WP 1 – REVIEW AND ANALYSIS OF NATIONAL FORESIGHT

D1.1SE – CASE STUDY

SWEDEN – THE FORESIGHTED SOCIETY 1998 - 2000

STATUS: PUBLIC

PARTNER RESPONSIBLE:
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The FISTERA network is supported by the European Community under the FP5 specific program for research, technological development and demonstration on a user-friendly information society (1998-2000).

WHAT IS FISTERA?

FISTERA is a Thematic Network on Foresight on Information Society Technologies in the European Research Area.

The **FISTERA** network is supported by the European Community under the FP5 specific program for research, technological development and demonstration on a user-friendly information society (1998-2002).

The aim of the FISTERA Thematic Network is bring together on a systematic and extended basis, actors and insights in national foresight exercises on IST in the Enlarged Europe.

Main objectives:

- Compare results of national foresight exercises and exchange visions on the future of IST
- Provide a new forum for interactive consensus building on future visions for IST
- Contribute to the European Research Area through benchmarking and community building, by providing a dynamic pan European platform on foresight on IST

In order to meet these three key objectives, FISTERA will:

- Review and analyse the national foresight exercise outcomes (a country synthesis report)
- Build aggregate pan European Technology trajectories (a roadmap of potential developments of key emerging technologies)
- Map the European IST actor space (an analysis of the EU IST actor space)
- Provide an IST Futures Forum (strategically selected scenario exercises that will look at wider aspects of applications of IST)
- Disseminate the results to a targeted audience by various means (a dynamic website at the address http://fistera.jrc.es, an e-mail alert service, publications, conference presentations, a "road-show" of workshops and a final conference)

Network Membership:
Core partners (coordinators, work package leaders):

- JRC-IPTS (Institute for Prospective Technological Studies), part of the European Commission's Joint Research Centre, Scientific Coordinator of the network.
- FZK - ITAS (Forschungszentrum Karlsruhe GmbH in der Helmholtz-Gemeinschaft, Institut für Technikfolgenabschätzung und Systemanalyse), Germany.
- TILAB (Telecom Italia Lab – Scenarios of the Future), Italy.
- ARC/sr (ARC Seibersdorf research GmbH, Division Systems Research Technology-Economy-Environment, Seibersdorf), Austria.
- PREST (Policy Research in Engineering, Science and Technology) of the University of Manchester, United Kingdom.
- GCI (GOPA - Cartermill International), Belgium, Administrative and Financial Co-ordinator.

The group of **Members**, which is expected to grow over the duration of the contract, currently includes the following organisations: TNO-STB (The Netherlands), Danish Teknologisk Institut (Denmark), TecnoCampusMataró (Spain), Observatório de Prospectiva da Engenharia e da Tecnologia-OPET (Portugal), ARC Fund (Bulgaria), IQSOFT (Hungary), Tubitak (Turkey), The Researchers' Association of Slovenia (Slovenia), NMRC, University College Cork (Ireland) and BRIE-Berkeley University (USA). In addition, McCaughan Associates (McCA) runs a group of High-level Experts to the Network Management Committee.

FISTERA Web site: http://fistera.jrc.es/

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Summary

The Swedish Foresight programme is unique in that it was not conducted by or on behalf of the government. It ran from 1998 to 2000, including a long dissemination phase. It was organised in 8 thematic panels, involving an average of 15 experts per panel. The goals were "to strengthen a futures-oriented approach in companies and organisations, to identify areas of expertise with potential for growth and renewal in Sweden, to compile information and design processes for identifying high-priority areas in which Sweden should build expertise". Methods included scenario building and workshops in addition to an exercise called "technology hindsight", which was aimed at identifying causes for faulty predictions and assumptions on future technology. There were many workshops to disseminate and discuss results and a second exercise was launched late in 2002.

1 Background and Objectives

As of 2003, Sweden is the only Nordic country to have carried out a wide-ranging national foresight exercise. The project was started in 1998 as the result of a preliminary study by the Royal Swedish Academy of Engineering Science (IVA) and the Swedish National Board for Industrial and Technological Development (NUTEK, as is was at the time). These two organisations were joined by the Swedish Foundation for Strategic Research and the Federation of Swedish Industries.

The overall costs were SEK 34 million (€3.74 million), of which half was provided by the Foundation for Strategic Research, SEK 10 million (€1.1 million) by NUTEK, and the remaining 7 million SEK (€0.77 million) by the Swedish government.

Despite this support, the Swedish foresight was not carried out on behalf of government, but of the four organisations mentioned previously. A major aim was the commitment of private companies, public agencies, and other interested parties to the foresight process.

The final report of the project, "The Foresighted Society", was presented on 28 March 2000, but according to the understanding of the four organisations, this only marked the end point of an introductory phase. Since then efforts have concentrated on a discussion of the future development of Swedish society and business, centred around the report. Among these have been more than 20 regional conferences, over 100 presentations for specific organisations or companies, dissemination via the Internet and via the human networks of which the four organisations behind the report are part.

The time horizon for the studies was 10 to 20 years depending on the subject under consideration, the main aim being to "create insights and visions about technological development" over such a period. The three main objectives of the foresight exercise were:

- To strengthen a futures-oriented approach in companies and organisations,
- To identify areas of expertise with potential for growth and renewal in Sweden,
- To compile information and design processes for identifying high-priority areas in which Sweden should build expertise.

2 Organisation of the Foresight Exercise

The project was directed by a six-person steering committee with its own secretary and a project office, a project manager and four project officers, including one responsible for project controlling. In addition, an advisory panel consisting of representatives of around 30 organisations was set up to ensure that important Swedish stakeholders were integrated in the foresight process, to suggest names of possible panel participants, and to create involvement and generate support for the foresight exercise within the members' respective organisations, and to provide guidance for the work of the expert panels. Finally, an evaluation committee was set up to continuously monitor and evaluate the implementation of the foresight exercise.

The major part of the work done for the foresight project was carried out within eight expert panels, defined and staffed by the steering committee following a phase of discussion and definition. This was based partly on a review of comparable foreign studies and their lessons learned. The division into panel subject areas was made on the basis of user perspectives, not fields of technology:

1. Health, medicine and care
2. Biological natural resources
3. Society's infrastructure
4. Production systems
5. Information and communication systems
6. Materials and material flows in the community
7. Service industries
8. Education and learning

Each panel consisted of a chairperson and about 15 other members, a total of 130 in all. Each panel also had a project manager who worked at least half-time in this capacity.

3 Method and Procedure

Work on the panels started in January 1999, with a kick-off conference. A joint conference for the coordination of the panels' work took place in August 1999 while work in the panels ceased after one year.

There was a recommendation by the steering committee for the panels to follow a uniform methodology within a firmly fixed timetable. Their point of departure was a project plan based on the lessons of technology foresights in other countries. The steering committee also asked the panels to consider selected cross-cutting issues, such as environmental and energy aspects, economy and the market, attitudes and values. Apart from this, the panels had freedom to define and prioritise their own tasks.

In general, this procedure was indeed followed by the eight panels. The first step was an inventory of a large number of subject areas believed to be of importance for society. Following discussion, these were grouped into issues and a number of key areas were selected for more detailed analysis. The panels were free to form sub-groups and to outsource assignments.

During Spring 1999, Sweden's Defense Research Establishment (FOA) developed four future scenarios to underpin the work of the thematic panels. These varied with respect to the role assigned to geographic proximity in development and with respect to the relative number of players involved in development. The degree of use made of these scenarios varied among the panels.

A novel feature of the Swedish Foresight Study was a separate study of earlier attempts to predict the future. This was termed Technology Hindsight (Teknisk Baksyn) and discussed the various difficulties and sources of errors involved in forecasting.

Drafts of the eight panel reports were posted on a project website for comment by all interested individuals. The results of the foresight exercise were publicly presented at a final conference in March 2000. There have subsequently been the presentations already mentioned and the entire process has been subjected to evaluation by the panel set up for this purpose, which reported to the four organisations running the project.

4 IST in the Swedish Foresight Exercise

4.1 General findings on IST

One of the stated aims of the study was "to engage many of the players in Sweden's 'knowledge society' in a discussion of the best ways to promote a long-term interplay between technological, economic, institutional and social process" (The Foresighted Society, p.52). Accordingly, information technology, the new biology and increasing globalisation are seen as major drivers of societal developments in the coming decades (ibid., p. 4).

While there was a separate panel on information and communication systems, the final report also contains a chapter on "pioneering technologies", which includes among its three headings, one on IT. This singles out:

1. The rapid advances in computing power and capacity,
2. The development of telecommunications, particularly the advance of the Internet,
3. Advances in wireless telephony,
4. The use of computers for simulation.

IT was also addressed in the work of most other seven thematic panels beside that concerned with ICTs as such (cf. the synthesis report "The Foresighted Society").

One of the eight panels of the project was devoted to information and communication systems, albeit from the "user perspective" which was employed for all panels in the project. Obviously most of the other panels also addressed IT related aspects of their subject area. An important factor to consider in all assessments of the outcomes of the Swedish Foresight Programme on IT is the existence of an IT commission at government level. The commission which changes regularly in its composition has already addressed very similar questions to those guiding work on IT in the Foresight Programme**.**

The main results from Swedish foresight on IST are summarised in the following.

- IT will play an increasing role in the health care system, e.g. by providing patients with information about their diseases, as a tool for home care, by enabling communication between health care professionals at all levels. Security of IT systems is singled out as a particular problem in this area.
- IT is mentioned in connection with better all-round utilization of biological natural resources. The panel for this topic also recommends concentration on the development of products with high knowledge content, which highlights the importance of human knowledge in the oncoming knowledge society.
- With relation to society's infrastructure, IT is mentioned as the main tool for upgrading transportation, providing "completely new 'intelligent' ways of utilizing existing facilities more efficiently, but also of making traffic safer and more environmentally friendly" ("The Foresighted Society", p. 38).
- Mobile telephones are mentioned as one of the mainstays of Swedish industrial production. IT is regarded as a major driver for reforms in traditional production systems. Telecommunications and mobile equipment will facilitate close global collaboration. ICTs are an essential component of "virtual companies". Intellectual capital is regarded as the most important asset for competition and this requires working tools and procedures frequently enabled by ICTs. Microelectronics, computer and communications technologies are seen as the basis for entirely new products, simulation and modelling are identified as elements determining new working methods. In addition, "products are being given a large knowledge content…" (p. 41). A major expansion of communications systems is regarded by the panel as an important prerequisite for Sweden's future position. The panel also draws attention to the need for companies and organisations to adapt to network based projects and to rapidly increase the IT, software and service contents of their products.
- Information technology (e.g. search engines) in connection with global development is seen by the materials panel as one of the reasons for the greater availability of many raw and standard materials (p. 46). Sweden is described by this panel as an attractive test market for new products, due to the population's high degree of IT adoption among other things. Smart materials combining modern semi-conductor technology with materials

technology are identified by the panel as a priority area for Sweden in the future. Computer simulations are, as elsewhere, an important tool for technological advances in materials.

- The services panel draws attention to the rapid growth of this sector, which is due to a large extent to new technology. The "home market" for such services is increasingly the whole of Europe and not simply Sweden. The panel suggests public subsidies for home computers and broadband to provide all inhabitants of Sweden with access to the Internet. This panel also addresses the subject of teleworking from home. Such homes could also be more "intelligent".
- The education and learning panel regards information technology as a means to meet the challenges posed by societal change, provided it is adapted to people's needs. IT has a role to play in pedagogical development and for the dissemination of information. Modern technology is also viewed as a means to develop critical and constructive thinking. The IT age calls for an adult education system.

The IT panel was among those which set its sights on the next ten, rather than twenty, years. It formulated visions of futures of society and described the technology required to achieve them. This resulted in the identification of seven key areas regarded to be of great importance for the future evolution of ICTs.

- Always online: this refers to the development of home networks, wireless communications, the convergence of different media. Among the challenges are providing greater bandwidth and adequate human-machine interfaces.
- Digital assistant: this refers to software required to examine and interpret information and to adapt it to the situation and the needs of an individual user.
- More and more is becoming software: refers to the replacement of hardware by software. There is a need for new methods of programming, packaging, distribution and recycling of software as well as a need for greater attention to be devoted to the design of intuitively usable interfaces.
- Services of the future are electronic: meaning the possibility of customizing goods and services by means of improved software tools and information-based services that presuppose electronic communication.
- Continuous and immediate learning: refers to the blurring of distinctions between education and work, entertainment and learning.
- The technological and the biological worlds meet: denotes developments in the borderlands between ICTs and biotechnology.
- Security and privacy: covers the issues of vulnerability and mistrust of individuals of ICTs due to their potential for information gathering and surveillance.

The panel's main recommendations include:

- The creation of a Swedish "IT university" with an emphasis on mobile telecommunications systems. As an organisational form for this university, the panel proposes a number of nodes tied together in a network. This network should also collaborate with other universities and institutions of higher education. The panel also urges for closer collaboration between the universities and business, e.g. through the exchange of teachers and further education programmes. The panel further recommends training multi-disciplinary programmers capable of developing software tools at a university of the type proposed.
- Wiring up the country's schools to put them online, thus promoting development and stimulating new meeting places. The panel proposes starting this process with universities and colleges, eventually extending it to the compulsory and secondary schools.

- Building expertise and applications in molecular electronics based on biomolecules as building blocks for electronic functions. This again requires the creation of interdisciplinary environments and research programmes.
- The panel identifies a particular demand for IT interfaces, in particular those involving all human senses. It therefore proposes an interfaces programme, preferably under the auspices of the Interactive Institute.
- The creation of a project or research programme on systems science for groups of autonomous systems, consisting of physical and mechanical robots, software agents and autonomous systems. Potential applications for such systems are seen in areas where large quantities of data require interpretation, e.g. in e-commerce, healthcare or self-care.
- The creation of a network on security and privacy in information systems, involving both the business and public sectors. The network would be responsible for the "follow-up and analysis of deliberate attacks throughout society".
- The development of a strategy for travellers and transport systems to be always on-line. Building blocks of this strategy are electronic services, sensors and adaptive systems tailored to travellers and traffic systems. Among the tasks to be tackled would be the provision of information on the traffic situation and accident risks. At a later stage, the strategy seeks to involve other partners such as the automotive industry and logistics companies.
- The development of a strategy for IT in the health care and social service sectors. One element of this strategy is a programme for home health care and involving researchers, companies and public institutions in the joint development of innovative products and services for care providers, other affected institutions and the patients themselves. Pilot projects operated by hospitals are part of the strategy recommended by the panel to experiment with milieus involving IT solutions. One such milieu is the "intelligent bathroom".

4.2 Analysis of National Strengths and Weaknesses

The Swedish foresight study includes a brief analysis of strengths and weaknesses in its final report. According to this Sweden has a number of strengths such as:

The education system which provides broad general education to a large number of people. Among its major assets are the good knowledge and experience possessed by many individuals, good knowledge of English, experience in using computers and telecommunications, an interest in technology and a tradition of adult education.

The country's cultural strengths, include good industrial relations and a political tradition based on widely shared beliefs and values. Sweden also has more informal, less hierarchical structures and bureaucracy than many other countries. Public discourse is open and transparent, giving much weight to the younger generation.

The country has a long industrial tradition, including strong exports in many fields – iron and steel, timber/paper/pulp, engineering products, vehicles, telecommunications, defense, pharmaceuticals. This has turned Sweden into a successful user of new technology and Swedish industry into a prominent supplier of complex systems products. Sweden's environmental awareness and experience of modern technology make it possible to find domestic customers at an early stage for new, complex technology.

In proportion to its population, Sweden has an unusually large number of internationally active companies and organizations, in which comparatively many Swedes have gained solid experience of advanced international work (cf. The Foresighted Society, p.26ff).

More specifically in the IST area, Sweden's strengths are a solid industrial tradition, experience in systems thinking, a good knowledge of languages and the use of IT, a business culture suited to a project-oriented working method, and an infrastructure that is well-developed in many respects.

On the other hand, the Swedish foresight study also points out a number of weaknesses:

- A small domestic market, and a long distance from important markets and business partners;
- A lack of capacity for change in certain organisations and companies;
- Rigid regulations and structures for industry, in particular small companies;
- Comparatively high individual taxation making the country unattractive for skilled labour and acting as a barrier to higher education;
- Lack of ability to take advantage of the potential of women in the work force.

The Swedish Technology Foresight project primarily points to two fields in which both the government and the business sector can and must take quick action and make concrete decisions to develop Sweden's strengths and eliminate weaknesses: education and infrastructures.

There are a number of threats: a lack of desire for change in companies and public institutions, stiff competition from countries with low costs for both simple and highly educated labor, as well as a lack of interest in technology, industry and entrepreneurship among young people. Another threat is that research in production engineering and product development is being given inadequate resources.

4.3 IST Visions

The final report on the first Swedish foresight project is ambitiously titled "The Foresighted Society", indicating a major vision for the impact of the foresight exercise. The panel on information and communications systems proposes a number of strategies, designed to enable Sweden to become a world leader in some areas and "thereby attract expertise and capital". The summary report contains a number of key technology areas described in a "vision-like" form:

1. *Always online:* People can communicate with each other independent of space and time, partially with the support of a personal communicator. Important aspects are home networks, wireless communications and convergence of media. It requires greater bandwidth and improved human-machine interfaces.
2. *The Digital Assistant:* Software is available to independently examine and interpret information for the individual. This requires the appropriate standards, sensors and improved techniques for the retrieval, interpretation and evaluation of data.
3. *More and more is becoming software:* Many functions of hardware can be replaced by software. This sets new demands for software production tools, programming, packaging, distribution and recycling of software.
4. *Services of the future are electronic:* Traffic both in electronic and physical products and services enabled by electronic means is increasing (e-commerce), leading to new business models and an increase in the value of customer information and brand names. Needs

identified here are greater bandwidth, new standards, payment systems and delivery and quality control.

5. *Continuous and immediate learning:* There will be more connections between work and learning as well as entertainment and learning. To achieve a breakthrough in this field, there must be efforts on development of teaching methods, software tools, functional interfaces and greater bandwidth.
6. *The technological and biological worlds meet:* This refers both to applications of IT in biotechnology, but also to the development of IT from biological knowledge. The miniaturisation of electronics is a major driving force, and additional developments include biological sensors and interfaces. A challenge for more basic research is the use of biomolecules as electronic materials.
7. *Security and privacy:* There are threats to privacy and society is vulnerable due to its dependence on IT. There is a need to foster trust to enable greater diffusion of IT applications. Beside technological solutions, this requires work in the legal/regulatory field.

For several years already, the Swedish government has been running a programme on "An Information Society For All", which is driven by the goal of making the country the first to be such an information society with universal participation. The programme is targeted on three main objectives: *confidence* in IT, *competence* in IT application and *accessibility* to the services of the information society. Swedish authorities proudly underline that Swedish society has been ranked first of all countries in terms of "e-readiness", i.e. readiness for the information society.

5 Other Important Results of Swedish Foresight

Eerola and Jørgensen (2002, p. 40) quote some of the main comments from the evaluation report:

- Participants, in particular from industry, appreciated the long-term character of the exercise which is in contrast to the conventional short-term perspective adopted in business.
- While the exercise tried to avoid a narrow technological focus by emphasising the broader societal perspectives, some evaluators felt that technological aspects were underexposed, at least by some panels.
- The tight schedule and need to write reports themselves to some extent distracted the panels from generating ideas. This could be avoided in future by providing more professional support.
- The use of scenarios to support outlining possible futures was not equally successful in all panels. Again, there is need to provide support during work with the scenarios.

Over all, the exercise was regarded as a success and an initiative was launched in 2002 by VINNOVA (a spin-off of NUTEK) for a new round of foresight. A formal agreement on this was signed in June 2002 and the project itself was launched in December of the same year.

6 Literature

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Annex 1: Tabular Overview

Foresight effort "The Foresighted Society" 1998 - 2000/Sweden		
Categories, Criteria & Questions	**Answers**	**Comments**
Project promoter / initiator	– Royal Swedish Academy of engineering – Swedish National Board for Industrial and technological Development – Swedish Foundation for Strategic Research – Federation of Swedish Industries	
Agency or organization responsible for the foresight activity	– Swedish Royal Academy of Engineering – Swedish National Board for Industrial and Technological Development (NUTEK)	
Scope / areas covered	– 8 panels on the basis of user perspectives	
Time horizon	– 10 to 20 years	
Societal dimension	– "user perspective" of panels	
European dimension	– EU membership is "outside pressure" on market – domestic market no longer Sweden but EU	
Major explicit objectives	– strengthen futures-oriented approach in companies and organisations – identify areas of expertise with potential for growth and renewal in Sweden – compile information and design processes for identifying high-priority areas in which Sweden should build expertise	
Second order objectives and indirect effects	– commitment of private companies, public agencies and other interested parties to the foresight process.	
Impact	– most recommendations picked up by government – long term character appreciated by industry	
Target groups	– industry, public agencies	
Participation	– advisory panel recruited from c. 30 organisations – 130 panel members	
Major Characteristics	– non-governmental foresight organised by important organisations and agencies	
Methodology	– panel discussion, brainstorming, some use of scenario techniques, but variable from one panel to the next – technology hindsight as unique feature	
In which way have IST been included and treated in the FS exercise?	– panel on information and communication systems, but IT is also treated as a pioneering technology. IT is also addressed in the work of most of the seven other panels	
Strengths/opportunities weaknesses/threats identified in IST	– good education system – informal structures with low degree of bureaucracy, but also tendency to resist change in some companies – language Skills (English – solid industrial tradition – experience in systems thinking	

	– project-oriented working methods – small domestic market, long distances to important foreign markets – rigid regulations and structures as barrier to SMEs – high individual taxation, low pay for academics – temptation to emigrate – competition from countries with lower labour costs – lack of interest from young people in S&T jobs – inadequate resources for R&D on production engineering, product development	
Dissemination	– final conference, Report on website and published physically – many workshops to disseminate and discuss results – 20 regional conferences over 100 presentations for specific organisations or companies	