



– WP4 First Scenario Synthesis Report –

Deliverable 1.1 for the FISTERA project

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PREST

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I. Introduction: Scenarios and IST Futures

Scenario Analysis comprises a set of approaches to developing visions of future possibilities. For FISTERA, we are interested in using, and developing (or further developing), scenarios that:

- have been derived and presented in a fairly systematic way
- present some holistic sense of IST developments, and not just a few parameters (quantified or otherwise)
- are believed to be useful for the work of the IST Futures Forum

Most (but not all) studies present multiple scenarios. But some that appear to do so are really presenting alternative vignettes within one general scenario (though close inspection may reveal inconsistencies across the vignettes that imply different contextual scenarios for them).

Multiple scenario analysis reflects the fact that the future is uncertain. Study and elaboration of just one scenario does little to communicate much about the range of opportunities and challenges that lie ahead. The use of several alternatives is held up as offering opportunities to:

- Challenge received wisdom - by demonstrating the plausibility of several diverse futures
- Give more sense of how different trends and countertrends might unfold and interact, what the implications would be of variations from the standard account of these developments
- Allow for some test of the robustness of policy and strategy conclusions across different paths of development
- Provide guidance as to signals that may be used in future to see how far we are on one or other path
- Introduce substantially different "worldviews" concerning what drivers of change are and how they are related together, and allow for dialogue among proponents of different viewpoints as to the results of, or the requirements for, various events materialising

There are numerous interesting overviews of the scenario literature and methods available,ⁱ and one recent study has reviewed many of the general scenarios produced in exercises over the last few years.ⁱⁱ We need not detail all of this work here, then. An Annexe presents some points arising from studies that are earlier; less IST-related; or less EU-related, though we draw on some ideas from these studies in the accompanying text. In the present report we shall mainly focus on recent EU IST-focused scenario studies.

II. Key drivers & challenges of IST scenarios

II.1. *Introduction*

This chapter outlines a series of driving forces and challenges identified in most recent IST scenario reports in Europe. We use the term 'key' to indicate that to some extent the selected drivers or challenges are determining the course of action of IST scenarios. These top ten drivers and challenges were identified by compiling a long list of driving forces and challenges from various scenario studies and identifying those which occurred more frequently and, when necessary, clustering them into a number of aggregated categories.

II.2. *Key drivers of IST scenarios*

This list of driving forces brings together major trends shaping IST scenarios in Europe. We have tried to assign each driver to a category within the STEEP (social, economic, environmental, political and values-ethical) framework. It is however important to bear in mind that most of these drivers are obviously influenced by socio-economic and political interests of major IST producers and users.

We have identified 10 driving forces which are recurrent in some of the latest European IST reports. These drivers are believed to originate future changes in society and therefore a proper understanding of them will help us undertake vision building activities for anticipating the future of IST.

... 2.1. **Relationships & communication (Soc)**

A major driving force is the use of IST to mediate interpersonal relationships in work and leisure, and for individuals to interact with service providers of all kinds. The demand for such applications will continue to shape the evolution of IST itself, organisations using it, and patterns of social interaction more generally.

... 2.2. **Aging population & health (Soc)**

There are growing demands for health- and elder-care, associated with demographic change and the emergence of new medical and medicalised problems, and rapid development in biosciences and related fields. Again, IST applications have much to contribute here, and this will shape IST R&D (e.g. telemedicine, health monitoring, biosensors) and the provision of care and self-care facilities.

... 2.3. **Cultural pluralism (Soc)**

EU and ongoing migration is leading to quantitative and qualitative change in linguistic, cultural and other features of the EU. As well as increasing lifestyle differentiation and socio-political expectations, these developments will impact upon access to and uses of IST and services applying it.

... 2.4. **Community learning & planning processes (Soc)**

The knowledge society implies informed citizens and consumers, not just as atomised individuals but also as members of groups in civil society. Going beyond use of IST in communications and relationships, this driver implies reconfiguration of relationships between social groups and political and economic organisation to shape social action and create social memories and other forms of social capital.

... 2.5. Miniaturisation of communication devices (Tec)

IST contains its own drivers, in that competition between research groups and firms continues to generate evermore capable components and systems. The long-established trend of miniaturisation (Moore's law, etc.) seems set to persist for years to come, and even were it to slow there is still much scope for smaller, faster and more powerful IST devices to be applied to all areas of social and economic activity. These opportunities will be seized in one form or other.

... 2.6. Interconnectivity & systems integration (Tec)

Related to the above development, a major shift in recent years has been the move to more pervasive networking of IST devices. Integration and interconnectivity of devices, and interoperability of systems and services, facilitates numerous applications, notably moves towards Aml-type uses of IST.

... 2.7. Mobility and evolution of trade and economic affairs (Eco)

Enhanced opportunities for mobility and growth of markets, extension of the international division of labour and search for new products has been very much driven by "globalisation" and more recently by the EU enlargement process, and one major uncertainty is whether this trend will be undermined by political pressures or other factors (such as economic instability generated by business cycles, brain drain or financial crises). IST prices and competition – and applications - will be shaped by such factors. For instance, the extent of "offshoring" and the orientation to developing country markets would be very contingent on the evolution of this driver.

... 2.8. Environment and sustainability (Env)

The development of global environmental concerns is highly unpredictable, with climate change potentially forcing considerable adaptation upon EU countries, and efforts to reduce greenhouse gas emissions likely to shape much policy for technology, production and consumption patterns. Other environmental problems – in the built environment and well as in nature and agriculture – also have to be considered – it is highly likely that links between pollutants and human health problems will be established in coming years, leading to major challenges. While many of these will be based on chemicals, some may relate to IST (e.g. electronic signals?). In any case, IST will have an important role to play in creating more sustainable societies, through emissions control, sensors, etc.

... 2.9. Governmental efficiency (Pol)

Governments are under wide pressure to be more open (questions of new governance structures) but also to improve the efficiency of public administration and services, to reform regulations, and so on. IST – despite recurrent problems in large public projects - is seen as an important tool for improving efficiency, effectiveness, and ultimately democratic participation. Demands from government, businesses and civil society will shape IST use and the functioning of states.

... 2.10. Security concerns (Pol)

Security issues are now seen as a continuing and prominent concern. The challenges of terrorism (from cults and internal dissent as well as from external state and nonstate sources) are substantial ones, both impacting upon IST systems – whose vulnerability to accident and hacking has long been a subject of concern – and possibly finding (partial) solutions in some IST applications. As well as large-scale incidents threatening network security, integrity and stability, there are more "localised" concerns surrounding fraud, identity theft, and other issues undermining confidence in IST systems.

II.3. Key socio-political challenges of IST scenarios

This list of challenges brings together major issues constraining the future integration of IS technologies in the European society.

... 3.1. Privacy, security & trust

New generations of IST, with capacity to locate and identify people so as to tailor services to them raise evermore challenging issues of personal privacy. Who can have access to what data for what purposes, and how is this to be transparent? It is necessary to support trust with appropriate on systems and processes, though inevitably there are questions of establishing trust between individuals and organisations that go beyond technical issues. (Many other issues arise in this context, including authenticity/authentication which involves long-term accessibility and physical and intellectual integrity of digital objects as well as the preservation and identification of personal identities). Another important challenge is the issue about content ownership vs. free availability and distribution.

... 3.2. Reliability & robustness

People may be reluctant to entrust not just personal data, but also operational control, to systems that may be vulnerable to outages, failures, and mistakes of whatever provenance (viruses, hacker attacks, natural disasters or EMC interference from other systems). The increased use of electronic systems requires more efficient content-filtering and anti-spam security systems in organizations and businesses of all sizes.

... 3.3. Ethics

In the last few years information society technologies have provided a space for carrying out electronic activities that traditionally would have required face-to-face interaction (i.e. shopping, data and knowledge exchange, etc. One of the main challenges for the emerging information society is the ethical use of technology for controlling environments, personal relations, identities and content (i.e. protecting vulnerable people from being manipulated or seduced by pornography).

... 3.4. Uneven access to finance & information resources

Digital divides are liable to persist and develop in new forms with successive generations of IST. Financing “universal access” across social groups, regions, firms of different sizes, etc. is liable to prove problematic, yet this would help establish wider markets and support SMEs and wide-flung communities. The latter would also be arguable important sources of further innovation in their own right.

... 3.5. Social innovation: IST literacy and capabilities

A major challenge is organisational modernisation to complement and make effective use of new IST, and creative solutions to all kinds of social problems that cannot just be made to disappear by applying standard IST solutions to them. Social creativity, informed by IST skills of all kinds, is required in organisations of all sorts and in civil society. Without this, the productivity and quality of life potentials of new IST will remain severely restricted.

III. Overview of Existing IST Scenarios

III.1. Introduction

This chapter outlines a series of five IST oriented scenarios that have been developed in the course of recent EU projects. They are extraordinarily different studies, and each one is described in terms of the methodologies and rationale as well as the substantive content. For each we begin by providing some background information on the study – who prepared the scenarios, using what methods and for what purposes. Then we excerpt illustrative, useful and relevant material from them.

III.2. EUFORIA scenario (Delphi-based)

... 2.1. Background information

In the context of its four-year work programme, *Analysing and Anticipating Change to Support Socio-Economic Progress 2001-2004*, the **European Foundation for the Improvement of Living and Working Conditions** has undertaken a foresight project (Euforia) on the 'European Knowledge Society and its influence on living conditions, working conditions and industrial relations'. Euforia was also linked to the Lisbon objectives for the EU to become 'the most competitive and dynamic knowledge-based economy, capable of sustained economic growth with more and better jobs and greater social cohesion.' The project combined a great number of foresight methods: Brainstorming, SWOT, cross-national workshop, cross-impact analysis, prioritisation, panels, and Delphi.

EUFORIA studied the "knowledge Society" development in the EU, rather than Information Society per se. The notion of Knowledge Society (KS) is wider than that of information society (IS), or so it was argued there. IS concerns the transformations of society effected through the use and reactions to the use of new ISTs. KS also includes sociocultural changes such as the rise of services, new philosophies and practices of knowledge management, greater knowledge-intensity of work and production – all of which are mediated by IST use, but which are not necessarily derived from this. EUFORIA involved some EU-wide work (indicators, workshops) and some analysis at the level of three pilot countries (**Finland**, high on most KS indicators, **Germany** roughly average in EU terms, and **Greece**, relatively underdeveloped on most KS indicators). A Cross-National Workshop examined drivers on KS and their influences on living and working conditions and industrial relations. Two rounds of national workshops were held, the second set concentrating especially on developing scenarios for the KS in the respective countries. These national scenarios developed by the national workshops were analysed to some extent in the EUFORIA report, but for now we focus on the development of a *single* scenario, in the form of a vignette derived from the online Delphi study undertaken in the project.

The scenario was prepared in November 2003ⁱⁱⁱ and built on the results of a multilingual cross-national online **Delphi survey** with a response rate of **208 experts**. About 70% of the participants were from the three pilot countries (Greece, Germany and Finland), 20% from the EU15 and new accession countries, and the remaining 10% from Asia and The Americas (altogether, respondents from **25 countries**.) The focus was the EU15 Knowledge Society by 2015. The questionnaires targeted individuals from the **research, public, private and NGO** sectors (an even distribution of participants across all sectors was achieved in the Finnish and international surveys, while Greek and German responses were dominated by the research and private sectors). The Euforia Delphi looked at 32 cross-national social, technological, economic, environmental, political and values-related (STEEP) trend statements, clustered into six categories: governance and mobility, health and privacy, industrial relations, living conditions, sustainable development and working conditions.

The survey evaluated the impact of the 32 trends over 9 factors:

- Social cohesion
- Social exclusion or divides
- Sustainability/environmental quality
- Employer-employee relations
- Economic growth/wealth creation
- Entrepreneurship and innovativeness
- Employee exercise of autonomy and responsibility at work
- Work-life balance
- Job creation

... 2.2. Scenario 1 – **Leia's Monday morning by 2015**

The '*Leia's Monday morning by 2015*' scenario shows some events around the life of a 16 years old European school student and her family. Using story telling techniques, the scenario linked the 11 trends where there was a high degree of consensus among the 208 Delphi participants that these would form likely characteristics of the European society by 2015. Four of those trends are related to Information Society technologies.

a) Main driving forces

The scenario is driven by the following knowledge society trends:

<ul style="list-style-type: none"> • Life-long learning becomes widespread with a majority of workers undertaking more than one period of substantial retraining during their working life 	Socio-economic
<ul style="list-style-type: none"> • Europe has developed into a leading force in the area of sustainable development and the use of environmental technologies 	IST-related
<ul style="list-style-type: none"> • Social and policy changes in European countries encourage female entry into professional and technical jobs that are currently male-dominated, leading to substantial decreases in gender-related pay inequalities 	Socio-economic
<ul style="list-style-type: none"> • New forms of networked business organisation, that were unknown or very rare at the turn of the century, will now account for a substantial level of economic activity 	Socio-economic
<ul style="list-style-type: none"> • A major increase occurs in the use of electronic networks for remote supervision of new kinds of work (tele-working, mobile working), and new atypical forms of work 	IST-related
<ul style="list-style-type: none"> • Widespread use of ICT in e-governance enhances transparency in the procedures concerning the relationship between the citizen and the state 	IST-related
<ul style="list-style-type: none"> • Harmonisation of educational standards (including certification) across the EU increases trust and transparency in the educational system 	Socio-economic
<ul style="list-style-type: none"> • Widespread use of telemedicine and online health monitoring systems increases the ability of people with serious chronic and age related diseases to maintain their independence 	IST-related
<ul style="list-style-type: none"> • Despite social and employment policy interventions, for most workers their work-life balance deteriorates causing rising family stress and conflict 	Socio-economic
<ul style="list-style-type: none"> • Widespread abandonment of conventional notions of retirement enable the elderly to continue working if they wish to 	Socio-economic
<ul style="list-style-type: none"> • EU policies are used to promote labour market mobility, despite resistance from individuals, trade unions and employer organisations 	Socio-economic

III.3. STAR scenarios (survey-based)

... 3.1. Background information

The STAR scenario report^{iv} (prepared in October 2003) looked at future uses of ICTs and in particular tried (1) to understand what types of access, what types of content and what practices will draw IST applications forward and (2) to identify what brakes could appear (i.e. security issues such protection of personal data) by **2010-2020**.

STAR scenarios used inputs from **300 European IST experts** through a **survey** developed by STAR working team (the group included researchers from Databank Consulting, SPRU, Telecom Paris, Empirica and National Technical University of Athens in cooperation with Media Alse). The STAR project is an initiative conducted under the User-Friendly Information Society Programme, as part of the European Union's Fifth Framework Programme for Research and Development.

In this context, the STAR team considered **three dimensions** for the development of IST scenarios survey: The first relates to social communication processes: what type of media and use will the information **society** favour? The second concerns the economic system and the role of **industry**: what type of company and economy will the information society produce? The third relates to how the State (**government**) will act and be affected by ICTs. The key questions addressed in the survey dealt with three large domains (5 questions for each domain):

- (i) **society vs. individual:**
 - Will the adoption of communication services favour a type of use or not?
 - Will the increased availability of media modify social behaviours?
 - What will be the individual "trust" in the information society services?
 - What adoption mechanisms (learning and dissemination) will be established?
 - What consideration is given to information?
- (ii) **market vs. hierarchy:**
 - What impact will the information society have on industrial structures?
 - What impact will the information society have on industrial performance?
 - How will the production system respond to the demands of the information society?
 - How will the company, society, knowledge and territories articulate?
 - How are information society products defined and how do they develop?
- (iii) **correction of imbalances vs. a search for a new balance:**
 - Can governments mobilise the information society to solve problems which they encounter in their administrative and productive activity?
 - What policy as regards managing public assets?
 - What protection will exist for authors and consumers?
 - What policy will governments adopt to extend uses and consumption?
 - What relation exists between policy towards the information society and sustainable development policy, notably understood from the angle of the environment?

Four scenarios were envisaged:

- **The reign of communities**
- **The reign of ambient mediation**
- **Effective relationships**
- **The failure of the information society**

... 3.2. Scenario 1 – The reign of communities (Connected Lives)

This scenario presents a European **society** where ICT developments reinforce sensory communication and emotional contacts. Reallocating relationships plays a key role (i.e. using the Internet to divide society along new values) and there is limited trust in Information Society services because interfaces and people's competences advance more quickly than the complexity and diversity of IS services.

IST relations with **industry** are driven by consumers' willingness to pay for product quality improvement, thus stimulating market growth. Transaction costs remain stable and complex industrial value chains are dominated by big corporations. Strong institutional and business global networks prevail and integrated products and services are offered as packages by large corporate alliances.

IST relations with **government** are only for minor reorganisation of processes, resulting in low efficiency benefits and cost reductions. EU governments keep outsourcing services to private and non-profit sectors and policies favour content suppliers (i.e. strong enforcement of intellectual property rights, commercial use of data). There are proactive policies against the Digital Divide seeking for more equality and supporting national champions.

a) Main driving forces

The scenario is driven by:

- Human use of ICT for **interpersonal media supporting emotional relationships** (environment dominated *by audio-visual equipment in the habitat* such as television and even home cinema and *by the mobile telephone and/or mobile videotelephony*)
- Human use of ICT for reallocation of relationships
- Industry use of ICT for stabilising transaction costs
- Industry use of ICT for complex value chains dominated by large companies
- Government use of ICT for **marginal reorganisation of processes** (remains the traditional outsourcing of services to private and non-profit sector)
- Government use of ICT with low efficiency benefits and cost reductions

b) Main challenges

The major challenges are:

- the strengthen community values and individual security but with some risks of creating greater social and economic exclusion
- the limited scope for free use of content

... 3.3. Scenario 2 – The reign of ambient mediation (The Internet Galaxy)

This scenario presents a European **society** where ICT developments reinforce symbolic and rational communication whereby individuals interact with society primarily through machines (via writing in particular, i.e. according to survey respondents, you speak better of yourself by letter or mail than by sending a photo). Reallocating time between different tasks or social functions plays a key role and a wide range of Information Society services are extensively adopted due to society's complete trust in ICT (i.e. individuals outsource decisions in an ambient intelligent world).

ICT relations with **industry** are driven by positive effects of improvements in productivity. Transaction costs decrease and non-linear-open value chains dominate industrial relations (smaller firms with intense-unstable-and-evolving interpersonal networks sustain business relations and participate in collaborative management of information systems). Price structures of IS products and services are transparent and production costs are openly tailored by customers.

ICT relations with **government** are based on major reengineering of processes resulting in significant efficiency/effectiveness benefits and cost reductions of public services (e-governance). EU governments highly invest in infrastructural reforms related to IS services. EU governments launch proactive-liberal-market policies promoting free content provision but making sure that personal data is not used for commercial purposes. ICT contribution on sustainable development policies motivates governments to increase investments in the IS.

a) Main driving forces

The scenario is driven by:

- Human use of ICT for **symbolic and rational communication** (environment dominated by *communication of data* and diversified by *emergent communicating objects*)
- Human use of ICT for **reallocation of time** (remarkable importance of the time budget)
- Industry use of ICT for reducing transaction costs
- Industry use of ICT for non-linear-open value chains dominated by small firms
- Government use of ICT for **major reorganisation of processes** (large investment in IS infrastructure)
- Government use of ICT with high efficiency benefits and cost reductions

b) Main challenges

The major challenges are:

- symbolic and rational communication requiring **acquisition of certain level of IT literacy**
- liberal **market-oriented policies increasing the digital divide** (marginal social groups without or with very limited access to IS benefits)
- the increased individual insecurity
- the strong risks of economic and social exclusion
- the increased social isolation

... 3.4. Scenario 3 – Effective relationships (Web Impact)

This scenario presents a European **society** where ICT developments reinforce sensory communication and emotional contacts. Reallocating relationships plays a key role (i.e. using the Internet to divide society along new values) and there is limited trust in Information Society services because interfaces and people's competences advance more quickly than the complexity and diversity of IS services.

ICT relations with **industry** are driven by positive effects of improvements in productivity. Transaction costs decrease and non-linear-open value chains dominate industrial relations (smaller firms with intense-unstable-and-evolving interpersonal networks sustain business relations and participate in collaborative management of information systems). Price structures of IS products and services are transparent and production costs are openly tailored by customers.

ICT relations with **government** are based on major reengineering of processes resulting in significant efficiency/effectiveness benefits and cost reductions of public services (e-governance). EU governments highly invest in infrastructural reforms related to IS services. EU governments launch proactive-liberal-market policies promoting free content provision but making sure that personal data is not used for commercial purposes. ICT contribution on sustainable development policies motivates governments to increase investments in the IS.

a) Main driving forces

The scenario is driven by:

- Human use of ICT for **symbolic and rational communication** (environment dominated by communication of data and diversified by emergent communicating objects)
- Human use of ICT for **reallocation of time** (remarkable importance of the time budget)
- Industry use of ICT for reducing transaction costs,
- Industry use of ICT for non-linear-open value chains dominated by small firms
- Government use of ICT for **major reorganisation of processes** (large investment in IS infrastructure)
- Government use of ICT with high efficiency benefits and cost reductions

b) Main challenges

The major socio-political challenges are:

- the strengthened community values and individual security but with some risks of creating greater social and economic exclusion
- the limited scope for free use of content
- liberal market-oriented policies increasing the digital divide (marginal social groups without or with very limited access to IS benefits)

... 3.5. Scenario 4 – Failure of Information Society

This scenario presents a European **society** where ICT developments reinforce symbolic and rational communication whereby individuals interact with society primarily through machines (via writing in particular, i.e. according to survey respondents, you speak better of yourself by letter or mail than by sending a photo). Reallocating time between different tasks or social functions plays a key role and a wide range of Information Society services are extensively adopted due to society's complete trust in ICT (i.e. individuals outsource decisions in an ambient intelligent world).

ICT relations with **industry** are driven by consumers' willingness to pay for product quality improvement, thus stimulating market growth. Transaction costs remain stable and complex industrial value chains are dominated by big corporations. Strong institutional and business global networks prevail and integrated products and services are offered as packages by large corporate alliances.

ICT relations with **government** are only for minor reorganisation of processes, resulting in low efficiency benefits and cost reductions. EU governments keep outsourcing services to private and non-profit sectors and policies favour content suppliers (i.e. strong enforcement of intellectual property rights, commercial use of data). There are proactive policies against the Digital Divide seeking for more equality and supporting national champions.

a) Main driving forces

The scenario is driven by:

- Human use of ICT for **interpersonal media supporting emotional relationships** (environment dominated by audio-visual equipment in the habitat such as television and even home cinema and by the mobile telephone and/or mobile videotelephony)
- Human use of ICT for reallocation of relationships
- Industry use of ICT for stabilising transaction costs
- Industry use of ICT for complex value chains dominated by large companies
- Government use of ICT for **marginal reorganisation of processes** (remains the traditional outsourcing of services to private and non-profit sector)
- Government use of ICT with low efficiency benefits and cost reductions

b) Main challenges

The major socio-political challenges are:

- symbolic and rational communication requiring **acquisition of certain level of IT literacy**
- the increased individual insecurity
- very strong risks of economic and social exclusion
- the increased social isolation

III.4. SEAMATE scenarios (projection-based)

... 4.1. Background information

The SEAMATE (Socio-Economic Analysis and Macro-modelling of Adapting to Information Technologies in Europe) scenario report^v was prepared by ISIS with contributions from RAND over a period of 2 years (2002-2003). The report focuses on the overall economic impact of Information Society Technology within the context of the European Union and national policies.

SEAMATE scenarios intend to provide a systematic overview of the complex dynamics of the digital economy. They are based on critical analysis, comparison and selection of available data (**time series and projections**) supplied by Eurostat, OECD, DGIST of the European Commission, EITO and other sources. The SEAMATE project is also an initiative conducted under the Information Society Programme, as part of the European Union's Fifth Framework Programme for Research and Development.

In this context, the SEAMATE project considered only **seven EU15 countries: 2 innovators** (Finland, Ireland), **3 advanced** (UK, France, Germany) and **2 laggards** (Italy and Portugal). The time horizon chosen for the study is **2010** mainly because of the e-Europe Action Plan launched in Lisbon Summit 2000 (aiming to make Europe the most competitive knowledge based economy by 2010). The scenario work envisaged three different scenarios: based on **common-sense extrapolation of the present** (Business as usual scenario to 2010), **positive** (Positive scenario to 2010) and **negative** (Negative scenario to 2010) **projections of 12 indicators:**

The 12 indicators considered in the SEAMATE scenario report:	
<ul style="list-style-type: none"> Investment in research and development as proportion of GDP Number of researchers as proportion of total workforce Proportion of population aged 25-64 having upper secondary school 	Prerequisites
<ul style="list-style-type: none"> Share of ICT-producing and ICT-using sector in overall value-added Number of internet users Proportion of companies engaging in purchasing via e-commerce Proportion of companies engaging in sales via e-commerce Share of ICT manufacturing in total manufacturing employment Value of ICT market [measured for EU15 aggregate only] 	IST variables
<ul style="list-style-type: none"> GDP GDP per capita Unemployment rate 	Socio-economic impacts

The positive scenario assumes that laggard countries will follow the example of more innovative ones, while the negative scenario implies an overall slowdown and increasingly strained international relations.

12 Indicators Data for 2001^{vi} (*)

	FIN	IRL	UK	F	D	I	P	USA
Population (M)	5.1	3.6	58.9	58.4	82	57.4	9.9	286
Investment in R&D (% of GDP)	3.3	2.8	1.8	2.2	2.5	1	0.8	2.6
Researchers/000 workforce	10.5	5.1	5.5	6.1	6.1	33.	3.3	8.1
% Pop. 25-64 with upper secondary education	72	52	81	62	81	43	21	86
ICT share in overall value-added (1998) (**)	16.6	n.a	n.a	18.8	20.2	18.6	n.a	n.a
Number of internet users (M)	1	0.5	8.5	4.5	10	5	0.6	85
% of companies buying online	34	n.a	27	10	28	14	3	n.a
% of companies buying online	13	n.a	20	11	34	5	4	n.a
ICT manufacturing share in total mfrg. employment	10	14	7.3	5.5	6.2	3	2.5	8
GDP (GEuro)	125	104	1425	1355	2017	1372	172	10371
GDP per capita (kEuro)	25	29	24	23	25	24	17	36.2
Unemployment %	10	5.8	6	12	8.7	11	4.4	4.2

(*) Value of ICT market aggregated for EU15 = 537 GEuro (2001)

(**) Sum total of manufacturing and services both in ICT producing sectors and ICT using sectors

... 4.2. Scenario 1 – Business as usual to 2010

This scenario shows a continued growth at a slower pace than in the past: only a few technical breakthroughs but with no major socio-political impacts. The gap between innovators and laggards increases. Assuming slower rates of growth than the ones up to year 2000, this scenario foresees **GDP and GDP p.c. over the period 2002-2010** to increase around 13% for innovator countries such as Finland and Ireland, around 10% for advanced countries (UK, France, Germany) and around 8 % for laggards (Italy and Portugal). Projections for US showed levels around 16%.

IST variables are expected to stay close to present values with some improvements in laggard countries and more dynamic performance in innovator countries. E-commerce is believed to be strongly correlated with Internet use.

a) Main socio-economic drivers of all 3 scenarios

- Performance of EU economies
- Dynamics of IST and related knowledge-based activities
- Investment in R&D and physical capital
- Improvements in computer power, software, Internet, IST
- Intellectual property, human capital and workforce skills
- IST production and use, Science, Technology and Innovation

b) Main technological and cultural drivers of all 3 scenarios

- Digitalisation
- Cost-effectiveness
- Miniaturisation
- Standardisation
- Market penetration
- Literacy
- Education
- Skills (of experts and end-users)

... 4.3. Scenario 2 – Positive scenario to 2010

This scenario illustrates a future characterised by high-tech innovations widely accepted by all advanced countries and also less developed countries thanks to international cooperation. The scenario foresees that laggards and less developed countries are expected to be the initial gainers from general improvement of the cultural and research climate. There will be follow the leader situations where laggard countries introduce policies that proved to be successful in innovative countries.

This scenario assumes greater or equal rates of growth than the ones of the period 1993-2000, so it foresees **GDP and GDP p.c. over the period 2002-2010** to increase around 40% for innovator countries such as Finland and Ireland, around 16% for advanced countries (UK, France, Germany) and around 15 % for laggards (Italy and Portugal). Projections for US showed levels around 22%. Both **IST and prerequisites variables** are expected to grow much faster in laggard countries than in innovator countries.

a) Main driving forces

Among the factors possibly leading to such a positive scenario are the following:

- Innovative governmental industrial policy for new enterprises
- Innovative Government and private education policies
- Total quality management tuition introduced in all schools
- Founding new excellence institutes for advance studies
- Establishing mass media cultural programmes (all levels, all targets)
- Redesign careers (retraining and new professions after retirement)
- Train high-level scientists, professionals, experts and practitioners, to communicate their knowledge directly and through the media
- Integrate all above mentioned at an international level (including Easter Europe and less developed countries)
- Plan investment in all sectors (economy, industry administration) to obtain results through education/knowledge diffusion rather than through direct short term action programmes
- Immigration of highly trained professional from Eastern Europe or from Asia

... 4.4. Scenario 3 – Negative scenario to 2010

This scenario describes a situation where the use of IST is reduced due to socio-economic factors affecting the EU15 region (i.e. wars, unexpected large climate variations).

The scenario foresees that laggards and less developed countries are expected to suffer the most from the region's economic downturn (i.e. mismanagement of large companies, speculative bubbles possibly causing stagflation and financial crisis). There will be no follow the leader situations and laggard countries struggle to find policies aiming to stabilise trade and commerce.

This scenario assumes much lower rates of growth than the ones up to year 2000. So it foresees **GDP and GDP p.c. over the period 2002-2010** to increase around 9% for innovator countries such as Finland and Ireland, around 7% for advanced countries (UK, France, Germany) and around 4% for laggards (Italy and Portugal). Projections for US showed levels around 10%.

Both **IST and prerequisites variables** are expected to grow much more slowly in laggard countries than in advance and innovator countries.

a) Main driving forces

Among the factors possibly leading to such a negative scenario are the following:

- Terrorism inspired by non EU15 countries or immanent Europe
- Immigration of masses of uncultured people from Africa and/or Asia
- Near East conflicts expansion
- Major international war
- Major international economic depression
- Climate change due to global warming
- Burst of financial bubbles connected to top management unethical behaviour and technological ill judgements
- Aging population
- Trade conflicts with diminishing power international trade organisations result in tariff and price wars (i.e. falling prices in steel production and increasing oil prices)
- Social unrest in old and new industrialised countries
- Dissemination of mass irrationality (i.e. believe in magic or in radical groups leading low productivity and damaging cultures)

III.5. ISTAG scenarios (workshop-based)

... 5.1. Background information

This study was conducted by IPTS for ISTAG. The scenarios used inputs from **35 European experts** (the group included 10 *academicians*, 10 *managers and directors of six large ICT companies* such as IBM, British Telecom, Ericsson, Nokia, Philips and France Telecom. It also incorporated 15 *researches from various ICT research centres and consultancy groups*). The final scenario report^{vii} was compiled by 5 members of the Institute for Prospective Technological Studies - IPTS (part of the European Commission's Joint Research Centre – JRC) in collaboration with the Information Society Directorate.

These scenarios were developed in **2 workshops** where the time horizon proposed for technologies, applications, services and products was **2010**. The study was carried out early 2001 with the aim of describing the **influence of IST in the European society by 2010**. The scenarios focused on *what living with Ambient Intelligence (Aml) might be like for ordinary people* using an **exploratory** approach. Ambient Intelligence is a concept that involves IST developments with greater emphasis on user-friendliness, more efficient services support, user-empowerment, and support for human interactions. Four scenarios were envisaged: (1) Maria, Road warrior; (2) Dimitrios and the digital me; (3) Carmen: traffic, sustainability and commerce; (4) Annette and Solomon in the ambient for social learning.

In terms of our initial discussion, we would describe these “scenarios” as being more like vignettes, set within a common scenario of relatively unproblematic development of Aml. There are relatively minor differences in emphasis, but few if any major inconsistencies across the four. Thus one main scenario is really being presented.

... 5.2. Scenario 1 – **Maria the road warrior**

This scenario presents an extrapolation of IST needs and developments of the nowadays mobile business market. Based on a trip overseas of a young business woman, Maria, the scenario describes different situations where IST developments are driven by **individual users** in an attempt to **increase economic and personal efficiency**.

a) Main driving forces

This scenario gives importance to individuals' interest on **reducing the size of personalised communication devices** (i.e. more advanced and integrated systems than current PDA or laptops being embedded or reduced to a bracelet). It also provides examples of imaginary **smart environments providing personal support**, such as:

- the automobile (with integrated traffic guidance systems, rental, booking, billing, communication devices),
- the airport (with sensors in charged of doing body and luggage screening and passenger check-in and check-out),
- the hotel room (with inbuilt person recognition system allowing automatic customisation of temperature, wall colours and telecommunication preferences and languages),
- the conference room (with high security levels, compatible with systems outside Europe, and with remote access barriers controls).

b) Main challenges

Technical and technological challenges:

There are several key technologies and features required for achieving 'Maria the road warrior' scenario. According to ISTAG experts Europe lacks of strength in the following areas:

- ATML
- electronic ID
- distributed databases
- network based speech recognition
- self-generating energy
- bio-directional biometrics
- ubiquitous display technologies
- self-organising software systems able to handle complexity and self-repair

Socio-political challenges:

The major socio-political challenges are:

- the high levels of **trust** and **security** required for protecting personal information
- the need to establish cooperation and **intergovernmental services confidence building** through complex international treaties

... 5.3. Scenario 2 – **Dimitrios and the digital me**

This scenario presents how IST technologies could be used to **support existing human relations, create new ones and participate in virtual ones**. Based on an ordinary coffee break of a 32 year-old employee of a major multinational, the scenario describes different ways in which IST developments are **driven by individual users** in an attempt to **improve sociability and human relations**.

a) Main driving forces

This scenario gives importance to individuals' interest on **registering, processing and offering information on private lives** (i.e. presenting D-me as a learning and acting device offering communication, processing and decision making functionalities). It also provides examples of imaginary situations **describing management of human relations**. The scenario deals with:

- Human needs for **family relations management** (negotiating more issues and relations at a distance)
- Human needs for **working time management** (saving more time by using digital devices to deal with everyday time-consuming situations such as answering telephone calls from family members, i.e. wife)
- Human needs for **networking relations management** (helping people to find or contact the right person to solve a particular situation, i.e. to list closest drug shops, alternative drugs and contacts)

b) Main challenges

Technical and technological challenges:

There are several key technologies and features required for achieving 'Dimitrios and the digital me' scenario.

- Data capture relies largely on speech and speaker recognition (including ID recognition), but such developments are not expected by 2010
- D-me's network communication requires 100% interoperability and common operating systems which bring the challenges of (1) compatibility of systems and architectures and (2) permanent large data upload, processing and transferring on the spot
- Highly efficient and secure advances in centralisation synchronous updating, back up and downloading of data will require dynamic synchronisation of distributed databases, smooth and reliable routing of data
- Decision making functionalities substituting human decisions such as family negotiations over the phone would require substantial further multi-domain progress

Socio-political challenges:

The major socio-political challenges are:

- **privacy**-related issues, such as ownership of data, content control, and accessibility of content
- **authenticity**-related issues, such as potential use of multiple identities, 'marketed identities'
- **security**-related issues, such as exposure to viruses, hackers, 'classical' computer and network collapse
- **ethics**-related issues, i.e. false identities, controlled environments
- **digital divide**-related issues affecting business models

... 5.4. Scenario 3 – Carmen: traffic, sustainability and commerce

This scenario assumes that Ambient Intelligence environment has been already achieved and live-styles adapted to it. It also supposes that Information Society technologies are embedded in most urban infrastructures and good distribution is based on real-time demand, thus resulting in optimal use of energy and maximisation of safety. The scenario introduces the concept of personalised area networks (PAN) where individuals are able to communicate to each other and dialogue with other networks, i.e. vehicle area networks (VAN), thus building an Ambient Environment.

By describing a normal weekday morning of a young working woman (Carmen) on her way to work, the scenario shows different ways in which IST developments are **driven by community** in an attempt to **increase economic and personal efficiency**.

a) Main driving forces

This scenario gives importance to community's interest on **improving urban systems, especially the transportation of people and goods**. ICT is fully used to manage flows of information, individuals and commodities, thus assuming major changes in urban business models and life-styles. The scenario is driven by:

- Human needs for **efficient and low-cost transport systems** (i.e. finding a vehicle to share with somebody on the route to work)
- Human needs for **reliable and customised transport services** (i.e. recognising non-smoker drivers for trip sharing)
- Human needs for **assistance in selecting and purchasing goods** (i.e. ICT-assisted shopping list advice, preparation and ordering)
- Human needs for **efficient use of resources** (i.e. drivers willing to economically benefit from picking up individuals going on their route, use of dynamic route guidance systems to avoid traffic and reduce time for trips)
- Human needs for **relevant information on preferences and eventualities** (i.e. personalised alerts on special promotions of products and services, avoiding potential accidents by using embedded car sensors alerting on objects/individuals approaching on planned routes)
- Business sector needs for widespread use of e-commerce
- Government needs for **organisational system chains** (i.e. allowing efficient management of cities and citizens' duties by means of automatic deduction of tax/toll/bill payments)

b) Main challenges

Technical and technological challenges (key technologies and features required for achieving 'Carmen: traffic, sustainability and commerce' scenario):

- Traffic beacons
- Bandwidth
- Miniaturisation
- Low power resources
- Security/encryption
- Reconfigurable sensors
- Biosensors
- Scalability
- Wireless

Socio-political challenges:

- **excessive intervention or 'social engineering'**, such as teleshopping, telework, car sharing, park and ride systems, accident prevention systems, road pricing, engine-speed control to cap pollution levels
- **need for heavy infrastructural investment programme**, such as large-scale investments in transportation technologies including cars with satellite positioning, embedded computing, remote engine management, vehicle tagging, etc
- **large-scale investments in integrated traffic urban transport management system**, such as beacons, sensors, actuators, variable message signs as well as physical networks and computers to store databases
- **high levels of trust required** (i.e. sharing vehicles & information with strangers)

... 5.5. Scenario 4 – Annette & Solomon in the ambient for social learning

This scenario illustrates IST developments oriented towards life-long learning, new ways of learning-by-doing and growing demands for communication skills and 'emotional intelligence'. The learning environment is able to create challenging and interactive learning situations, i.e. involving groups of people from 10 to 75 year-old interacting with and learning from the ambient. By describing the role of two individuals (Annette and Solomon) involved in a computer supported pedagogic group session on environmental management, the scenario shows different ways in which IST developments are **driven by community** in an attempt to **improve sociability and human relations**.

a) Main driving forces

This scenario gives importance to community's interest on **learning by connecting people and creating community memory**. ICT is used to guide and facilitate group's communication and knowledge transferring. The scenario is driven by:

- Human needs for **copng with different languages, cultural backgrounds, skill-levels, interests and learning styles**
- Human needs for systems aimed to **reduce the digital divide**
- Human needs for **customised content** (i.e. information on the use of technologies for specific purposes, such as environmental management techniques)
- Human needs for **multi-channel services** (i.e. web-TV, mobile)
- Human needs for **online storage, reprocessing and retrieval of content on demand** (i.e. providing facilities for people to work together in non-real time)

b) Main challenges

Technical and technological challenges:

There are several key technologies and features required for achieving 'Annette and Solomon in the ambient for social learning' scenario. However the main challenge lays in the combination of those technologies for the generation of 'learning experiences'.

- Recognition of individuals, groups and objects
- Interactive negotiation of targets and challenges
- Language and speech interfaces and dialogue modelling
- Projection facilities for light and sound fields
- Tangible/tactile and sensorial interfacing
- Reflexive learning systems,
- Content design facilities, simulation and visualisation aids
- Knowledge management tools to build community memory
- Miniaturisation and nanotechnologies

Socio-political challenges:

- The increased needs for clearer identification of economic players results in lack of investment
- The increased needs for new skills, new work processes and new business models results in lack of innovation capacities, rigid institutional structures and corporatism

III.6. FLOWS scenarios (panel-based)

... 6.1. Background information

The FLOWS project was an initiative conducted under the Information Society Programme, as part of the European Union's Fifth Framework Programme for Research and Development. FLOWS scenarios brought together **16 professionals from a wide range of disciplines**. The group included researchers from UEDIN, IST-TUL, PRL, TELN, SAG, UoY and TUHH. The scenarios report^{viii} was prepared by the University of Edinburgh on **December 2002** with the main purpose of highlighting the variety of IST activities engaged in by a single user and demonstrating how IST activities hinge on social as well as technical issues, such as context, equipment capability, mobility and geographical location. Again this is more of a series of vignettes than a set of multiple scenarios.

FLOWS scenarios are based on the combination of three main sub-scenario fields:

- **User scenarios:** describing users in various contexts with particular technologies making specific *demands on wireless telecommunication services*
- **Context scenarios:** describing particular market sectors (location, type of application package)
- **Service scenarios:** describing everyday demands of device technologies and networks by users of particular data applications

Three general scenarios were envisaged: (1) Business traveller on the train; (2) Family weekend in the city; (3) Self-employed service engineer in sub urban area. Each scenario describes the **access technologies, principal users, locations, application packages, devices and data applications**.

a) Main driving forces of all 3 scenarios

The scenarios are driven by:

- Traditional application domains (education, work, entertainment, shopping, communication)
- Information activities (information seeking, knowledge sharing, browsing, access, communication, transactions, verification, services, media consumption, play)
- Closeness of human relations (immediacy, intimacy, flexibility, freedom)
- Management of daily activities (belongings, playing, coping, surviving, balancing, delivering, controlling, etc)
- Management time use (time saving, time wasting, time filling)

... 6.2. Scenario 1 – Business traveller on the train

This scenario describes a situation where a businessman travels on a train from the city through suburbs and rural areas. On his journey, the traveller is able to continue his normal business activities by means of **network supported work tools** and **personal communication devices**.

ACCESS TECHNOLOGIES	UMTS in the city and urban parts of the journey HIPERLAN/2 connectivity in stations GSM connectivity everywhere Digital Terrestrial broadcast, Bluetooth in each carriage of the train
PRINCIPAL USERS	Business executive
LOCATIONS	Medium distance train
APPLICATION PACKAGES	Network supported work tools (Travellers Aid, Social Networker)
DEVICES	Small mobile phone, small PDA, laptop computer
DATA APPLICATIONS	File transfer, email/multimedia messaging, voice phone call, synchronous document sharing, video on demand, broadcast radio, cooperative document editing, web-browsing including video stream.

... 6.3. Scenario 2 – Family weekend in the city

This scenario describes a situation where a mother of two teenage children and her husband take a weekend trip to Oslo from a suburban town about six hours drive away.

ACCESS TECHNOLOGIES	UMTS in urban and city areas HIPERLAN/2 connectivity in small areas (i.e. hotels, museums, cafes) GSM continuous GPRS, EDGE, DAB near continuous
PRINCIPAL USERS	Average family
LOCATIONS	City centre, suburbs, rural areas (villages, motorways, tunnels, hotels, restaurants)
APPLICATION PACKAGES	Travellers Aid, media consumption portal, Personal Networker, Network supported tools
DEVICES	PDA, mobile phones, car
DATA APPLICATIONS	File transfer, email messaging, voice phone call, synchronous document sharing, video on demand, web-browsing, instant multimedia messaging, and streaming audio.

... 6.4. Scenario 3 – Self-employed service engineer in sub urban area

This scenario describes a situation where a service engineer runs a business maintaining computer systems.

ACCESS TECHNOLOGIES	UMTS (widespread) HIPERLAN/2, GSM/GPRS access
PRINCIPAL USERS	Service engineer, peripatetic manager
LOCATIONS	Industrial estate, office building, autobahn, suburb
APPLICATION PACKAGES	Mobile office, Travellers Aids, Personal Networker, Media Gateway
DEVICES	PSA+/Webtablet, mini-mobile, laptop, car
DATA APPLICATIONS	Voice call, video call, file transfer, video on demand, file sharing, web browsing, email/multimedia messaging.

IV. Scenarios for FISTERA: Some Conclusions and Proposals

The first and most obvious conclusion from this review is that there are a great many interesting and relevant scenario studies and their resulting scenarios already in existence. So it may be asked, what is the point of conducting another?

There are several reasons to undertake new scenario studies – though obviously they should be informed by the activities and results that have gone before, and not just reinvent the wheel. Among these reasons are:

- Involvement of participants in workshops, especially, and possibly online processes, can give a better sense of “ownership” than simply reading reports and attempting to relate these to their concerns. They should understand the logic much better than if presented the material in a standard report; have deeper insight into the considerations that have gone into the scenarios; and be better-equipped to be “carriers” of the scenarios to the outside world
- The scenarios should also possess greater legitimacy than (a) scenarios produced in the past, since they are more up-to-date and (b) studies drawing on a smaller or differently focused expert group without wide participation. Simply having something new to present means that the scenarios may be attended to

The studies reviewed here provide material that can be used in FISTERA work, as well as lessons for how this work can be conducted. They provide, for example:

- Lists of drivers that can be drawn on to speed up the work undertaken here (A note on major drivers will be prepared for the January Manchester meeting)
- Substantive content that can be reworked to fit into some scenario accounts
- Suggestions for presentation of scenario information that appear to be successful approaches (We are rather impressed by some features of the FAST approach, reported in the Annexe)

They also indicate several major decisions that need to be resolved for FISTERA scenario work and the Futures Forum to make progress. Probably the most important of these are:

- Just what should be the focus of the scenarios? (We discuss this in more detail below.)
- What role should be given to online methods? The existing studies have made limited use of these approaches (the STAR survey may be an exception). The use of these methods is in many ways still experimental, but this is not a methodological study so we will focus on simple methods that can yield rapid results. PREST has circulated a series of notes outlining our views here, and given the absence of any critical feedback, we are about to implement a first online scenario questionnaire. This will be the subject of a separate note
- How far should the focus be Aml as opposed to IST developments more widely? Aml is a (largely persuasive) view of an emerging (or visionary) paradigm of IST application, but it is contested in some quarters, and is by no means the only possibility. It “soaks up” and contains within itself all sorts of IST development, but viewing things through this perspective might risk missing some of the ideas about new communications approaches, or developments in neuroinformatics that are also highly important. We suggest this be addressed at the Manchester meeting, and in the meantime have adopted a rather open approach
- Can scenario work be undertaken on a national basis, as well as an EU-wide one? This was the case in the EUFORIA study^{ix}, for instance, and very different perspectives were generated in this way (though the study underlined the need for consistent methodology). While this would be desirable, there would be commitments required from national teams that we have not so far elicited

IV.1. Scenario Focus – A Proposal

IST scenarios can be conducted at various levels of analysis, according to the type of aggregation being used. We propose using a “nested” approach in FISTERA, which will involve examining at least two distinct types of scenario, as outlined in the following subsections. We invite comment from FISTERA members as to the utility of these approaches.

... 1.1. Global Political Economy of IST

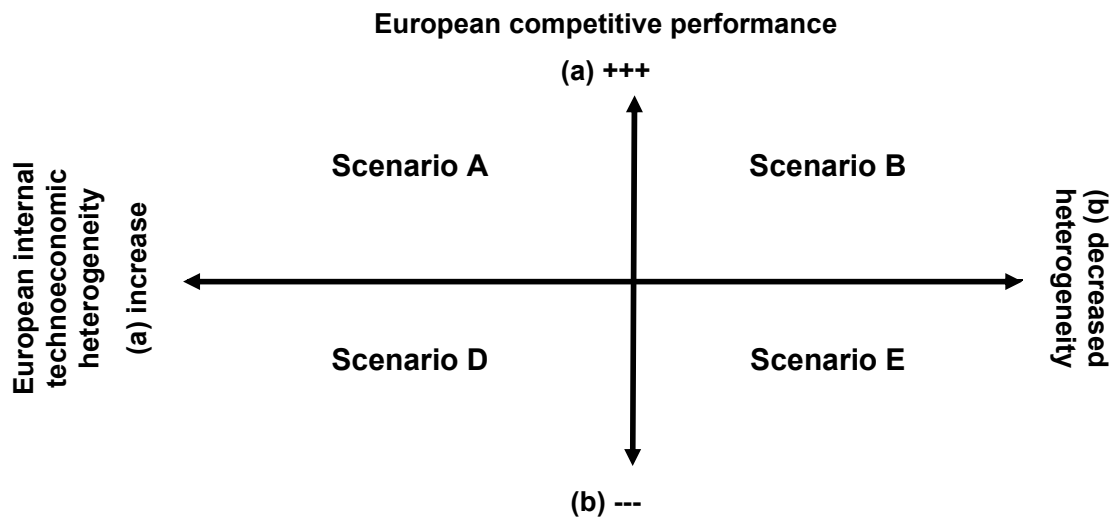
Here the focus is very much on a matter that drives much EU policymaking. The question is how the EU performs in the context of global competition in IST production and use; and how well different areas of the EU are performing in these terms. This approach has been at the heart of the questionnaire developed for the Roadshows, and an online questionnaire that is about to be trialled. It relates most closely to the SEAMATE model described earlier.

The starting point here is to develop a number of profiles of the future that will form the seeds, the starting points for scenario development. We can here be relatively unimaginative in the sense that we can at least begin by using the widely-criticised (mainly because it is widely-used) method of deriving 4 scenarios from a 2 by 2 matrix. The two underlying parameters here are:

1. **European competitive performance** The two poles are: (a) EU^x overall attains leadership in many areas of IST, becoming a substantial competitor to the US and other regions in production and export of hardware, software and services. (b) EU overall lags in most areas of IST, only rarely becoming a serious competitor to the US and other regions in production and export of hardware, software and services
2. **European internal technoeconomic heterogeneity** The two poles are: (a) Variation across EU countries/regions in technoeconomic performance intensified, with differences between cities/regions/countries being even more intensified. (b) Variation across EU countries/regions in technoeconomic performance decreases, with differences between cities/regions/countries being substantially reduced

This gives four profiles, as in the figure below. It may be that at least one of these profiles is seen as rather implausible – our own view would be Scenario B – in which case it might make sense to drop it, or modify the parameter in some substantial way.

Of course, there is much scope for variation within these scenarios, and we could envisage a situation where, say, scenario C applied to software, A to hardware, D to content, and the like. Similarly across different application areas. Another issue might be divergent patterns of divergence (!) – e.g. more heterogeneity at regional level but less at country level (not impossible, with the “right” indicators), or metropolises becoming more divergent from their regional peripheries... These are major issues, but are actually things to explore in the scenarios, not problems that stand in the way of conducting an analysis along these lines.



The rationale for conducting a scenario analysis of this type is reasonably straightforward:

- Europe's competitive standing is an important policy concern...
- And one that is liable to substantially affect how much influence the EU can wield over the future development of ISTs and potentially information Society itself
- The internal economic disparities within the EU are also major policy concerns...
- And are important features of the European Information Society, how this performs (e.g. in terms of adaptiveness, social welfare, etc.), and how the particular patterns of implementation of – and acceptance/resistance concerning – IST evolves

However, the scenarios generated at this level tell us very little about how patterns of IST application and development might evolve. There is necessarily some treatment of these issues, but the level of depth established is low, and other factors need to be addressed to tackle this more thoroughly. Thus we propose a second level of scenario analysis.

... 1.2. Social Ecology of IST

The ISTAG Aml "scenarios" drew great attention to the sociopolitical concerns associated with the developments of this paradigm of IST use. The vignettes developed in that study were largely contained within a scenario in which these concerns were effectively addressed by a mixture of technological and regulatory solutions. But this is by no means a foregone conclusion, and there could indeed be quite contradictory solutions – for instance, social practices might evolve so that people cease to be concerned much about privacy – we might simply write it off as a lost feature of life (and move on to concerns about security, stopping such things as identity theft, for example); or there might be satisfactory regulatory and other social innovations which provide sufficient protection for private information. Or, there may be sufficient concern that IST use is seriously impeded, at least in certain application types. This latter possibility has not been encountered a great deal in IST to date – unlike, say, in biotechnology – but it is extremely likely that emerging technologies in, for instance, personal location, are liable to generate high levels of concern.

We propose that it would be valuable to explore alternative possible patterns of development here. In the online questionnaire, given the need to avoid overloading respondent, we have simply invoked a single contrast, compressing many different things into a single parameter, where the contrast is between:

- Social concerns around emerging developments in IST (privacy, security, etc) grow to such an extent that market development is substantially hindered
- Attractiveness of emerging developments in IST outweighs social concerns (privacy, security, etc) so that market development proceeds rapidly

This is, it is hoped, sufficient for a starting point. We believe that it will be valuable in future work to “explode” the dichotomy so as to develop more subtle readings of alternatives for social and technological innovation and practice. Provisionally, we see this as a task for workshops, where we could structure working groups around specific clusters of concern, for instance.

The rationale for conducting a scenario analysis of this type is also reasonably straightforward:

- These issues have been identified in previous studies as liable to be extremely important influences on the rate and style of development of IST
- They are topics of profound concern to a range of EU and national policy institutions and elements of civil society

IV.2. Final Word

We invite feedback on the proposals above and their rationale, as a matter of priority.

We also welcome inputs on any of the ideas and proposals mooted in the series of notes on scenarios and online scenarios that have been circulated among FISTERA members over the past year. As time has gone by, some of the possibilities we mooted have been ruled out by our determining that they proved too difficult or costly to implement. But many other options are still possible ones, and it may be that some partners would be interested in developing them further.

V. ANNEXE: Other Scenario Studies

In this Annexe we present a very selective set of other scenario studies that may provide useful insights to our current work. There is no attempt to be comprehensive here. We shall not present these scenarios in such systematic detail as those above, but will attempt to bring out useful points about the method, presentation or impact of the work, and in some cases quote illustrative snippets from the studies that can inform our general approach.

V.1. *Earlier IST Scenarios*

Here we include a number of studies that vary in focus and methodology, though most are predominantly desk-based research.

... 1.1. **Worldview-Based Analysis**

This approach was mainly a product of desk research, and is interesting in that it uses different conceptual accounts of information society as a basis for scenario development. Though framed in highly general terms, the set of four scenarios proposed by Miles can in principle be articulated and elaborated to fit the circumstances of specific countries and time periods.^{xi} One specific set of scenarios related to this approach was developed for the UK (for 2000 and 2010), on the basis of a survey of about 100 experts. In that case, the four scenario clusters were developed by factor analyses that classified expert forecasts in terms of two underlying factors – effectively representing the speed of IST developments and the extent to which positive or negative outcomes were stressed.^{xii}

a) **The Scenarios**

Four scenarios – four visions of Information Society developments, reflecting different assumptions about the nature of social and technological change - are created by cross-cutting two dimensions believed to underlie much of the debate on the social implications of IT. The poles of each dimension provide for strikingly differentiated scenarios. The two dimensions are:

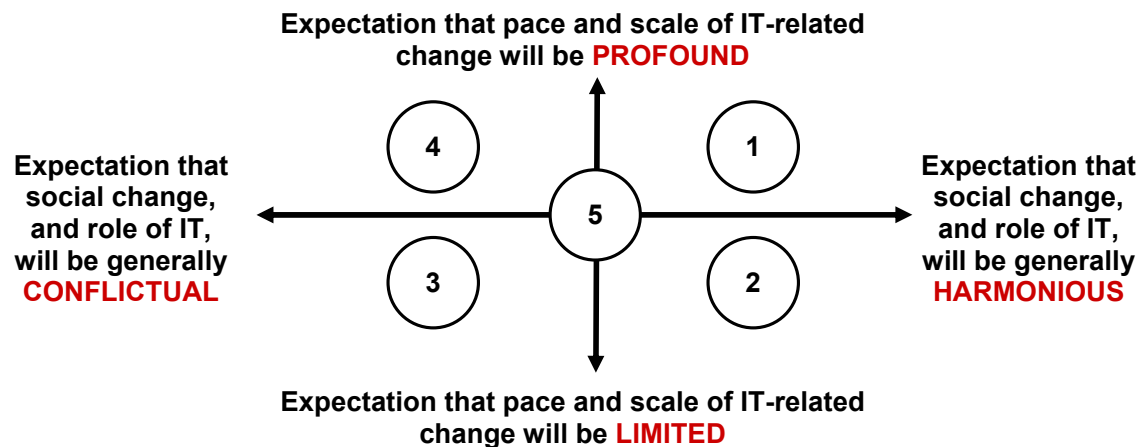
- **'Depth'** - reflecting the debates between those who see information society (IS) as something fundamentally new and IST as all-pervasive, and those who stress the limited extent of change and who often reject the term IS. The polar positions are labelled *continuism* and *transformism*. The crucial distinction between continuism and transformism is more than a matter of disagreeing about how far change is slow and steady versus rapid and discontinuous. Of critical importance is the contrast of 'more of the same' versus 'something different'. Are new technologies used to substitute for current activities or to establish completely new activities? Do they involve discrete innovations or are stand-alone devices and discrete processes being networked and integrated? Is the potential of new technology being restrained by interest groups or enabling the emergence of new social actors?
- **'Width'** - reflecting the debates between those who see IS as characterised by greater democracy and IT as enabling more self-expression and personal choice; and those who stress the threat of greater surveillance and control on political and personal activities. The polar viewpoints are labelled *concordism* and *antagonism*. A concordist approach portrays access to information as liberating, and access to communication systems as promoting decentralised structures. The antagonist viewpoint links information to control, draws attention to uneven access to the apparatus of cultural production and communication, and suggests that existing inequalities in society may be jointed by gaps between the information rich and information poor

Scenario Pool

The two dimensions can be treated as compass points, distinguishing quadrants representing four visions of the future, displayed in the figure below.

A fifth scenario, based on a synthesis viewpoint need not just be a neutral average of the extremes. It could be more of an integration of the contributions and overcomes the limitations of each extreme. This is labelled “structuralism” (not to be confused with the common use of the term in social philosophy). In terms of the **depth** dimension it recognises **both** the obstacles to change and innovation (identified by continuism), and the possibilities for wide-reaching change in social and economic practices (identified by transformism). How these combine depends upon the actors and interests who shape the development and applications of technology, and the ways in which efforts to selectively realise the potential of new technologies affect social relations. In terms of **width**, a structuralist synthesis interprets current changes as involving a shift between different regimes of social actors who have unequal opportunities to intervene, but whose actions do have consequences. As the terrain of social action changes, new resources and interests are established and new areas of co-operation and contestation are discovered. Trends breed countertrends as actors seek to offset the costs of change. A diversity of actors and interests, embodied in the different social structures of different countries, confront a multiplicity of choices. There are many possible outcomes - especially given the uncertain interactions of policies and the sensitivity of events to timing.

This implies there is not simply one Information Society. Rather there are many possible information societies - just as there are many different post-war (Fordist), advanced industrial capitalist societies (consider the range represented by the USA, Sweden and Japan).



SCENARIO	<i>Rate of Diffusion of IST</i>	<i>Degree of Innovation of IST Applications</i>	<i>Pattern of Use of IST</i>	<i>Consumer Acceptance of IST</i>	<i>Political Implications of IST</i>
1 BENIGN INFORMATION SOCIETY	Fast	Extensive	New Activities	Enthusiastic	Democratising
2 HARMONIOUS SLOW EVOLUTION	Slow	Limited	Mainly Substitution	Mainly for entertainment	Limited
3 CONFLICTUAL STAGNATION	Slow	Limited	Mainly Substitution	Suspicious	Limited
4 PROBLEMATIC INFORMATION SOCIETY	Fast	Extensive	New Activities	Enthusiastic but mainly for entertainment	Threats to Civil Liberties
5 POLYMORPHIC SOCIETY	Moderate to Fast	Very uneven, Limited to Moderate	Mix of New Activities and Substitution	Mainly for entertainment	Very mixed

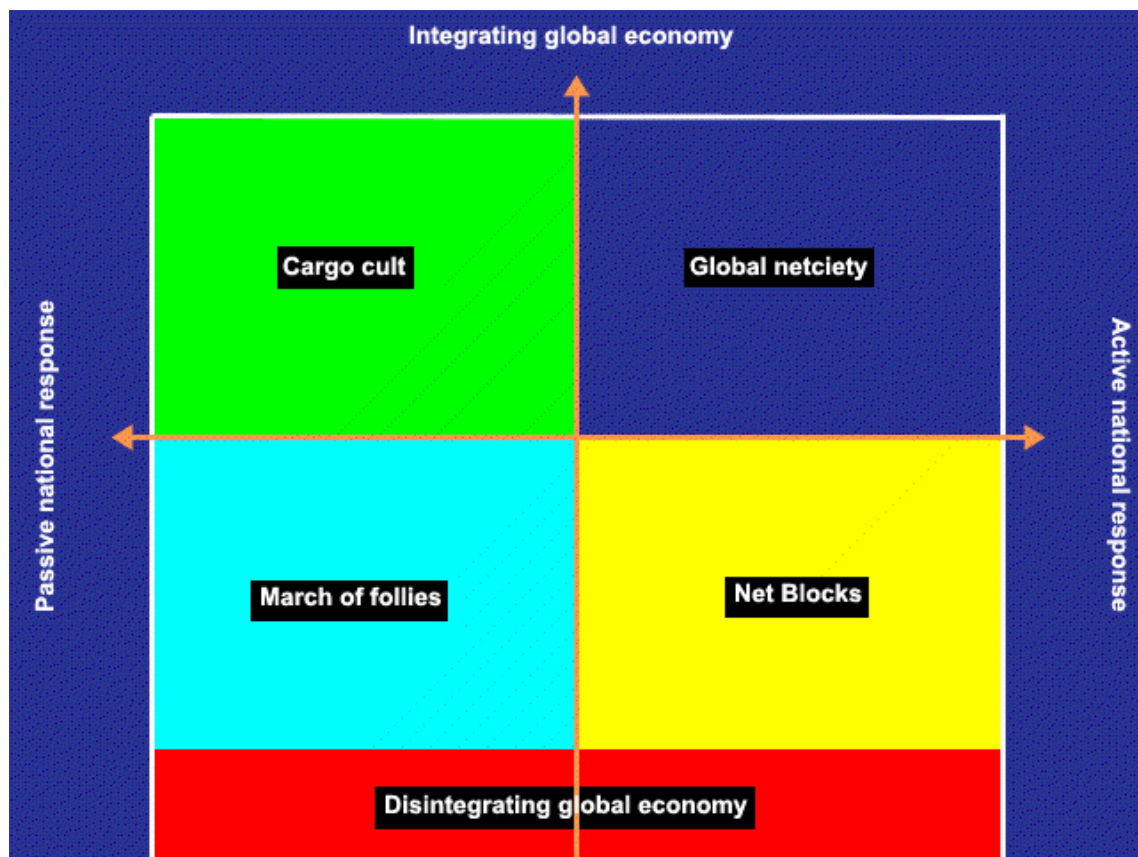
b) Commentary

While a very schematic approach, and probably out-of-date in some details, this illustrates an important way of defining scenarios – by taking an “as if” approach to explanations and expectations of change. Earlier studies had addressed topics connected with global development in terms of a similar methodology, contrasting radical, reformist and conservative accounts, and asking how one would reach various normatively defined futures were one or other of these accounts correct. The study was initially based on desk work, but was extended to encompass a survey study. The implication is that such an approach could also be furthered by other types of survey analysis, or by groupwork.

... 1.2. Global Trade, Employment and IST: a UN Economic and Social Council view

The UN Economic and Social Council’s working group on *Information And Communication Technologies For Development* produced a set of scenarios in 1997 that Mittar and Miller summarise in an ILO study.^{xiii} (They thus pay particular attention to the employment dimensions of the scenarios.) The two dimensions which structure the scenarios are:

- extent of integration/disintegration of the global economy, which may be” inclusive or exclusive, giving rise to open technology standards and universal access to communication networks, and having clear implications for global participation in employment and trade... [or] be dominated by a small number of powerful monopolistic and oligopolistic companies, and result in increased concentration of power, technology, trade, and employment within the developed economies”
- active versus passive responses to the trends by governments, private sector firms and non-governmental organizations in developing and transitional economies. “Passive responses would result in failure to meet development objectives. ... action ...[would] assist the accumulation of technological capabilities that are a necessary adjunct to active participation in the emerging digital economy”



The resulting two-by-two table is depicted below.

Source: UN Economic and Social Council, 1997.

The four scenarios that emerge from the intersection of these two axes are described, apparently on the basis of desk work – though reference is also made to a working group. More detail was provided on the last two scenarios (which are seen as more likely by the authors):

- **Cargo Cult** - the outcome of passive policy responses in an integrating global environment, where new technologies are available but a failure to adapt them (e.g. infrastructure and services, etc.) to the local context leads to low levels of use, discouragement and frustration
- **March of Follies**- policy failures in a poorly integrated global economy, leading to growing digital divides (especially between rich and poor countries). Power becomes ever more concentrated
- The **Global Netciety** features (a) rapid diffusion of IST and “integrated global IST structures” with (b) “active and co-ordinated policies for appropriating IST in ways that meet development goals”. ... “measures are taken by international organizations, national governments and local businesses to remove barriers to access to the global information society. IST projects are implemented to assist the poor and the marginalized populations of the world...” (UN ESC, 1997: p.20)

To cite Mitter and Millar, “Employment implications that arise from this scenario include the development of personal and business networks that are built on the basis of mutual trust, and supported by a secure system of intellectual property rights, and electronic commerce. There are opportunities for small enterprises, and independent workers to use the Internet in order to build market presence, as in the Bangladesh example, and compete with large firms. Teleworking and telenetworking, as employment options, are used flexibly, for the benefit of companies as well as for citizens, and strategically in situations where they can foster participation in a globally distributed workforce. New intermediary organizations, such as guilds and professional associations, are created to provide cohesion in the system, for example, through ensuring a level playing field for large and small firms, brokering relationships between buyers and sellers, orchestrating the labour inputs to employment, or encouraging the formation of social networks among community groups. These generate employment, and, given their dependence on communications and negotiation, may provide opportunities for women, who are especially noted for their skills in these areas. Universal access to lifelong learning, training and re-training, for example through distance education delivery mechanisms, help to ensure the supply of generic, vocational and job specific skills in the numbers that are required to meet the demands of a growing global economy, and these may be supplied on a demand-led basis. These target future skills, and foster a culture of continued innovation and enterprise”

- The **Net Blocs** scenario features a poorly integrated global economy with narrow self-interest being pursued by industrialised nations. But in developing and transitional economies there is a proactive response. Decision makers “create a variety of alternative, and locally appropriate and successful, trajectories” for IST development. (“This environment, in which there is regulated oligopoly, was considered by the working group to be the most likely outcome by the year 2005. This generates a slow but dynamic process of social and economic transformation that leads to improvement in some regions of the world as governments and enterprises in the newly industrialising countries ... use ICTs to achieve a more pluralistic and culturally diversified world. These ICT systems compete effectively in international markets by creating blocs of interconnection with other developing countries and countries in transition. Because each competing ICT system has a more limited market and a smaller range of information to build on, the benefits of

ICT are not widely shared. Also, economies tend to trade and interact more narrowly between regions, rather than globally." (UN ESC, 1997: p.21)

Implications for employment elaborated by Mitter and Millar include "the use a range of measures to attract and retain key high level staff within a firm, for example through offering a range of incentives, including options for flexible work. Here IST technologies are used to support teleworking and telenetworking among those with high occupational status within firms, typically not women, and the formation of relatively stable networks of strategic partners in order to gain competitive advantage. ... There may be few opportunities for the participation of new technology-based firms from, for example, developing and transitional economies, within these networks. As a result, such firms may will need to create and develop their own regionally-based networks, perhaps in niche markets. These will provide fresh areas of employment within the region, the take up of these opportunities by people across the region, for example through telework, would, in the first instance at least, depend on ICT diffusion and local access. Deliberate exclusion from global trade, and trade fluctuations, may well protect a certain number of these jobs, and enable local resources to be targeted towards local development needs and the resource base. For certain communities, aspiring towards participation in high-technology, high value-added work that caters mainly to international markets may not be appropriate, as opportunities for global participation are likely to be fewer than those that arise from the Global Netciety"

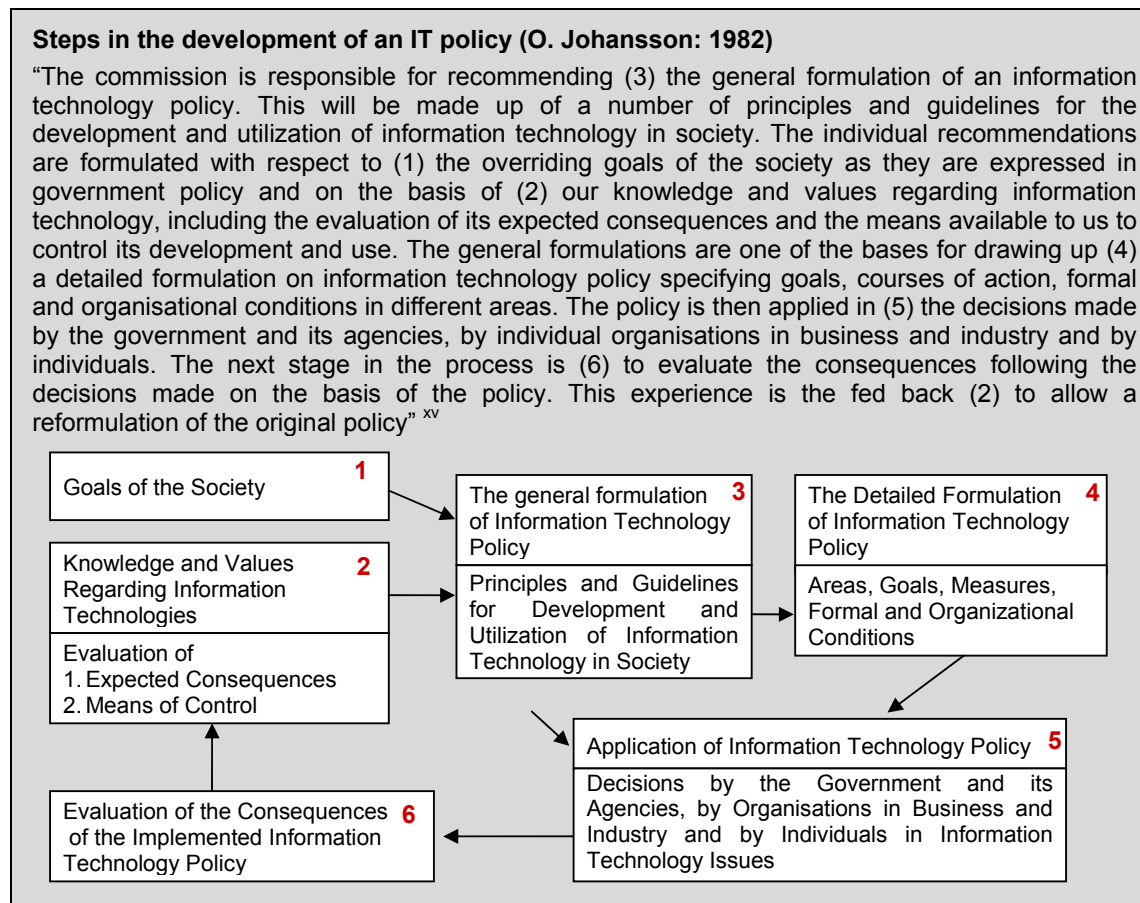
... 1.3. FAST scenarios (panel-based)

a) Background information

Back in 1978, the Council of Ministers set up FAST (Forecasting and Assessment in Science and Technology) programme in **Directorate General for Science, Research and Development** (DG XII) of the CEC. The project was design to be a pilot **5 years experimental** research programme which started with an assessment study of foreseeable **changes in industrial society and the implications for science and technology policy**. The programme then carried on by trying to demonstrate whether the “European societies want to retain, over the next 20 years, some autonomy and some control over their own futures... The main argument was that the European societies have no option but to collaborate in a joint strategy for socioeconomic development where voluntary cooperation is obligatory”^{xiv}.

FAST programme concentrated on three central themes: bio-society; **information society** and work and employment. For the purposes of this review we will focus on the results of the **six research projects** supported by the information society (IS) group: international division of labour; creation of new jobs; new power structures; daily life of the individual; transport; man-machine interfaces.

Many R&D directions were suggested in each project supported by the IS group. Large is, too, the number of policy recommendations, assessments of **New Information Technologies** (NIT) impacts on society and implications for a common R&D policy to be designed by the European Commission (Task 3 of the box). A comprehensive chart suggested in the 1982’s conference by the Swedish Minister of Civil Service Affairs indicates how the process of information technology policy development was already considered in some European countries within an integrated system where the EC was seen as the institution in responsible for the formulation of Information Technology principles and guidelines.



c) Synthesis of FAST scenarios for Europe & the Information Society

The possible impacts of NIT on society were analysed by the FAST-team using four scenarios plotted into two axes: economic growth (+, -) and social innovations (+, -).

Synthesis of FAST scenarios for Europe & the Information Society	
<p>Scenario 2</p> <p>Social innovations + Economic growth -</p> <ol style="list-style-type: none"> 1. Integration (60%) 2. Dysfunction (20%) 3. Subjection (15%) 4. Exclusion (5%) <ul style="list-style-type: none"> • Market = Non-market supply of services • Equality > Inequality in society • Centralization > Decentralization of power • Dependence = Autonomy of the individual vis-à-vis the group • Security > Risk of the individual vis-à-vis the future • Homogenization = Differentiation of cultures and daily life 	<p>Scenario 4</p> <p>Social innovations + Economic growth +</p> <ol style="list-style-type: none"> 1. Integration (60%) 2. Subjection (20%) 3. Dysfunction (15%) 4. Exclusion (5%) <ul style="list-style-type: none"> • Market = Non-market supply of services • Equality = Inequality in society • Centralization = Decentralization of power • Dependence = Autonomy of the individual vis-à-vis the group • Risk > Security of the individual vis-à-vis the future • Homogenization = Differentiation of cultures and daily life
<p>Scenario 1</p> <p>Social innovations - Economic growth -</p> <ol style="list-style-type: none"> 1. Subjection (30%) 2. Dysfunction (30%) 3. Integration (20%) 4. Exclusion (20%) <ul style="list-style-type: none"> • Market > Non-market supply of services • Inequality in society • Centralization of power • Dependence > Autonomy of the individual vis-à-vis the group • Security = Risk of the individual vis-à-vis the future • Homogenization > Differentiation of cultures and daily life 	<p>Scenario 3</p> <p>Social innovations - Economic growth +</p> <ol style="list-style-type: none"> 1. Integration (40%) 2. Subjection (40%) 3. Dysfunction (10%) 4. Exclusion (10%) <ul style="list-style-type: none"> • Market supply of services • Inequality in society • Centralization of power • Dependence > Autonomy of the individual vis-à-vis the group • Risk > Security of the individual vis-à-vis the future • Homogenization > Differentiation of cultures and daily life

The scenarios work considered four models of interaction between daily life and NIT represented by four relationships: **integration** (society produces the scientific and technological innovations corresponding to societal needs), **dysfunctioning** (technology and society are two separate universes with a minimum of mutual influence), **subjection** (it is the technological development which creates needs, the supply pushes the demand), **exclusion** (implying resignation from society, poverty, alternative lifestyles). The percentages^{xvi} represent the proportion of the European population under each category.

Two main observations are made by the FAST scenarios:

- (1) **In case of no social innovations** (scenarios 1 and 3)
 - more homogenization of cultures and daily life
 - more inequalities in society
 - more dependence of the individual vis-à-vis the group
 - more centralization of power
 - Increase growth would benefit an elite
 - much more homogenization of cultures and daily life
 - much more inequalities in society
- (2) **In case of social innovations** (scenarios 2 and 4)
 - more uncertainty and tensions
 - different groups and regions in Europe may have different characteristics

The FAST-team therefore emphasized that “the most clear and general message coming out of their studies is that technological innovations must be accompanied by social innovations and this cannot be done without a long-term societal strategy for NIT”^{xvii}.

FAST programme also recommended stimulating a series of key R&D areas; however it was also emphasised that there was a risk that in the years to come some of those areas will not be operating in Europe at all.

Key areas for Community R&D actions

1. Interface between chips and their immediate environment (supports, sensors, activators, pattern recognition, visualisation, molecular electronics etc)
2. Third generation robots (with image analysis capabilities)
3. Advanced production technologies (mask making, control and test equipment and software)
4. ‘Expert systems’ (encouraging the development of the advanced software required)
5. Artificial intelligence (particularly for teaching and learning systems)
6. Languages (the development of new man/machine communication methods, languages suitable for widespread popular use, etc.)

It was also recommended to set up a group to study the long-term implications of NIT over society in fields such as education, employment, consumer protection, energy, developing countries, etc. It was also suggested to launch four programmes of “social experimentation”. Such programmes were aimed to monitor the introduction of NIT in various countries of the Community. The first suggestion was on **local communication networks** (involving evaluation of NIT such as electronic mail, tele-shopping, etc.). The second suggestion was on **work** (evaluating the impact of distribution of jobs to local work centres and the home). The third suggestion was on **education integrated to work** (encouraging and evaluating activities related to learning process on the job, specialisation, gaining qualifications, etc.). Finally the fourth suggestion was in the field of **leisure** (evaluation the impact of distribution channels for audio-visual leisure local or remote production, etc.).

d) Main driving forces

The interaction of the following four factors was reported to strongly influence the societal impact of new technologies: (1) Scientific and technological factors, (2) economic and industrial factors, (3) social factors and (4) institutional factors.

Factors influencing the societal impact of new technologies^{xviii}

1. Scientific and technological factors: defined by the developments in the research laboratories, essentially limited only by the capability of the researchers, by the resources made available to them and admittedly characterized by a high degree of unpredictability
2. Economic and industrial factors: lack of knowledge and awareness, lack of capital, lack of skilled manpower and the existence of present ‘adequate’ manufacturing and office equipment are all factors which delay or block the assimilation of a technological innovation into economic life
3. Social factors: even if an innovation might be economically advantageous, its introduction may be refused or delayed because of the non-economic values of the potential users. Personal computers require skills not universally available, tele-shopping impedes social contacts, teletext may be abused to ‘tap’ information on the consumption pattern and information needs of the individual, etc.
4. Institutional factors: institutions and regulation are there to ensure a certain balance in the social distribution of benefits and risks, or indeed to defend current positions. Thus, institutions must assume the combine role of protector and guardian, a role which, by its nature, must have a touch of conservatism. This may reduce the immediate societal gain to some people from new technology, but will also reduce the immediate harm caused to others

The reason for presenting here the set of factors considered by the FAST-team when evaluating the societal impact of new technologies is basically to provide the reader with a clear picture of the sort of issues discussed around the already mentioned dual challenge (external strength and internal social cohesion) that NIT posed on Europe. Five key issues were considered. The first two are related to the external strength challenge: (1) The capacity for industrial command of information and (2) the readiness towards an international information and communication system. The remaining key issues are related to the internal social cohesion challenge: (3) alienation or integration of the individual and of groups, (4) employment – the creation of new jobs and (5) education and training.

e) Main challenges

The FAST-team highlighted various challenges:

- being able to protect privacy
- being ready to internalise technologies that would eventually force Europe to leave to others (non-Europeans) the job of designing and producing the products and infrastructures which are going to make up our (European) society's 'nervous system', with all the economic, cultural and political consequences that will imply
- European technological, industrial and social command of products, services and corresponding networks being able to ensure the survival of Europe's industries and economy and guarantee the autonomy of European society, whether culturally, socially or politically
- being able to integrated techno-industrial challenges and the social challenges
- It is only to the extend that societal and individual needs directly influence the development of new technologies from the outset that these will become a powerful tool for growth and will be able to make a contribution to solving certain problems involving employment, energy savings, increasing agricultural productivity, professional training, communications, use of free time, etc.

V.2. Scenarios where IST is at best a secondary focus

Some of the studies in this section do contain one or more scenarios where high weight is placed upon IST developments, within a more general framework. Some will specifically pull out implications for IST. Particularly interesting, then, are the ERMA scenarios with which we begin. These include both an IST scenario, which specifically focuses on trends here; and provide an IST axis in the more general scenarios, a set of parameters in which the scenarios can be compared in terms of at least some features of IST development.

... 2.1. EIRMA Scenarios

The Material excerpted below is derived from a report prepared in May 2000.^{xix} It includes a scenario based on rapid IST development, IST implications of trends in various sectors, and a set of general scenarios and issues, some of which have IST elaborations extracted here. Large portions of text are quoted fairly directly.

a) An IST Scenario

Method: four group meetings were held over five days of direct contact time, together with email, website, and telephone discussions, between members of an ad hoc team of young managers from different industries and different European locations. Group discussion identified a set of drivers: Energy supply; Environment; Finance & Economics; Health Care; Information Technology; Social Structures.

This gives an IST-related example of Scenario Planning: "Information Technology Becomes the Dominant Driver", where Moore's Law, pertains till 2020 with general improvements in other hardware (e.g. Optical Computing, Superconducting Magnetic materials, Bandwidth), with high levels of parallelisation of systems occurs, improvements in software (so that voice controlled equipment is the norm), genetic algorithms/genetic programming brings AI to reality with decision-making PSC widely available for a variety of applications.

IST Impacts in this scenario:

- AI in medical research work allowing the development of diagnostic sensors for a wide variety of illnesses; these are combined with the PSC machines to produce *home doctors* that diagnose, arrange delivery of remedies to the door, and monitor progress. Result: less burden on the health care sector, funds for other health improvements
- Improvements in all types of sensors allow production to be monitored and modified to optimise production output directly
- Improved data handling capability brings modelling to the forefront of scientific research as limited experimentation is now undertaken thus reducing research budgets
- Regulators have access to multi-sensing real time systems that allow them to act immediately. This leads to improvements in quality and cost of products as tighter regulations are applied in all areas
- Improvements in robotics permit replacement of humans in the manufacturing and production environment
- The latter is seen to provoke social resentment towards PSC with subsequent legislation and political interference to limit developments in Artificial Intelligence: research in electronics and computing becomes unfashionable; IST reaches a plateau in its development, which mirrors a levelling of the world economy as all become equal

b) Scenarios for European Manufacturing Industry

In the study, European manufacturing industry was seen as having a choice between two strategic directions to expected changes, and some manufacturers will strive to become the lowest cost producers, while others will aim at providing high-value services and functions rather than focusing on manufactured goods. The table below quotes from the study:

	SCENARIO	
	<i>THE LOWEST COST PRODUCER</i>	<i>THE SERVICE PROVIDER</i>
Energy Supply:	<ul style="list-style-type: none"> • Aim to drive cost down by selecting lowest price energy providers • Can do little to offset the effects of rising energy costs • Will be at a disadvantage to global competitors with production capabilities in regions with lower energy and labour cost 	<ul style="list-style-type: none"> • Will review and alter its manufacturing processes in order to cope with added costs of increased energy prices • May aim to convey a green image by differentiating between energy sources and suppliers
Environment:	<ul style="list-style-type: none"> • For lowest cost manufacturers environmental issues are focussed on their production facilities • Manufacturers need to decide either to ignore environmental issues, at the cost of hostile consumer reactions, or to incorporate environmentally sound practices in the organisation. In a worst-case scenario, the first could lead to the demise of the business. The second choice means the company has to carry out a certain amount of R&D and its overall strategy becomes more akin to that of the 'quality' company • Environmental issues are an additional cost, putting industries at a disadvantage compared to international competitors from other regions 	<ul style="list-style-type: none"> • Environmental concerns offer options for new services and new product opportunities • Research and development can be adapted to exploit these new markets and opportunities • Company can position itself as an environmentally friendly business, acquiring a new consumer base • Company may incur some extra costs, but because of its flexibility may be able to balance these out elsewhere in the business
Finance & Economics:	<ul style="list-style-type: none"> • Closer scrutiny from investors makes this strategy difficult to employ. Actively searching for, and making efforts to retain investment in a market where money is increasingly fluid, does not fit in with a lowest cost producer strategy 	<ul style="list-style-type: none"> • Can offer identifiable returns to financial markets, but the company must strive for continuous innovation in such a competitive environment • Company will strive to keep asset levels low to remain flexible and attractive

	THE LOWEST COST PRODUCER	THE SERVICE PROVIDER
Information Technology:	<ul style="list-style-type: none"> • Lowest cost manufacturers need to be adept to exploit global price variations in commodity raw materials • A global market offers increased opportunities for lowest cost manufacturers 	<ul style="list-style-type: none"> • A global market also offers increased opportunities for the service provider, but they need to be more aware of their intellectual property rights and the protection of these • Service providers will invest heavily in R&D and IT in order to create and exploit opportunities • Companies will be more concerned with maintaining their brand positions, as clients and consumers will need something they can recognise and rely on
Social Structures:	<ul style="list-style-type: none"> • Lowest cost manufacturers struggle with flexibility, since they have large fixed assets tied up in their manufacturing operations • There is a glut of unskilled workers, who can be employed to carry out routine tasks at relatively low costs. • The population offers a large customer base • Even the low cost producers need some skilled workers, and competition for these will be fierce, driving up employment costs, something they would seek to avoid 	<ul style="list-style-type: none"> • Service providers need to be very conscious of shifting consumer preferences • Outsourcing of manufacturing will be used to increase flexibility • Service providers will be forced to compete for highly skilled employees and they will invest in training and other staff benefits as well as paying higher salaries • Skill management policies will be required to keep employees expertise up to date • Recruitment strategies will need to be developed and some companies will set up their own universities. Others will work closely with academic institutions in order to ensure that new recruits are tailored to their needs and/or to 'take-the-pick-of-the-crop'. Only 'quality' providers will be willing and able to pursue this path • Investment in establishing brands and marketing will be imperative in a market that is flooded both with information and with products. Marketing and innovation will be inextricably linked
Manufacturing:	<ul style="list-style-type: none"> • <i>Competition for lowest cost producers will be very fierce, with European industries often at a cost disadvantages compared to industries from other regions</i> 	<ul style="list-style-type: none"> • <i>manufacturing is just one of the business elements, often not the most critical one. Service providers will seek to be very agile and flexible and often consider outsourcing their manufacturing operations.... companies currently investing in R&D will have an advantage when the time comes to metamorphose into such a service-oriented organisation</i>

c) IST developments in various areas in EIRMA scenarios:

CHEMICALS AND PLASTICS

- Successful knowledge management and establishment of 'knowledge management' groups will be key in maintaining a competitive edge for all chemical producers. Monitoring of global developments is necessary in research-intensive areas
- Protection of intellectual property and safeguarding of process know-how will be essential to European industry but also increasingly difficult. Control of information flow and data security will be imperative
- Use of computers to plan, control, run, evaluate and model chemical production will be necessary. The efficiency and innovation rate of R&D will be increased by high tech synthesis and analysis equipment
- Highly efficient and integrated R&D, i.e., a short path from innovation to production, is required to meet global competition

ELECTRONICS AND ELECTRICAL CONSUMER GOODS

- Information transfer and management will be the dominant enabling technology in the next 20 years
- Investment in hardware and software will increase **dramatically**
- The successful industry will be 'knowledge transfer based' with an integrated strategy
- An IT strategy will be mandatory - the implementation of this may be out-sourced but the power will rest with whoever has control of the strategy
- Keeping up with developments and information will be imperative for the successful company
- International regulation will increase
- Self-generating harmony of practice
- Limited number of system providers
- Open access free trade will supersede national legislation but traceability will increase
- The risk of cyber terrorism will increase the need for secure systems

ENERGY

- Cheap energy products can rapidly be bought via the Internet, provided by companies that have no own production capacity, see for example <http://www.utility.com/>
- Those energy companies that can convince the public of the necessity of IT in their business, and their own capabilities in this area, can rapidly increase their stock market value and use any additional collateral for investments in company expansion

FOOD AND AGRICULTURE

- Wide use of e-commerce disrupts existing power bases in commercial retail and manufacture
- Know-how in primary production developments spread rapidly and worldwide, but only to 'on-line' industries
- Global companies control networks of supply rather than manufacturing or retail capital
- Local chains emerge built on local tastes and fresh supply
- Underclass of IT illiterate emerges

INFORMATION AND COMMUNICATIONS

Telecommunications Consumers:

- Going out for shopping will no longer be necessary but it may still be done as a leisure activity. No more stress queuing in supermarkets, no more time wasted on public transport or in traffic jams
- Telecommunications in 2020, will more than ever before, be vital to our daily life. One of the best changes, thanks to telecommunications, will be the possibility to choose our location of work. (That was not the same for our grandparents!) Permanent connection to information networks will be widespread in Europe, so that we will have the opportunity to live anywhere. This will also help to cope with urban pollution and rural depopulation
- We will all be equipped with an electronic 'communications assistant', which will help us to solve a lot of our daily problems
- We will all subscribe to communication and information services at the same time. Each Communications and Information Provider (CIP) will try and do his best to provide us with easy and adapted services. Thanks to new terminals, we will have easier access to a large number of communication services (high quality video, large choice of databases, high level of personal security, etc). We will entrust such systems with a lot of personal data, stored on remote networks

Information Industry

- Thanks to information technology, most industries will increase their profitability. Due to huge investments, their manufacturing tools will be updated too. This will cost a lot of money, but it will be worth it. Industries that do not invest from the outset in information technology will no longer be able to compete. Firms will all be organised around their *Integrated Information Management Systems* (IMS), which will enable them not only to exchange information with their distant production sites (whenever they want), but also to be informed of market trends, in their chosen sectors of activity. Efficiency and profitability, therefore, will grow at an incredible rate
- However, this situation will probably be very different from one continent to another. These tools of communication will spread all over Europe, the United States, and Australia and some parts of Asia. Other parts of Asia and Africa will suffer adversely. In China for example, the situation will still be far from rosy. Most Chinese people will still not have access to the Internet, and even if they can afford it, the content will be tightly controlled. In 2020, a large number of governments will still intervene in information access

(Tele)Communications Operators

- Inter personal, business or even collective (education, health, etc.) communication technologies will structure all economic sectors. CIP (Communications and Information Provider) will replace today's telecommunications operators. They will provide their customers with a large range of services in addition to their traditional network operator activities, including information content, as mentioned above
- Technological improvements will diversify access to information: communication using radio, satellites, balloons, narrow and wide bandwidth wired on copper or optical fibres networks. This will mean that it will be technically possible to answer a large variety of needs at scalable costs
- In addition to individual mobile phones, the services available to customers will involve wireless or fixed personal multimedia terminals, interoperability between networks, between basic services, bandwidth adaptability, home network capabilities, information adaptability relative to the terminal, and more generally performance-guaranteed, availability and security

- More and more services will be located in networks, as bandwidth will be sufficient to cope with a wide variety of demands. A permanent connection to the network will move services away from time-based billing to content-based billing

ANALYSIS

- From an economic point of view, this means that a communications operator will be obliged to provide more than just physical connectivity to its customers. The customer will demand increased access to information but will care little about the means needed to connect to or transport it. So, communication operators will have to adapt themselves very fast, to a new role: Communications and Information Provider. From the many that exist today in Europe, it is likely that as few as five will have survived to 2020. If by chance, these huge companies draw up non-competitive agreements, this could affect the right to access information and freedom of speech may suffer

PHARMACEUTICALS AND HEALTH CARE

- Rapid growth of advice and diagnostics via the Internet
- Confusion of professional versus advertising information leads governments to issue certification to web sites
- Rapid growth in use of traditional and ethnic remedies via e-commerce as consumers 'do it themselves'

(ROAD)TRANSPORTATION

- ...Electronics and software are taking the control of vehicles, following the same evolution as aircraft in the '80s. It is likely that this evolution is going to accelerate in the future since electronics and software are providing higher functionality and flexibility for lower cost
- Each vehicle will be equipped with a communication system. It will be possible to perform remote vehicle diagnostics anywhere at any time, provide effective help in case of break down and accident or inform the vehicle's owner about possible malfunctions in advance. A large range of services can also be offered like navigation, traffic information, fleet management, entertainment system and mobile Internet access
- Nowadays major components in vehicles are internal combustion motor and chassis when most electrical and software systems are outsourced....Vehicle makers will have to invest a large amount of money to acquire and control these new technologies, leading to major changes in development and manufacturing... But the biggest challenge for the automotive industry is maybe not related to the emergence of new technologies but to new business opportunities based on services. This will mean radical changes in company organisation to move from a heavy mechanics manufacturing culture to a service supply culture
- It will be necessary to control information technologies both in the vehicle (mobile communication platform) and in the company (huge database, Intranet, Internet gateway and communication provider gateway). This corporate information management structure will become the most critical component for company operations
- Lack of laws and regulations related to information flow (vehicle data ownership, privacy protection, etc.) will have to be handled

d) Extreme Scenarios

These four scenarios of the situation in European industry in the year 2020 were developed by the group after a series of brainstorming sessions. (IST developments have been pulled out here.)

After the scenarios come some more general thoughts on trends and (presumably) wild cards.

• **Free Markets and Strong Economic Growth**

In this scenario the world economy continues to grow as in 1990's and 2000's, with three economic superpowers: USA, Europe and China. The economy in Europe has continued to grow for years. Local economic depressions in EU countries have been hindered and instead a *financial stability* has been gained with *fast capital movement* from declining to growth areas. *Unemployment* remains low since social backup systems have been cut down and most people have adopted the idea of lifetime learning and rapid movement to new professions in growth industries. The *role of multinational companies* is still *increasing*. Companies are concentrating on business areas where they are leaders or close to the leading position in the *global market*.

- 3-dimensional Internet2 has widely substituted the old Internet. Connections have become very cheap; for example people can earn money by accepting that a connection to Internet2 be installed in their homes. However, they must accept to receive a limited amount advertising too
- *Speech analysis* has been *integrated* in computers so that it is possible to ask any kind of question and have the answer via the Internet by using *artificial intelligence*. It is possible for a computer to collect information and learn rapidly to answer questions on related material
- Computers are so tiny that it in many cases it is impossible to see them. They can communicate with people via a microphone that is integrated with the ear

• **Chaos After an Ecological Catastrophe**

Climate and GMO-related disasters and disease... *Internet cash flow* cannot be trusted because it is impossible to verify if the business is still in operation on the other side of the world. *Transport* infrastructure is totally destroyed in many countries because of a lack of fuel.

- Internet technology has not developed notably since 2010
- In locations where there is no power supply, the Internet has become useless

• **The Demise of Europe as an Economic Super Power**

In the early years of this century, economic growth escalated in Europe. [Then social and organisational problems mean that] Europe is no longer the leading market of the world. Poor countries ... have not managed to put up the money for their development. IMF is now in a critical situation, as even private investments are not sufficient to pay back debts. Asia, which is today a world Super Power, imposes its culture and economic might, buying European companies, one after the other. Poor people are obliged to work in bad conditions bringing us back to the 19th century, and there is little hope in sight for the coming years.

• **Fossil Fuel and Global Warming**

Global warming increases much more rapidly than predicted, major environmental results including e.g.: switching off the Gulf Stream, Micro particles causing the deaths of 1M people per annum across Europe; regular 'biblical' famines will occur across the globe Demands have grown for movement towards a hydrogen economy with technology advances matching this in fuel cell technology. The key players will be those who produce hydrogen, from sources other than carbon. Initially the transportation of goods will become the major cost in the manufacturing chain, as the transportation system moves from fossil to hydrogen-derived propulsion.

- **Extreme Scenario Snapshots (wildcards and topics – some IST-specific, most others IST-relevant)**
 - **Private Banking:** online banking becomes more and more important compared to traditional banking, differentiated into administration of private accounts (free of charge, financed by advertising) and more traditional banking services(e.g. investment advice, loans and distribution of assurances)
 - **Common Currency and Common Trade:** Europe and the US have the same currency, free trade is possible
 - **Gap of Wealth between the rich and poor countries:** larger, but life quality in the third world improved better due to political stabilisation, a world trend to democracy and strong partnerships between industrial countries and 'non-industrial' countries
 - **Decreasing Taxes:** due to the privatisation of social services and state administration tasks and the downsizing of the state institutions, public taxes will rapidly decrease. State employees are more responsible and efficient. On average there is more money for consumables and investment goods in the consumers' purse
 - **Global Warming:** the CO₂ problem (higher emission and lower absorption of CO₂) is not adequately handled, resulting in global warming and weather instability; increase in related diseases; rising sea levels; change of the local agriculture and plants; dramatic reduction of animal species; population movement to areas with better quality of life regarding air and climate; change of the human biorhythm from day-based to night-based work. Global Consumption: large imbalance between what people consume and what the planet can provide leads to political stress between countries with a high consumption and countries with high natural recourses and climatic problems. Disappearance of Tropical Rain Forests: ... dramatic influence on the number of surviving animal species and the global climate. Northern European countries have today's Spanish climate. And in the southern part of Europe they will have to move their active time more and more to the evening and the early mornings. These environmental shifts will lead to conflict between the 'responsible' generations and the 'new' generation. For example in Europe we will have more environmental incidents than political and financial incidents and these will influence the generation changes in political leadership and business management. Nightshifts: Because of the dramatic change of the climate and in particular the consequences of the CO₂-effect we will have to move our main business and leisure activities to night-time and we will sleep during day. It will be necessary, therefore, to take daily medicine to help with this new biorhythm
 - **Health:** Genetic Medicine: For rich people it is possible to transplant all body parts, in particular the brain into a younger person. Specialised institutes are all located in the third world because of legal and financial issues. Due to the progress in developing interfaces between human material and artificial hardware material we can programme human brains... Artificial Uterus: In the developed world it is more and more popular for rich women or infertile couples to use artificial uterus machines to incubate babies. Centralised Specialists for Surgical Operations: Surgical Hospitals are renamed 'Medical Application Centres' where machines perform the operations which are guided via the Internet or Intranet by specialists in other countries. Virus Infections: The largest danger for the human population in 2020 is an increasing number of viruses. It becomes the norm at all international airports to complete a medical analysis of every visitor from foreign countries. Consequently, videoconferencing is the standard business communications tool and aircraft traffic between the first and the third world is reduced to a minimum

- **Higher Percentage of Homework:** The biggest advantage of information technology progress is that home-work makes up more than 70% of our job time. We are, therefore, less inclined to stick to rigid working patterns and office presence. This benefit will lead to a higher quality of family living and integration of family life into the work arena. This means bringing those two worlds closer than they are today
- Digital videoconferences are standard and the Internet is 1000 times faster than today
- **E-Commerce:** Attitudes to e-commerce will change dramatically. Today the majority of the consumer businesses started with a certain number of shops in several cities before the Internet and then developed e-commerce façades. In 2020 it will be possible to buy consumer articles from companies that started directly on the Internet in the centre of our main cities, for example Amazon or other e-commerce specialists. However, there is no doubt that the main market shares will be made via e-commerce
- **Transportation:** Global Positioning Systems will be integrated into all cars. This technology is the key to fully automated vehicles. Business aircraft traffic will be totally reduced due to the progress in information technology. The number of airlines will decrease dramatically. The number of high-speed train systems will increase
- **International Communication:** The next generation of voice recognition systems will directly translate and understand all kinds of languages. Hardware will be reduced to a minimum and makes international communication very easy. Translation software uses your voice to retain a personal touch in the conversation. In particular, communication between Asian countries and the Western world will be much better. This positive influence is also important for international politics and for solving international political challenges like climate chaos, extreme weather events, country or area conflicts and crime related issues
- **Energy: Solar Energy:** ...the technology of the future. It is necessary, therefore, to develop suprapiping of current to 'transport' energy over very long distances, from sunny regions such as the Sahara to more cloudy regions like Northern Europe. **Nuclear energy:** The critical discussion about this kind of technology will rapidly increase after the next power station crash in a western country between 2000 and 2005. Therefore a special emergency plan is developed to eliminate kernel energy and according to that plan the last kernel energy power station in Europe will be closed in 2010. **Global Energy Consumption:** There will be a large imbalance between energy consumption and how much the planet and its natural resources can provide. Oil and coal will begin to run out in the middle of this century. This leads to political stress between countries with a high-energy consumption and countries with the latest remaining natural resources. In general, the costs of energy will increase dramatically after 2010. The industrial world has to change its view of energy as a consumable for everybody to something very valuable for rich people
- **Religion:** The political influence of religion in the Middle East will decrease significantly to resemble the influence of Christianity in the year 2000 in Europe. Only 5% of the European population are members of a certain church or faith
- **Family:** The family is no longer the foundation of society. The majority are old people, singles and couples without children. The main reason for this change is the infertility of men in industrial countries. We will, therefore, have a large number of adoptive children from the third world and couples with their own children will be very rare but receive significant financial support from the state

- **Work:** One advantage of the information technology progress is that home work is a larger part of our job time than office work. We are, therefore, required to be present in the office far less. This benefit will lead to an increased standard in the quality of family life and the integration of family values into the work arena. In larger and even in smaller companies it will be normal to bring children to the office where specialised staff will take responsibility for them. This is directly related to a higher personnel prestige and image. The total separation of the family world from the work world no longer exists
- **Increased Lifespan:** Due to new research results and newly developed medicines the average lifetime for men is 90 and the average lifetime for women is 95. The age of retirement in Europe is 75. Benefits paid to couples for having children in Europe increases to prevent a continuation of this trend. As in the '50s in Germany, Europe has a special integration program for young foreign immigrants especially from of the third world

e) Commentary

The EIRMA study presents lively and provocative scenarios, though not all the technological forecasts have the same degree of plausibility (brain transplants by 2020?). There also seems to be some failure to think through social implications in depth (brain transplants mean less air travel?). However, the study provides an excellent overview of some contemporary speculations about IST implications for the future of manufacturing, and some other topics like health. Treatment of issues such as environment and privatisation reflects specific ideological stances (quite widely shared in business communities). The study provides usefully systematic overviews, and a helpful discussion of wild cards.

... 2.2. The Five Scenarios in EUROPE 2010

These scenarios, produced by the Forward studies Unit of the EC, have had a high profile, though apparently they have proved very controversial. They deal very much with the future structure and strategy of the EU, and the context in which these are forged. There is little specific to IST in them. The account below quotes more or less directly from a summary prepared by Mike W Rogers of DG Research.^{xx}

a) Triumphant Markets

...A future in which developments are mainly driven by technological advances and rapid economic globalisation. The world of Triumphant Markets is one of fluid markets, consumption across the board and instant transfer of information and capital. Confronted with the superior economic performance of the United States at the beginning of the (21st) century, other world powers have not been able to come up with their own way to the Third Industrial Revolution. Europe has been no exception to the rule: the public sector has gone through a decade of extensive privatisation and downsizing, entrepreneurship is on the rise and competitiveness has improved dramatically, but the price to pay has been a massive increase of social and regional inequalities over the period. In such a scenario, the obvious tendency would be for the EU to concentrate on economic matters at the expense of more political projects social or environmental policy, foreign aid ...) and to favour free-trade approaches against more redistributive policies like structural funds or the Common Agricultural Policy (CAP). The European Union would evolve towards a European Economic Area flanked with a limited number of policies and Brussels main task would be to manage the Single Market.

As the political importance of the EU as a whole would recede, there would be no further attempts to reform the institutional system in greater depth. The European authorities would remain unchallenged in the economic and commercial fields: the European Central Bank for monetary policy and the Commission for competition state aid and regulation of the Single Market. Several elements of the present political project, like environmental or social policy, would survive in the form of closer co-operation between only some Member States. The same would hold for foreign policy and defence matters, the latter on a purely intergovernmental basis.

In such conditions, EU enlargement could take place very quickly and at low cost. If the Union were to become a mainly economic project, one could even imagine some North African or Middle Eastern States applying for membership. In return, rapid enlargement would block further progress in all areas subject to Unanimity voting. New applicants would not be required to share the more political goals or to take part in corresponding co-operations. On the other hand, they would be expected to adopt all the regulations of the Single Market and enforce them to an acceptable degree.

b) The Hundred Flowers

A scenario of overall political and social fragmentation. With the spread of information technologies, small and informal structures are blossoming across the continent, while bigger bureaucracies (especially Public) end up losing contact with the day-to-day reality of European societies. The public becomes increasingly cynical about politics and big business; there is massive voter abstention and tax-fraud hamper governments in their attempts at reform. Politics reaches a standstill in several countries.

At the same time, Europeans become much more involved in local life and they attach more importance to smaller political communities and regional identities. This is analogous to the US Community Based Research Networks. The outcome in 2010 is a complex political map.

Several Member States, especially the largest, are still caught in the vicious circle of inaction and public mistrust. New laws and inconsistent reforms pile up, leading to ever-greater complexity and chaotic implementation. At the other end of the spectrum, some Member States have not been hit so badly by the crisis: they have undertaken a process of radical simplification of laws and procedures and they enjoy a relatively high level of public confidence. The latter group also includes newly created States stemming from the break-up of certain Countries at the start of the century.

Such a crisis would significantly affect EU institutions and lead to paralysis and constant squabbling between Member States. The enlargement process would probably be immediately sacrificed, as national governments would not be ready to defend the decision to enlarge before their home electorates. But the consequences would reach far beyond the issue of enlargement. There would be no political momentum for new reforms of the EU's institutions and policies, and neither the European Council nor the Commission would be able to concentrate on the essential issues and take major new initiatives.

In The Hundred Flowers scenario, Member States would request ad hoc arrangements and transition periods in order to postpone internal reforms to appease public opinion and major lobbies. These ad hoc arrangements may concern whole policy areas but they may even be opt-outs from particular decisions. The EU would turn de facto into several Unions: one for foreign policy and defence, one for Justice and home affairs, a third one for monetary matters, with numerous exceptions and protocols making each of these circles increasingly complex. If the founding members were part of all these circles, they would remain at the heart of the Union, but even they would be seeking exemptions tailored to their internal political needs. The situation on the ground would be more opaque than it looks on paper. Whatever decisions may be taken in Brussels and in the capitals, most national agencies would not be able to implement them effectively. The rules underpinning the Single Market would be subject to erratic enforcement: Member States would systematically bend the rules to their own profit and protect their economies when needed. What would inevitably follow is the unravelling of the whole system.

c) Shared Responsibilities

In this scenario, Europe manages to reconcile its ideal of social Justice and the need to enhance economic competitiveness. Faced with massive public resentment, European governments undertake a deep and co-ordinated reform of the Public sector in order to do away with traditional Public bureaucracies and replace them with flexible and user-friendly administrations. Public authorities, be they at local, national or Community level, are re-organised along their core tasks of co-ordination and facilitation. This gives birth to a renewed approach to policy-making based on networks and enhanced participation of the civil society.

The reform described in the scenario is based upon four fundamental principles: decentralisation and, whenever possible, delegation of responsibilities; openness and clarity of objectives; accountability and enforcement of commitments to quality; subsidiarity, including the duty of co-operation between different levels of government. It leads to the introduction of a code of conduct for public service binding on all levels of administration and guaranteeing the citizens a right to information, consultation, transparency and access to justice.

In line with the principles mentioned above, European governments undertake a major effort to clarify the goals of European Integration. In the middle of the decade, the European Council convenes a group of randomly chosen citizens from all member and applicant countries and asks them to produce a vision for the Union. This initiative starts the ball rolling for a much larger public debate on the issue, highlighting amongst others the need for a

unified foreign policy. An Intergovernmental Conference follows where major institutional reforms are decided: abolition of unanimity voting, co-decision across the board, better representation of lion governmental organisations (NGOs) in the Economic and Social Committee, transformation of the European Court of Justice into a European Supreme Court (whereby the Court would be the sole interpreter for the Subsidiarity principle and conflicts between EU treaties and national Constitutions).

Relations between the three levels of governance (regional, national and European) evolve towards a logic of "co-operative subsidiarity". Generally speaking, Shared Responsibilities is a scenario where regions gain responsibilities in most policy areas but where monopolies of competence tend to disappear: the general objectives are set in common at EU level and each level of government brings its own contribution to achieving them. This implies among other things much more intense relations between the EU and regional governments and a growing number of charters and soft-law agreements involving the Commission, national and regional administrations as well as elected representatives at all levels. For instance, on issues such as infrastructure investment or environmental protection, it would be up to each region to involve all the stakeholders and issue its general orientations for five or ten-year periods, and the Union and the national government would then tailor their aid to these requirements.

Another important element of the scenario is the attempt to enhance popular participation at all levels. This requires a re-organisation of public action in order to systematise the various experiments that have taken place everywhere in Europe since the 1980s. The Commission would generalise the practice of Green Papers and collect reactions from all stakeholders before embarking on any major reform. Beyond NGOs and what is commonly described as the civil society, the Union would try to establish more symbolic links "individual in the streets". Possibly through increased recourse to citizens' juries, in other words random panels of European citizens required to investigate an issue of common interest and deliver an opinion on it.

On the whole, such a reform would have major policy implications but it would appear insufficient and wearisome to the bulk of the population. Better representation of all stakeholders would result in more sensible choices on contentious issues like pension and welfare reforms. On the other hand the permanent search for compromise and the proliferation of soft laws and informal agreements would render decision-making much more lengthy and cumbersome than it already is. Active citizens would only remain a minority and the general public would be as prone as ever to lassitude and disillusionment with public life.

d) Creative societies

The key drivers of this scenario are to be found in Europe's societies. The starting point is the major shift in values that has occurred over the last twenty years, from the mind-set of the industrial society to more "post-modern" ways of living and thinking.

Today's Europeans attach far more importance than former generations to quality of life, protection of the natural environment and individual development in the widest sense of the word. If change in values continues along these lines, Europe may well see a conflict arising between what people expect from our economic and political systems; and what they are able to deliver.

This is precisely what happens in Creative Societies. As public frustration is growing against rising inequalities, the omnipresence of money and the rhetoric of permanent change, Europe goes through a year of massive protests triggered by repeated attempts to cut social benefits. As the situation gets out of hand, public forums are organised so that people can express their frustration and suggest reforms. The Outcome is a renewal of Europe's political class and a deep re-orientation of our economic systems. Europe's accounting and tax

systems are overhauled: green accounting is introduced in order to assess the impact of human activity on the environment, social economy and associations are strongly supported. Pollution and Financial speculation are penalised and each European is granted five years of personal leave during their working life with minimum income and social security or insurance incurred by the state.

The re-orientation described above would achieve mixed results in economic and geopolitical terms. The two most negative repercussions would be a major economic slump during and after the troubles and a marked tendency for EU countries to concentrate on internal matters at the expense of foreign policy (for instance, it would delay the enlargement to Central and Eastern Europe, Cyprus, Malta and Turkey).

Both trends would reverse slowly at the end of the period (2005-2010).

In such a context, governments would want to demonstrate their ability to 'tame' the EU, especially its more free market oriented policies. Institution-wise, this would mean more political control over the Economic and Monetary Union (EMU) and the Single Market. Governments would want to establish a solid political counterweight to the European Central Bank - possibly by reducing its independence from the Council of Ministers and they would request more laxity from the Commission on competition and state aid policy. The most significant progress in European integration would be achieved in the area of -Justice and home affairs, which could become a Community competence across the board by the end of the period.

Decentralisation and devolution of powers from national to regional governments would continue, but they would take place in a climate of mistrust towards Brussels and the capitals. Regions may even demand a more precise list of competencies to be incorporated into EU Treaties along the model of the German "Grundgesetz".

By any means, there would be recurring conflicts of competence between the various levels of government, and permanent tensions between the centre and the most powerful and richest regions. In short, as politics and ideology play a dominant role in this scenario, European Governance remains in a logic of "competitive Subsidiarity"; that is not devoid of inconsistencies.

e) Turbulent Neighbourhoods

Major security threats like international organised crime, ethnic tensions, terrorism and environmental downgrades are present in most of the other scenarios to some extent. But in Turbulent neighbourhoods it is the scenario where they are likely to dominate and become the Unions' primary concern. The geopolitical situation in Europe during the first 5 years worsened considerably; and EU public opinion have taken on a siege mentality with respect to the outside world. Their views are justified by sporadic ethnic based warfare in neighbourhood countries.

The risk of spillover becomes so high that it disrupts the fabric of everyday life. Terrorist attack threats and ethnic tensions are high and the EU intervene militarily – but on its own as the US regards it as an internal regional issue.

Inside the EU there are massive displays of law and order- street patrols, curfews, capital punishment for terrorism, hard line on immigration and asylum seekers. Europe accepts these needs as a price to maintain internal stability.

Such a scenario would imply a shift of power between the smaller and larger EU Member States, as unanimous voting would have to be dropped as faster and clearer decision

structures are needed for military imperatives. Bigger States may set up a European Security Council parallel to the EU with permanent representation with smaller States rotating- as in the case of the UN Security Council. They would work closely with the Council of Ministers, which remains the policy arm for security and defence. The EU's Foreign Policy would then go intergovernmental and the Commission take a back seat.

Europol would be rolled out to add an (external) border police and an enforcement agency. Tensions would arise in justice and home affairs as the competencies would be dynamic and unclear.

*The enlargement process would be deeply influenced by the geopolitical situation. Member States and Accession states would have little time to determine jointly what common purposes they want to pursue together. The decision to enlarge to individual countries would be based on more geopolitical factors: the Union of Turbulent neighbourhoods is first and foremost a 'security alliance' (one could almost say a 'stability alliance') and other economic and political dimensions have slid down the list of priorities. This is especially true of the Single Market, once regarded as the main founding stone and now subject to considerable distortions, especially from the part of new Members who are neither able nor willing to take on board the whole *acquis communautaire*. Broadly speaking, all Member States would infringe competition and state aid regulations under the pretext of national security, and the EU itself would sometimes adopt a similar attitude in larger frameworks like the World Trade Organisation (WTO).*

On the whole, Europe in this scenario has taken a decisive intergovernmental turn resulting in the weakening of supranational institutions like the European Commission, the European Court of Justice and the European Parliament. Larger Member States are able to impose their will, not only in security-related issues but also in economic and social affairs. Neither the Commission nor the Parliament are able to counter the slow erosion of the "acquis" and the major infringements to democratic principles that are taking place in the Member States. The Union of Turbulent neighbourhoods has strengthened considerably in several high-profile areas but it has lost its ability to anticipate long-term changes, as can be seen from its drifting competitiveness and its various unreformed welfare States.

... 2.3. Norway 2030

As part of the Foresight programme, this scenario exercise was carried out with participation from the OECD Futures Group and the EC's Forward Studies Unit. There is little IST-specific material here, but the work is interesting methodologically and raises some interesting substantive issues. The text below is largely drawn from a report on this exercise.^{xxi}

a) Five Scenarios

The result of the exercise was elaboration of five scenarios:

- Norvegia (strong Peace country)
- Regio (federation of 7 regions)
- Bonsai (minimal state, libertarian free market)
- Antagonia (rich but high conflict and division)
- Innova (creative and innovative)

b) Methods

Under the label “**Shaping Actors, Shaping Factors**”: the method adopted involved building scenarios for by:

- developing mini-scenarios (paths of development) for actors and factors
- collating these to form partial scenarios for key areas that are of major importance for the development of the area of study
- bringing together the partial scenarios to form main scenarios

The project group submitted initially a proposal for major key areas to study, aiming to encompass the major factors influencing development in the area studied. The partial scenarios were collated to form five main scenarios. The fundamental issues being addressed were future public administration policy and the organization of the public sector in response to the factors draw attention to by the partial scenarios.

For each of the key areas 20–25 actors and factors important to the development of these topics were selected. Potential paths of development for an actor or factor were then considered, and related to alternative paths of development of the other actors and factors – clarifying the mutual dependencies of actors and factors. This partly involved analysis of logical and non-conflicting relations between them – so, for example, factors such as ‘radical increase in the number of employees’ and ‘drastic reduction in the number of births’ or ‘reduced immigration’ did not occur in the same scenario. The analysis also considered the actors’ ability to act strategically either to influence the development of other actors or factors or to adapt to a development. The strength of the relations between the development paths was assessed, to judge their suitability for inclusion in consistent partial scenarios for the topic concerned. (This seems to be a more sophisticated version of cross-impact analysis.)

Four key areas were identified, and deliberately presented at a general level, to emphasize the participants’ freedom to select strategically important factors, actors and paths of development within their key areas. These key areas had to embrace the major factors and actors that were supposed to influence or delimit development in the area in which one was working. The key areas were:

- Global development – external influence (Members of this group came from the Ministry of Education, Research and Church Affairs, the Ministry of the Environment, the Ministry of Local Government and Regional Development, the Ministry of Trade and Industry, the Ministry of Agriculture, the Ministry of Foreign Affairs, the Ministry of Fisheries, the Directorate of Labour, and the Directorate of Communication and Public Management Policy. In addition there were also two researchers involved.)

- Economic adaptability in Norway (Members here came from the Ministry of Trade and Industry, the Ministry of Petroleum and Energy, the Ministry of Education, Research and Church Affairs, the Ministry of Health and Social Affairs, the Ministry of Local Government and Regional Development, the Ministry of Transport and Communications, the Ministry of Agriculture, the Ministry of Fisheries, the Ministry of Finance, and the Directorate of Labour. The group was headed of researcher in this field.)
- Values, culture and social patterns in Norway (Participants in this group came from the Ministry of Education, Research and Church Affairs, the Ministry of Local Government and Regional Development, the Ministry of Cultural Affairs, the Ministry of Health and Social Affairs, the Ministry of Foreign Affairs, the Ministry of Children and Family Affairs. One external social philosopher.)
- Social organization and democratic challenges in Norway (The members of this group were mainly from the Ministry of Labour and Government Administration, the Ministry of Finance, the Ministry of Justice, the Ministry of Trade and Industry, the Ministry of Defence, the Office of the Prime Minister, the Directorate of Public Management, and the Norwegian Central Information Service. One researcher.)

There was also an effort to consider more fundamental topics in all of the key areas. Norms, values, ecology, environmental protection, world resources, **information technology** and global patterns of consumption were all examples of such fundamental topics.

Development of the scenarios was carried out in several stages:

- a series of working seminars, where the first tasks involved identifying important structural factors and major actors capable of influencing development in the respective areas
- the chairman of the working group was responsible for preparing a preliminary memorandum enlarging on the issues and potential actors and factors in the key area concerned. The main objective of this phase was to demonstrate scenario methodology, to stimulate scenario thinking and -building as method of work, to make experiences with cross-ministerial co-operation, to discuss main actors and factors in different fields, and to develop partial scenarios as substantial input for the last phase, the scenario study phase. The results of this part of the project were among other things 20 partial scenarios, five for every group
- During the next phase, these partial scenarios were synthesized to form the main scenarios. The project manager of "Norway 2030" participated in all of the working seminars. All the chairmen of the working groups participated in the project group

The presentation of the scenarios reflected the intention of avoiding the two-by-two logic of many multiple scenario studies. Thus there were always planned to be at least five scenarios. For easy comparison among these a Spider's web / radar plot approach with eight variables was used. Variations between the scenarios on these variables were captured in terms of scores on a ranging scale from 0 at the centre to 10 at the extreme outer edge. Thus for scenario IV, Antagonia, a high degree of individualism and an international orientation are represented by high scores, while scores for collectivism and national orientation are both low.

VI. End Notes

- i E.g. G Ringland (1998), **Scenario Planning: Managing for the Future** (Chichester, John Wiley), A van der Heijden (1996); **Scenarios: The Art of Strategic Conversation** Chichester, UK: John Wiley; and M Keenan, I Miles, J Koi-Ova (2003) , **Handbook of Knowledge Society Foresight**, European Foundation, Dublin, available at: <http://www.eurofound.eu.int/transversal/foresight.htm>
- ii S.C.H. Greeuw, M.B.A.van Asselt, J.Grosskurth, C.A.M.H.Storms, N.Rijkens-Klomp, D.S.Rothman and J.Rotman (2000), **Cloudy Crystal Balls: An Assessment of Recent European and Global Scenario Studies and Models**. Experts' Corner Report: Prospects and Scenarios 4 (Copenhagen: European Environment Agency)
- iii R. Popper (2003) **Visions for EU15 by 2015** – The Knowledge Society Delphi: Executive summary of main results (...underpinning trends, impacts and policy areas in EU15's working conditions, industrial relations & living conditions), A report by PREST for the EUFORIA project, European Foundation, Dublin, Ireland.
- iv **Scenarios for the Information Society** (October 2003) A report by Telecom Paris, École nationale Supérieure de Télécommunications for the STAR project., available at: <http://www.databank.it/star>
- v **Assessment of IST trends, impacts on growth and outline of scenarios** (June 2003) A report by ISIS incorporating contribution by RAND for the SEAMATE project, available at: http://www.seamate.net/dwl/seamate_d1.pdf
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- ^{xvii} Idem xii, p. 91
- ^{xviii} Idem xii, p. 63
- ^{xix} “Scenarios for the Future, A Report by a Group of Young Managers from EIRMA Member Companies”, May 2000 presented by: Peter Lillford, the group’s Chairman. Available on NORWAY 2020 CD-ROM. (Peter Lillford, EIRMA, York UNIVERISTY, Paper Towards the next Generation, reporting on EIRMA work with young managers.) presented at Foresight to Scenarios - Landscaping Methodology and Tools Workshop 5th July 2002, at EFTA, Brussels
- ^{xx} The full FSU report, in many languages, is available at: http://europa.eu.int/comm/cdp/scenario/index_en.htm
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