relations between these factors resulted in three scenarios (cf. Table 1).

“Dynamic Digital” depicts a strong individualistic and internationally oriented, market driven society. Strong competition at a global level induces new innovations and challenges actors to exploit the economic ICT possibilities as much as possible. Environmental concerns are secondary to economic ones. ICT has penetrated all segments of society, including private life, industry and government.

“Conscious Digital” is a scenario of a society in which societal and environmental values are important and ICT is not used just for economic purposes but also to realise specific societal objectives. Driving force is the potential of ICT to support personal choices and societal decisions to enhance quality of life. ICT is also used to calculate and attribute ecological costs of processes, products and transport.

In “Hesitant Digital” the Netherlands is following other countries and only if advantages are certain. Industry, government and individuals are hesitant to implement ICT applications and only interested if they are cost effective. In the background there is stagnation of European integration and of economic and technological developments.

For each of the scenarios the study provides a general overview of how society will look if the specific combination of driving and inhibiting factors occurs, and the consequences for spatial development in the Netherlands, mobility and the environment.

Foresight experiences on ICT in the Netherlands are strongly shaped by their political contexts, and as far as there is any impact, it remains within these contexts. Moreover, exercises rely strongly on experts, and few other actors are involved. We were specially interested to see whether from a system perspective social issues would be better addressed than in

the large national exercises and if so whether there is any cross-fertilization between the exercises.

The scenario study indicates that the patchwork organisation of foresight also produces more interesting patches, in which indeed social issues are better addressed. However the other two exercises have not profited from these experiences. They display the weaknesses of heavy reliance on experts in foresight. Although such experts may be needed to ensure the quality of the scientific and technological content of a foresight, and because of their experience in the sector, their expertise seems to be too narrow to integrate social dimensions of ICT.

Table 1: Scenario study “Nederland Digitaal”

	<i>Dynamic Digital</i>	<i>Conscious Digital</i>	<i>Hesitant Digital</i>
<i>Driving forces</i>			
Freedom of choice	✓✓	✓✓	
Convenience		✓	✓✓✓
Interaction needs	✓✓✓		
<i>Inhibiting factors</i>			
Price and investment costs			✓✓✓
Conservatism			✓✓
Dependency			✓
Reliability		✓✓	✓
Security	✓✓		
Privacy	✓✓	✓✓✓	
Verifiability		✓	
Labour market	✓✓✓		
<i>ICT factors</i>			
Efficiency and cost reduction			✓✓✓
Effectiveness		✓✓	✓
Innovation and flexibility	✓✓		
Communication	✓	✓	

5.2 The ICM Panel of the UK Foresight

The second foresight initiative which we looked at which included scenario-like elements was the ITEC – Information Technology, Electronics and Communication group which was set up near the end of 1999 by the Information, Communications, and Media Panel of the second cycle of the UK Foresight

Program to identify technology developments for the next 15 to 20 years and make recommendations about the fertile areas for research for the UK (ICM Panel 2000).

The basic result of the study was a SWOT analysis (strengths, weaknesses, opportunities and threats), which was based on material gathered in a broad documentary and consultation process. Part of this process were separate activities on technological developments and the creation of a vision document, which contained short scenarios on the use of ICT in the future in different contexts.

The visions were created by the group itself in a three phase process. In the first brainstorming phase, the group identified underlying issues for ICT, which were structured in seven overlapping themes: work, learning, leisure, health, transport, public administration, and use of the Internet. In the second phase, the group collected possible ways technology developments in ICT might have significant effects on how people live, work, behave etc. in these areas. Subsequently, these relationships between technology, its benefits (!) and the related issues were transformed into 14 visions.

In the overall foresight process these visions are reflected in the final document through some of the issues, as well as the related technological issues.

Given the technological focus of the policy context, the study has a broader view on ICT and includes in its analytical phase also socio-economic issues, but unfortunately the scenarios do not go beyond the benefits of ICT.

5.3 Micro-Optics Scenario Study

The third study reviewed was a scenario study which was done as part of a university research program on micro-optics in 1998 (Deuten, Rip et al. 1998). Its impact on national policies has been negligible, but it is included in this review because of its explicit attempt to develop "socio-technical scenarios". The technological factors are not seen to be an independent TINA (There Is No Alternative), as in many other ICT studies, but to be uncertain as well. The research program on micro-optics had the ambition to develop materials and devices which could be used for transmission and processing of signals, and thus information at much higher speeds than

current electronic equipment. Within the specific research program, the scenario study was used to inform researchers on micro-optics about possible developments and applications as well as societal effects of micro-optics to improve strategic choices in the research program.

Six scenarios were developed by combination of three possible developments of micro-optics and two possible broader societal configurations. Based on insight in technological developments, and especially the role of standardisation, market developments and competitive forces between technologies, three possible future positions of micro-optics were distinguished:

1. Micro-optics as a niche technology, applied in specific domains where fast transport and processing of complex information is a requirement, but with little diffusion outside the niches.
2. Micro-optics as a new technological domain in combination with micro-electronics. Diffusion is developing through development of new applications and new professional and consumer products.
3. Micro-optics dominates micro-electronics and replaces micro-electronics in almost all ICT products because of its performances in terms of prices and reliability.

The two basic scenarios for societal developments are a

- I. Group Society in which community is a central value and social interactions are relatively stable;
- II. Network Society in which individuals are mobile and move easily between different networks.

Combination of these two main uncertainties gives six scenarios. For each of these scenarios the organisational structure of ICT industry was elaborated, the communication infrastructure as well as applications in the domains of health, education and retail (cf. Table 2).

Although the study did not go beyond its specific academic contexts, it showed that it is possible to integrate technological and societal dimensions by making use of the insights in socio-technical dynamics.

Table 2: The Micro-Optics scenario study

	<i>Group Society</i>	<i>Network society</i>
Niche technology	Together we go (but slowly)	It goes but not so fast
New domain	Together faster and faster	I want access, but what's the price
Replacing micro electronics	Together on a digital highway	All for oneself, speed for all

5.4 ISTAG Scenario Study on Aml

In 1999 the Information Society Technologies Advisory Group of the European Commission (ISTAG) challenged FP5 to: *“Start creating an ambient intelligence landscape (for seamless delivery of services and applications) in Europe relying also upon test-beds and open source software, develop user-friendliness, and develop and converge the networking infrastructure in Europe to world-class”*.

Ambient Intelligence (Aml) indeed became part of the work programme for subsequent years and FP6. Ambient Intelligence stems from the convergence of three key technologies: Ubiquitous Computing, Ubiquitous Communication, and Intelligent User Friendly Interfaces. Intelligent interfaces supported by computing and networking technology will be embedded in everyday objects such as furniture, clothes, vehicles, roads and smart materials to surround people and give them easy access, but be present only upon need. To improve the understanding of Aml, May 2000 ISTAG carried out a scenario study in collaboration with DG Information Society and the Institute for Prospective Technological Studies of the Commission's Joint Research Centre (IPTS-JRC).

The report, published by the IPTS starts with four scenarios that illustrate how Ambient Intelligence might be experienced in daily life and work around 2010 (Ducatel, Bogdanowicz et al. 2001).

The scenarios aimed to identify future technologies and subsequently research lines for realising the development of ICT into Aml, and to identify the economic, political, social impli-

cations of Aml. Discussion of the scenarios by an expert group led to a number of conclusions:

1. The realisation of Aml is not only a technological ambition, but also a social and political one and thus Aml can only be successful if it's part of the economic, social and political development of Europe.
2. Aml can act as a new paradigm for ICT and open the door to major new business and industrial opportunities.
3. Socio-political gains and the economic potential require significant and long term underpinning research of a focused nature.

The four scenarios were built around two main driving forces in the development of Aml. The first is on the objectives and goals behind specific applications and distinguishes the aim for economic and social efficiency from societal/humanistic objectives. The second focuses on the social orientation of the users and ranges from individual oriented users to community oriented ones. For each of the four combinations scenarios were developed. (cf. Table 3) The scenarios include a story about user experiences (e.g. Carmen's working day), as well as elaborating the socio-political issues, the business environment and a technology roadmap for realising the scenario.

Table 3: ISTAG Scenario study on Ambient Intelligence (Aml)

	<i>Individual</i>	<i>Community</i>
Efficiency	Maria, Road Warrior: Aml is the seamless and intuitive support for users going around in a high pressured world.	Carmen: Traffic Sustainability and Commerce. Aml is used to optimise amongst the competing goals for the use of urban space.
Sociable / humanistic	Dimitros, The Digital Me: A scenario about emergent communication and relation behaviours when Aml devices mediate social behaviour and create the possibility of people based ad-hoc networks.	Annette and Solomon in the Ambient for Social Learning: A scenario about a learning environment. Aml empowers the users, provides instant feed back and creates a collective memory.

The scenarios were developed in an interactive workshop of 35 participants and after completion tested and discussed in a second workshop with the same participants. The technological roadmap was also matched with studies on critical technologies and on the technological competitive position of Europe.

6 Conclusions

Based on the perspective on the future development of ICT, three types of foresight exercises can be discerned:

1. Technology driven foresight studies, which focus on the development of the technology or consider technological development as the only driving force. These studies also tend to focus on the benefits of ICT.
2. Demand driven foresight studies, that focus on how ICT can be applied in sectors as solutions to problems. The red thread in these studies is that ICT improves such sectors, and thus there is little to no attention to harmful effects.
3. The third type of foresight exercises consider technological and social developments as equally important.

Foresight can integrate social and technological dimension: it is not a problem of foresight methodologies per se, but of policy focus and drawing appropriate boundaries. Integration of social and technological developments is less a matter of a specific methodology or including the right stakeholder than giving attention to both sides of the development of the ICT process. For each of the dominant foresight methods, panels, Delphi and scenarios, we have seen examples of good integration of social aspects in the foresight process.

Scenario studies have proven to be an especially powerful tool to analyse mid-term future developments. Clearly there is a wide range of scenario studies in terms of scope and ambitions, but in each of the examples we saw that they can be used to integrate social aspects of ICT into foresight. In the two later studies (ICM panel in the UK, the Micro-optics scenario) the integration is really accomplished, balancing the social and technological dynamics and factors in a symmetrical way. In the last (on Ambient Intelligence) the scenarios are

even translated in a technology roadmap which can be used for programmatic purposes.

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First Findings from FISTERA on Foresight

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FISTERA, a thematic network on Foresight on Information Society Technologies in the European Research Area¹, has recently published its first report, an analysis of selected national foresight exercises with respect to their findings on Information Society Technologies (ISTs). The document was prepared by the Institute for Technology Assessment and Systems Analysis of Karlsruhe Research Centre. Some of the main findings on foresight in general and on IST in particular are reported here.

1 Findings on Foresight

The eight exercises were from Austria, the Czech Republic, France, Germany, Hungary, Spain, Sweden, and the United Kingdom. They were selected to represent a cross-section of recent European foresight studies with respect to client, aim and approach. With the exception of Sweden, the national government had commissioned the foresight study in each country. In most cases, the results of the foresight studies were aimed mainly at science and technology decision-makers in or close to government with the Czech study, in the one extreme, focused narrowly on the production of a draft National Research Programme. In the other extreme, Spanish foresight was focused firmly on industry, although it was being funded by ministries.

Four of the studies (Austria, Czech Republic, Hungary and Sweden) were the first endeavours of their kind in the country concerned. The Swedish study has been followed by a second started recently, but in the three other countries nothing definite has yet been decided on follow-up activities at a similar scale, although the final reports of the studies invariably contain a recommendation for further foresight.

The French study is the second of its kind in that country and there have been other foresight-like activities in the past, while in Germany there have been foresight activities of a different kind to that reported here, such as two major Delphi studies closely modelled on the Japanese example (see the article by Cuhls in