New Technologies Challenging Old Structures Of Governance

STAGE
FINNISH ANCHORING CASE

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According to the OECD and the European Commission, science and technology policies have been very successful in Finland in recent decades. These organisations have also ranked Finland among the top countries according to indicators of modern economic performance. Finnish policy makers tend to speak of the fruits of systematic public investment into new technologies, with new technologies meaning mostly information and communication technologies (ICT) and biotechnology. These two technology sectors are often dealt with as a uniform ensemble that creates similar potential for growth and development of economy and society. The Finnish success story is, however, based on the growth of an ICT sector that has recently experienced turbulence and instability in international markets. As a result the political expectations of the market competitiveness of biotechnology have become stronger. In this anchoring case we demonstrate the problems that arise when the potential benefits of new technologies are seen from a limited economic viewpoint. We also show how market governance has penetrated into all sectors of collective and individual action.

In order to understand the changing modes of governance and the possibilities of extending citizen discourse and participation into issues covering new tech, it is necessary to pay attention to the radical change of political ideology in Finland. Even though it is possible to identify long-lasting corporatist tendencies that favour new technologies, they have been linked to two almost opposite political frames. From the 1960s to the late 1980s the Finnish political system can be classified as belonging to the Scandinavian welfare states. Since then strong neo-liberal arguments have been used and market governance has taken the lead in the political action.

It is worth noticing that the corporatist discourse of the Finnish welfare state was based on the formal forms of democratic representation, where the political and economic elite, trade union and other professional interest organisations have the legitimate role of negotiation. Despite the coherence of this negotiation system, active and responsible citizens were not regarded as being important. The discourse was also a top down process even though economic performance provided possibilities to the state for a just delivery of the common good.

The neo-liberal orientation has emphasised market governance and the competitive elements of privatisation and efficiency. At the same time the nature of consensual elements in policy-making has changed. Party differences are no longer visible and there is a belief in the capability of markets to neutralise societal tensions. When competitiveness of the economy has become the primary goal, new forms of democratic dialogue are difficult to accomplish. The political elite tends to favour rational choices and to speak in one voice and there is only a limited space for an agonistic type of citizen action. Competitive individualism in market governance also means that consumers rather than active citizens are valued.

The object of this anchoring case study is to explore the changing modes of governance in large national new-tech projects. The first chapter illustrates science and technology policy frames of new technologies from a more general and historical viewpoint. The second chapter concentrates on the development of ICT-policy and on the tension between market governance and broader social issues. In the third chapter, the conceptions of public in biotechnology policy are opened and specified. Policy documents and strategies, as well as interviews of science and technology policy actors, have been used as the material for these analyses.

1 Changing Politico-Economic Expectations for New Technologies

Corporatist Aims to Promote New Technologies for the Welfare State

In Finland as in the other advanced countries the idea of industrial society has comprised tendencies to seek the most effective technologies of production. In this respect pulp and metal industries have served these goals. Since the late 1960s the efforts to modernise the national economy have concentrated on the promotion of new-tech industries due to their capability to compensate for national dependencies on raw materials, labour and energy. Policy-makers have considered new-tech industries as rapid growth fields that are able to resist the impacts of recessions and unemployment. In this view a rise in the technological level of production will increase productivity and the international competitiveness of the country (Lemola & Lovio 1986). Before the final breakthrough of information and communication technologies, electronics and chemical industry were regarded as the most progressive sectors.

The first systematic references to the importance of new-tech sectors occurred in the 1970s, in the midst of the Finnish welfare state period during which the functions of the state were concentrated both on the provision of welfare services and on state intervention in the economic sector. Even though the concept of a science-based society and economy was introduced into the political vocabulary, science policy was separate from technology policy and the economic issues fused with ideological views of government responsibility. The modernisation process was primarily a government-led effort wherein science policy was an integral part of general social policy, R&D activities were under public control and government efforts were made to activate discussion about the social relevance of science by making the planning process systematic, rational and public (Science Policy Council 1975; Alestalo 1997).

In the Finnish welfare state programme a new model of governance was established reflecting the intentions to increase state regulation in science, technology and economic policies. At the same time the global economic dimension became stronger due to the increasing role of the OECD as an economic policy advisor and the growing tendency to take international competitiveness as the main national goal. The public was a focus of government efforts and a receiver of welfare services. These services were provided in the name of equal opportunities, reflecting also expectations of collective solidarity concerning government goals. In science policy five priority areas of research were selected focusing on the problems of public health, transformation of national production structure, environmental protection, promotion of democracy and equality, and working life and working conditions (Science Policy Council 1975).

Even though the Finnish welfare state made new openings to the international scene, its strategic choices were very national. After severe controversies between the right- and left-wing parties about the components of the common good, there was a political agreement of the primary goals. The approach was a combination of discretionary and corporatist aspects. It was discretionary and corporatist as the public did not influence the science and economic policy planning and the aim was to deepen expertise in the public administration. 'Wide public discussion' was a hegemonic and exclusive effort of the political elite comprising the government and the representatives of the political parties, trade unions and industry. The elite discussed also the social relevance of scientific action and the new economic order. In its view representative forms of democracy are needed to neutralise agonistic tendencies of public concern. Accordingly, the government and the parliament should make the final decisions. The importance of the state as a guarantor of social justice was also emphasised by the reformist student movement criticising the goals of capitalism and the

authoritative and elitist aspects of science and university policies rather than the impacts of growing technologisation.

Up until the 1980s a strong societal scientification and a somewhat more diffuse but intensifying technologisation process was going on in Finland. Aside from the government willingness to deliver subsidies and funds to new-tech industries and to rationalise public bureaucracy, new elements of science-oriented citizenship in the context of educational governance became visible. The science policy-makers saw, however, modern citizenship from a limited point of view by emphasising the need to disseminate scientific information. In this view it was necessary to create information services in order to distribute information of academic research and to utilise its results (Science Policy Council 1975). This effort was again a top down process. Citizen participation was part of the educational 'equalisation of the opportunity' programme aiming at raising the level of primary education of the whole Finnish population and at promoting the education of qualified labour force through university education (Häyrinen-Alestalo *et al*. 2000). In these efforts new-tech was a generally accepted term for modernisation, even though the representatives of trade unions presented sceptical views concerning the impacts of new technologies on the potential growth of future unemployment.

New Technologies as Nationally Agreed Competitiveness Factors

During the late 1980s Finland started to follow the guidelines of the OECD by paying more attention to new, promising technologies (OECD 1988; Science and Technology Policy Council 1987). The government noticed that it was possible for a small country to become a world market leader only by specialising in limited areas of new-tech (Science and Technology Policy Council 1990). Concomitantly, there was agreement on pursuing a selective policy by concentrating on information and material technologies and biotechnology. In particular, the role of information technologies as an engine of economic growth was introduced into the speculations of the new growth factors. The trade with the Soviet Union had collapsed and ICT was seen as a symbol of Western advanced technology. The resulting economic depression in the middle of the 1980s activated both scientific and political criticism of the omnipotence of technology to solve social problems and of the growing instrumentalism in the goals of science and social policy (Allardt 1987; Alestalo 1993). Still new technologies, structural transformations of the production structure towards new-tech sectors and the competitiveness of national industries were emphasised in the government decision concerning Finland's future technology policy (Kuusi 1987).

As a response to the internationalisation efforts in new-tech fields the government made a decision to participate in Eureka (1985), the European Space Association (ESA 1986) and in Cern (1991). It was also responsive to an initiative of Finnish industry for the creation of an infrastructure for a systematic national technology policy. According to the first chief executive of the National Agency of Technology in Finland, the resulting state activism in technology and economic policies was an indicator of a corporatist decision of the responsibility of the state to increase the financial input to new-tech sectors. The National Technology Agency in Finland (Tekes) was also established in order to support industrial R&D, the competitiveness of new-tech clusters and to promote the interaction between science and technology policies. The shared decision meant the final institutionalisation of an upper level corporatist and deliberative strategy with elite level discussions of the goals of science and technology policies.

In the beginning of the economy-driven corporatist approach several efforts were made to link the science and technology policy issues together. Among others the name of the Science Policy

Council that had launched the goals of government programmes into the language of science policy was changed into the Science and Technology Policy Council. The composition of its members was expanded to include several ministers and the representatives of the trade union and new-tech industries. In the Council's first declarations one can find references to the new growth theory emphasising the role of human growth factors in economic progress (see Romer 1986; Grossman & Helpman 1991). Aside from the earlier aims of scientification the role of knowledge and competencies was emphasised as new growth and welfare factors. The role of basic science as a driving force of technological progress was also pointed out. The introduction of the concept of the national innovation system indicated, however, that all producers of knowledge became equally important. Therefore also the producers of academic knowledge were expected to become sensitive to the demands for marketing and commercialisation (Science and Technology Policy Council 1990; Häyrinen-Alestalo 1999). In the national innovation system the citizen started to transform into a technology-and market-driven citizen without, however, taking part in the construction of the future strategy of technologisation.

It is characteristic of Finland that despite increasing efforts to integrate science and technology policy issues, the administration and implementation of these policies were kept apart up until the early 1990s. The Ministry of Education continued to take the responsibility of science, university and education policy and the Academy of Finland was responsible for the funding of basic academic research. The Ministry of Trade and Industry and the newly established National Technology Agency (Tekes) became responsible for the goals and implementation of technology policy. The power structures between the two funding organisations started also to develop into two directions. The government expenditure to Tekes grew rapidly in relation to that of the Academy of Finland which led the academic community to criticise the systematic favouring of technology and industrial culture and the weakening of the role of academic science (Allardt 1987). The science policy efforts were concentrated on the internationalisation of Finnish science and on the promotion of its high quality. In this respect ICT and biotechnology received increasing attention among 'the rapidly developing, scientifically important areas of research' (Academy of Finland 1993, 10).

The agonistic views concerning the disparities between the science and technology systems were for the most part kept inside the political system. The channelling of citizen concern was still in the hands of the trade unions and the formal representative system. So there was still no actual public discussion of the changing role of the citizen as a customer. The trade unions saw now new-tech as the most promising cluster to guarantee future employment. Although there were signs of the government willingness to undermine the welfare state programme and the premises of the common good (Cabinet programmes 1987 and 1991), the implementation of a market-driven policy was still seen as a politically hot question. A milder version was launched in the form of result-based management where the rationalisation efforts were no longer based on the idea of scientification of the public services but on the evaluation of the cost-effectiveness of individual actions and productions. In this respect a passive welfare citizen was pushed towards the general efficiency strategy. This new citizen was now called a customer.

Market Governance for the Building of a New-Tech Society

Since the middle of the 1990s the competitive elements of economic progress and neo-liberal ideas of the market forces logic have been launched by successive Finnish governments (Cabinet programmes 1995; 1999; 2003). The government has also made a decision to privatise state-owned companies and to reduce and re-evaluate state responsibility for the provision of public services. In the days when other European governments decreased their funding to science and technology, the

Finnish government decided to transfer the capital from privatised state-owned companies to R&D activities 'to make the functioning of the national innovation system more effective to contribute to the growth of the economy, entrepreneurial activities and employment' (Academy of Finland 1997, 11). The majority of the funding was directed to the technology programmes of Tekes. The result was that the share of R&D from Gross National Product was already in the late 1990s the highest among the OECD countries (3.4% in 2000). There was also strong support for an intensified technology policy among the government, technology policy-makers, industry, trade unions and universities of technology. When the extremely rapid growth of the ICT sector and the rise of Nokia as a world market leader in the trade of mobile phones became evident in the late 1990s, the technology policy makers tended to refer to the exceptional corporatist elements of the selected policy guidelines.

The development in the late 1990s in Finland is a combination of economic growth policy, undermining of the welfare services and growing individualisation. The welfare state ideology was an initiative of the social democratic party, and the centre and conservative parties needed time to make the compromise. The neo-liberal state ideology in turn has been implemented by the governments having a social democratic prime minister and other ministers coming from left-wing, conservative and green parties (Prime Minister Lipponen's Cabinets 1995; 1999). Even though these governments have launched solid ideas of market-driven, globalising economy, they have had difficulties to legitimise the undermining of the common good. When radical cuts have been made in public services, the latest governments have lost their credibility as a developer of a Finnish society that is 'democratic, just and socially coherent' (Cabinet programme 1999). The citizens who were earlier passive receivers of public services have shown agonistic feelings and demonstrated against the government's aim at making people take the primary responsibility for their own welfare. It is characteristic of Finland that the agonistic movement criticises the loss of the value of the common good. The intensified efforts to maintain Finland as a world market leader in new-tech have in turn been taken as self-evident.

In the late 1990s market governance has become the leading principle of technology, science, university and education policies (Häyrinen-Alestalo 1999). Even though the state has increasingly penetrated to the economic issues, its role is highly dependent on the functioning of the market forces. This view tends to follow the ideological premises of the OECD and the European Union (OECD 2001; European Commission 1998). Since Finland became a member state of the EU in 1995, the government has increasingly defined its role as a supporter of market-driven activities and as an indirect compensator of market failure. An effort has also been made to strengthen new top level corporatist activities: the public and private sectors are expected to make a joint effort to guarantee the conditions of economic growth and employment by searching for new growth intensive technologies (Cabinet programme 1999; Tekes 2002).

Due to this process the science and technology policy frames have become almost identical in Finland (Science and Technology Council 2000). Even though universities have criticised the loss of their autonomy, they have started to see their societal role in terms of the innovation system. Despite many difficulties of the public universities in collecting capital and accumulating surpluses, the universities have made efforts to commercialise their products. They have also been willing to become partners in several kinds of ICT and biotech centres of competence (Häyrinen-Alestalo & Peltola 2003). The Academy of Finland has started a large funding programme for new-tech fields. A growing proportion of its centres of excellence are in ICT or biotechnology. These units have been integrated into the research programmes of the Academy and they have received most of the doctoral school places. The science and technology policy-makers have used this strategy as an

evidence of the rise of Finnish ICT and biotechnology to the scientific and technological forefront of the world (Tekes 2002, 3).

Growing emphasis on market governance and on new-tech industries has changed the concepts of knowledge and competencies. In current science and technology policies the concepts of science, knowledge, technology and innovation are used interchangeably. This view makes the efforts to discuss the changing functions of knowledge and governance complicated. In the political view knowledge and competencies are needed in the globalising new economy (European Commission 1998; Science and Technology Council 2000) and knowledge production and education must respond to the needs of new-tech based economy. Education is also seen to strengthen the capabilities of individuals, firms, regions and countries to adapt to the new conditions. As these conditions are market-dependent and new-tech driven, science and education policies have become increasingly selective. Competition in world-markets means that the value of scientific achievements has increasingly been judged on the basis of their marketability and surplus value (European Commission 2000). The responsibility of the educational system is to identify the best performers in order to keep the national labour force competitive (Science and Technology Policy Council 2000).

Market governance has also become evident in the arguments of the OECD, the EU and Finnish technology policy-makers (OECD 2001; European Commission 1998; National Technology Agency 2001). According to this view ICT and biotechnology will take – due to their multilevel applications and superior investment and market value – the lead in the technologisation process. The thesis of the new economy tends to stress the generic peculiarities of new-tech fields by paying attention to their capability to radically change the structure of industries, abolish fluctuations in the economy and level the interest controversies (Pohjola 2001; Castells 2001). As references have also been made to the tendency of new-tech fields to abolish the old hierarchies and to establish horizontal networks between relevant actors, there are expectations of development towards more open and participatory forms of deliberative and corporatist action. In the context of the new economy the networked society is, however, a market-oriented economy. This type of society may be able to interact, retrieve and distribute globally and even be capable of reducing costs, and increasing quality, efficiency and customer satisfaction. Due to strong market governance it is, however, difficult to introduce new criteria of joint action outside the highly selective economic model. This model leaves also open the complex issues of risk, public and private good and responsibility. Recently new-tech sectors have been said to contribute to the growth of social capital and social innovations (Tekes 2002). The problem is that market governance is not able to specify coherent means to collect surplus value in this respect.

The Fragility of Market Governance

In 2000 the leading companies in the ICT sector gave their first performance warnings causing turbulence in world capital and investment markets. At the same time the fragility of the new economy-thesis became evident and critical voices questioned its validity (Quah 2000; Pohjola 2001, Castells 2001). It has been argued that the old laws of the market are still functioning and that the deterministic assumptions of the endless growth of new-tech industries need to be revised. Even though Nokia has been able to maintain its position as a market leader, the Finnish ICT cluster has also shown its sensitiveness to world market change. Accordingly, the views of the technology policy-makers have become more sceptical. Some of them still believe in the value of the business networked model and refer to Castell's idea of an economy that is powered by information technology, dependent on self-programmable labour and organised around computer networks.

These decision-makers point to the OECD growth project (2001) where Finland is placed among the most successful new-tech countries on the basis of several performance criteria. They also see the current economic turbulence as a short-term period. Other members of the technology policy elite say that the new economy has been a political bluff. In their view there is a need to re-evaluate the amount of state incentives to the ICT industries and to reconsider the value of 'old' industries.

With the turbulence of the Finnish ICT cluster biotechnology has come out from the shadow of ICT. Even though the policy-makers have paid attention to the long knowledge production cycle of the field and to the complicated ethical issues, they regard biotechnology as the next promising growth intensive technology (Tekes 2002). In this respect the Prime Minister Lipponen's speech in September 2002 is a good example of the pressure on biotechnology to become a new national market leader (Lipponen 2002). Aside from pointing to the ethical peculiarities, he presented normative expectations of future commercial success. In his view the state has supported research and technology programmes in the field for over 20 years. Even though there is a need to open and enlarge discussion of the complicated ethical and social issues in this context, the state has a right to expect a real proof of the effects of the public funding. Therefore the biotechnology sector should give evidence of its capability to compete for new markets and a highly competent labour force and to produce knowledge-based innovations.

Today policy-makers tend to see market functioning as being identical in the case of both ICT and biotechnology. Of course both areas can be termed as new technologies with high growth potential and issues of risk and public concern are relevant also in the case of ICT. These issues are, however, more complicated in biotechnology. The applications of ICT and biotechnology have also had different effects from the view of large socio-economic transformations. In this respect ICT has been a cluster able to foster economic performance. It has had real global markets and Nokia has managed to find a fit between the products and market demand, to specify specific social needs and to apply the new networked business mode (Castells 2001). Despite expectations of high returns, biotechnology is still mostly a technology policy promise. As all marketable products do not necessarily provide any clear benefits to the producers and customers and zero-risk is not possible, it is also difficult to estimate the real surplus and investment value of various biotech products. The issues of safety and antagonistic concern of customers can also regulate the market

As both ICT and biotechnology have been called generic technologies, technology policy also contains large visions of the capability of new-tech to promote social transformations. In these visions the provision of the common good is still a valid idea and new participatory forms of democracy flourish (European Commission 2002; Ministry of Education 2000). Strong government belief in market governance has, however, retarded the political discussion of the modern aspects of the common good and of the form and nature of forums where modern public concern can be developed. The National Technology Agency has been, among the first institutions having launched the idea of social capital and social innovations. The enterprises are also discussing their social responsibility.

2 Governing Information and Communication Technologies – The Interplay of Economic and Social Objectives

This chapter looks at the governance of information and communication technologies in Finland by analysing the national policy objectives that have been related to ICTs from the late 1970s to the early 2000s.[1] Governance objectives are analysed by making a distinction between economic and social objectives where the latter refers to a broad range of aims or aspects such as increasing citizen participation and access to information, balancing regional differences, improving quality of life and accessibility to public services, and consideration of environmental factors, security aspects and perspectives of culture, education and everyday life. The relative position of the objectives and changes in these positions are analysed in relation to the general changes in social and technology policies. Besides focusing on the governance objectives, attention is paid to the actors that take part in the governance processes.

Finland has recently been considered as a paradigmatic information society due to the fast rise of the Finnish ICT sector during the 1990s (Castells & Himanen 2001). Generally speaking, public policies related to ICT in Finland have been based on two main foundations: the selective technology policy where ICT – together with biotechnology – has been the key target of public funding, and the liberalisation and market orientation in telecommunications. During the last two decades, ICT has received more public funding than any other field of new technologies: in the 1990s approximately one fourth of the funding of Tekes was directed on ICT (Pelkonen 2003a). The liberalisation of telecommunication markets was started in the middle of the 1980s, in the midst of a strong welfare state period with rigid state regulation (Steinbock 2000). Liberalisation reflects the general stress on market governance in the Finnish ICT policy as it has been characterised by the emphasis that has been placed on markets instead of state direction. Besides liberalisation, the prevalence of cooperative committees and a networked culture of action between the public and private sectors has been a peculiar feature in ICT policy in Finland reflecting the corporatist model of governance (e.g. Huuhtanen 2002). In this model, the role of the trade unions has been important together with the representatives of the state administration and the industry. The role of citizens, however, has been generally limited as the public has not been seen as a contributor to policy making but rather as the object of the policy – besides having the role as consumers and users of end products. Thus, the governance system in ICT can be described as a combination of discretionary, educational, corporatist and market types of governance where the relative emphasis on different models has varied over time. References to deliberative or agonistic models of governance, however, have been rather limited. In the following, three periods with different emphasis on governance objectives and different constellations of models of governance related to ICT in Finland are identified.

Governing Information Technology as a Broad Societal Question

Although research on information technology was already started in Finland in the 1950s and the first professorships were established in the middle of the 1960s, important public measures were carried out during the 1970s in order to promote research and development in the field. At this stage, the establishment of public sector based committees was seen as the key element for the development of information technology in Finland. Such committees were established in the 1950s

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[1] ICT policy is here seen to be comprised of telecommunications policy focusing on the regulation of the ICT sector, technology policy focusing on the development of information and communication technologies and information society policies centering on the application and spreading the use of ICTs in the society.

within the scientific community while from the 1960 onwards state-led committees including representatives from the industry, universities and the trade unions, became commonplace (Pietarinen 1993). The Committee for Computer Policy, established in 1972 to govern the state computer procurement and the Advisory Board for Electronic Data Processing Industry, established in 1975 as a forum between public and private sectors, users and experts on the field were among the first state-led committees. The latter can be regarded as an example of the corporatist culture of action where the negotiating links between the state and industry were dominant. In addition to representatives from the state administration, the board was comprised of representatives from higher education, research, industry, banking sector, and trade unions (Huuhtanen 2002, 16).

The influential role of trade unions was also characteristic of this period and it was highlighted in the formation of Technology Committee, a broad committee that was appointed in 1979 by the Council of State to examine the characteristics and impacts of technological development with particular attention to the effects of automation. The work of the Technology Committee proved to be influential: the future guidelines and infrastructure of national technology policy were created and institutionalised on the basis of the committee's recommendations. Besides international examples (OECD, EEC, UNESCO), the formation of the committee was particularly motivated by the trade union concern over the negative societal effects of automation, especially the increase of unemployment and social inequality (Lemola 2001). With the work of these committees a more profound consideration over the impacts of information technology on society was started.

The committee examined the development of information technology from a broad and societal perspective. The development and impacts of information technology were considered more as a question of general social policy rather than as an issue of economic policy. In particular, the committee stressed changes related to work and working life, control mechanisms, home and environment. Indeed, governing information technology was seen in particular as a question related to citizens' role as labour force: the key issue was whether the development of information technology would reduce the need for labour. Moreover, the societal risks of information technology were emphasised, in particular risks related to working life. Although work was seen to become physically less strenuous, total stressfulness would become greater and work tasks would become polarised and fragmented. On the macro level the committee paid attention to the possibility of increasing technical vulnerability and growing bureaucratisation of society (Technology Committee 1980, 63, 73; also Advisory Board for Electronic Data Processing Industry 1978; 1980).

Besides the general aims of improving economic growth and standard of living, balancing regional development was a central objective related to information technology in the 1980s. Through an increasing use of technology, activities could be decentralised both inside organisations and between regions (Council of State 1985; Technology Committee 1980). Thus, the increasing diffusion and use of information technology could improve citizens' access to knowledge and information and their direct political participation. In this respect, however, the risk of new exclusions was also acknowledged, i.e. the increasing the gap between active users of information and passive consumers of entertainment (Technology Committee 1980, 72).

The broad societal perspective on the governance of information technology and the objectives of the Technology Committee – and in policy documents in the 1980s more generally – suggest that citizens' standpoints were taken into account although they did not have any particular role in the process. In this sense, the governance was characterised by the discretionary model where, however, the negotiations were carried out inside the corporatist structure. Some elements of the educational model can also been identified in particular in the emphasis that was placed on learning

and education in ICT policy from very early on (see e.g. Advisory Board for Electronic Data Processing Industry 1985). More generally, the broad and societally inclusive perspective mirrors the prevalence of the strong welfare state programme in the 1980s. At the same time the objectives related to information technology reflect a beginning of a transitional period in the development of technology where the possibilities of a new and rising field of technology are regarded as extensive and broad.

Growing Emphasis on Educational and Market Governance – Building a Networked Information Society

In the context of economic recession and emerging neo-liberal ideology of the early 1990s, the building of an information society – at the core of which is the development, application and exploitation of information technology – started to become a key government programme penetrating into all policy sectors. The information society programme shifted the emphasis towards educational dimensions of governance which are highlighted in the 'top down' nature of the strategies. In the strategies, citizens are motivated and informed by the policy makers and experts to adopt new information technologies and to embrace the "coming" of the information society. Besides the need to learn to use new technologies, citizens are informed of the beginning of an era characterised by lifelong learning and growing individual responsibility (Ministry of Finance 1995). In this sense, the rise of the educational model of governance stressed that citizens need to be guided to the use of new technologies and the materialisation of the information society (also Ministry of Education 1999, 68).

Besides the shift towards educational governance, the principles of market governance started to strengthen in the information society programme. The Finnish society was described as "a networked information society". The information society programme specified that "above all, networks refer to an advanced networked economy, but also to a mature network culture as a whole" (Ministry of Finance 1995, 17). As such, the societal developmental model was adopted from the private sector and aimed at a general rationalisation of the society through increasing application of new information technologies. Indeed, in the vision of the information society, the role of information technology and data networks is to bring forth efficiency, organisational renewal and new forms of collaboration as well as to promote the network economy by opening up the development of new services and industries (Ministry of Finance 1995, 17). As such, the strategy also reflected the prevailing neo-liberal tones:

> "The main emphasis in this strategy is, however, on economic issues, as culture, equality and civil society, as important things as they are, are hard to promote before the Finnish economy is in balance again" (Ministry of Finance 1995, 22).

In this first phase of the construction of a Finnish information society, information technology was primarily considered as an economic factor: the use of information technology increases productivity and competitiveness and promotes employment. Some larger societal governance objectives were, however, introduced but they were strongly linked to economic factors. For instance, in order to prevent social exclusion, basic competencies in using information technology must be secured for every citizen. At the same time, however, it is stressed that the possibilities of information technology "must be harnessed to promote citizens' economic survival" (Ministry of Finance 1995, 23). Moreover, as the strategy emphasises the new opportunities that information technology opens to the citizens, it refers mainly to new forms of entrepreneurship (network entrepreneur, IT entrepreneur) and work (telecommuting). The emergence of civil society was,

however, regarded as "a desirable development" (Ibid., 39). Civil society was understood not only as increased participation but, as noted above, also as growing individual responsibility and lifelong learning. Besides new opportunities for participation, information technology provides individual citizens with new possibilities for studying and leisure activities. These perspectives, however, are listed in the strategy but their content is not analysed or questioned. Consequently, the view that the information technology increases civil participation is taken for granted.

The first national information society strategy was formulated by a working group comprising representatives from the state administration and industry. This time the trade unions were excluded from the strategy process, reflecting a more restricted model of corporatist action. More generally, the introduction of the information society programme shifted the focus of ICT governance from the combination of discretionary and corporatist governance towards educational and market governance. The perspective, however, was narrow and based on economic principles. Moreover, citizens were considered as one homogenous group rather than being comprised of different subgroups or individuals.

How to Combine Broader Social Objectives and Market Governance?

In the early 1990s, with the formulation of the new national industrial strategy, industrial and technology policies started to expand towards a more general social policy (see Ministry of Trade and Industry 1993; Jääskeläinen 2001). The national innovation system was introduced as the key concept of a policy which aimed to harness all sectors of society to promote national competitiveness. Although an attempt was made to extend the definition of innovation to cover all human activities, ultimately the concept of innovation refers to activities that are economically profitable (Allardt 1995). Consequently, the objectives and premises of technology policy increasingly passed on to other policy areas, such as science and university policies for instance (Häyrinen-Alestalo 1999). On the other hand, the extension of industrial and technology policy has led to an enlargement of technology policy objectives: although economic objectives and national competitiveness are of primary importance, an attempt has been made in the latest strategies to integrate social and ecological targets into the governance objectives (see e.g. Sitra 1998; Ministry of Trade and Industry 1997; 2001; Tekes 2002a).

Similarly, the governance objectives in ICT policy started to broaden from the highly economy-based targets of the early 1990s. In this respect, the reformulation of the national information society strategy in 1998 is a characteristic example. In this strategy, a new catchword was introduced to describe the aims of the project. Finland was defined as "a humane and sustainable information society" instead of "a networked information society" (Sitra 1998, 42; Cabinet Programme 1999). Moreover, citizens were no longer regarded as a homogenous group, but the perspectives and needs of different groups of people were stressed together with safety aspects, usability and risks. Social exclusion, inequality, the diminishing needs of labour and the weakening of the quality of services were identified as potential risks (Sitra 1998, 8-9). Despite such emphasis on social issues, the strategy was, however, still strongly based on economic premises: humaneness and sustainable development are ultimately subordinate objectives in the building of a competitive and market-oriented information society (also Science and Technology Policy Council 2000). From the perspective of governance, it is worth noting that the new strategy was prepared by a notably larger group of actors than the previous one: as well as representatives from state administration and industry, the trade union and a variety of civil associations were called to participate in the formulation of the strategy. In this way, an attempt has been made to regard citizens as relevant

actors in the process and to broaden and open the corporatist model by integrating at least some degree of public participation.

In the late 1990s and early 2000s, the educational perspective of governance has remained strong as emphasis has been placed on the expanding and spreading the utilisation of ICTs more broadly and efficiently in all sectors of society (Information Society Advisory Board 2001; Pelkonen 2003b). Applying information technology to improving access to public services, health care and social services in particular has been stressed. Moreover, the possibilities of technology to improve citizens' everyday life and to promote education and culture are underlined (Ministry of Trade and Industry 1997; Information Society Advisory Board 2001, 10). In addition, many of the societal objectives that were stressed in the 1980s are highlighted again: the promotion of ecoefficiency, democracy, citizen participation and regional equality (Ministry of Trade and Industry 1997; 2001).

At the same time, there has been an increasing shift towards market governance which is reflected in the growing orientation towards technology users and consumers. Moreover, the rise of mobile technology has highlighted the importance of telecommunications policy which is based on strong market orientation and competition in Finland. Consequently, consumer needs and preferences are seen as increasingly important factors in relation to the governance of ICTs. According to the Ministry of Transport and Communications (2003b, 145):

> "In the future, the emphasis on consumer preferences will be crucial for the nature of the next information society".

Thus, late 1990s and early 2000s have been marked by the accentuation of market and educational modes of governance. At the same time, the corporatist model of governance remains to be strong. In this respect the integration of civil associations in the reformulation process of the information society strategy has been important. There has also been an attempt for a closer integration of more socially oriented governance objectives and citizen perspective to the ICT policy referring to a return towards the dimensions of the welfare state period. However, due to the market orientation of the state policy and the increasing stress on the international competitiveness of the economy, the context of the governance system is notably different. Therefore, such goals as "the humane information society" tend to remain only as vague catchwords.

3 Framing Publics in Biotechnology Policy

In this chapter, the object of research is how publics are framed in Finnish biotechnology policy documents and how these publics are related to different forms of governance (based on typologies of Elam & Bertilsson 2002; Hagendijk & Kallerud 2003). The role of the public has been addressed already in the previous chapters, but here it is examined in more detail. Biotechnology has internationally become an exemplary case of the problematic relationship between science and society. This kind of examination also highlights the differences between biotechnology and ICT as venues for scientific citizenship. The analysis is based on the main Finnish policy and strategy documents and memos concerning biotechnology from 1997-2001 and some relevant EU documents from 2000-2002. EU documents are examined in order to bring in a comparative perspective and especially to underline Finnish peculiarities. The previous sections of this paper have had a more historical approach, but this part concentrates on the period of the last six years.

Four main types of publics can be found in the documents: citizens, consumers, human beings and populations. This classification is based on the amount and type of activity and responsibility given

to the publics. In short, *citizens* are political and active members of society who play an important part in decision-making and have social responsibility. *Consumers* are active but they do not make political decisions, only those concerning their patterns of consumption. *Human beings* are ethical subjects worthy as such and are active and responsible only in relation to their own bodies. *Populations* are the target of action and do not have active or responsible roles (Snell 2002).

Whether the public is perceived as citizens, consumers, humans or as a population determines to a great degree the relationship between science, technology and society. At the same time choices are being made about who are the responsible actors and to whom must science and technology be responsible. For example to the citizens, the policies have to guarantee some degree of equality in receiving health care but for the consumers of health care you need to offer choices.

Four Types of Publics: Citizens, Consumers, Humans and Population

The first type of publics that appears in the documents is the *citizen*. In the Finnish documents, the actual term citizen is used seldom. This is not only true for the term, but also for the analytical class. Citizens in this category mean active and political members of society. They are seen as important parties in decision-making or actors who have opinions that need to be heard. In the European Union's and especially in the Commission's texts these active citizens and the notion of civil society appear much more often.

> "Life sciences and biotechnology have given rise to significant public attention and debate. The Commission welcomes this public debate as a sign of civic responsibility and involvement. Life sciences and biotechnology should continue to be accompanied and guided by societal dialogue." (European Commission 2002, 12.)

Only in one Finnish document (Advisory Board on Biotechnology 2001) does the term citizen appear more than once. When mentioned, the citizens are not so much regarded as active, political actors instead they are seen as rather passive. However, the opinions of citizens are seen relevant, and there are often references to research made among citizens. This means that citizen opinion is constructed through surveys rather than achieved through active participation.

The question of whether surveys are a good way of mediating public opinion has been discussed. It has been claimed that surveys rationalise and construct public opinions instead of reflecting them correctly (See Kallerud & Ramberg 2002; Davison *et al.* 1997). In almost every Finnish document the need for citizen discussion is mentioned, but this thought is not elaborated. It is more like an obligatory mantra, and there are no concrete examples of how to create or maintain public discussion. Only in the memo of the Advisory Board on Biotechnology (2001, 10-12) are citizens seen in some instances as active participants. It is important to note however, that citizens are perceived as a group, not as individuals. Individual citizen possibilities to participate in decision-making are absent in all of the Finnish documents.

A descriptive example of the Finnish attitude towards citizen participation can also be found in a passage from the Law on gene technology (377/1995). In the process of its renewal in 2000, prompted by a directive the following paragraph was added. It does enable listening to the public, but does not encourage it or any other form of citizen participation.

> "If the Board for Gene Technology sees it appropriate, it can decide, that in certain cases concerning the usage in closed spaces or in cases related to research and development trials the

opinions of some groups or the public can be heard. The hearings should take into account what has been enacted in 32 § about concealment of confidential information." (36 a §)

The lack of the citizen aspect in the biotechnology documents has to be put, however, in a wider context. There has been active discussion about civil society and citizen participation in Finland, and there are many NGOs and citizens movements, but they seem to be targeted towards other areas like environmental protection and animal rights. Biotechnology as such has not become a similar controversial issue among the Finnish public.

Instead of citizens, Finnish as well as EU documents include other terms and categories of roles. One of the categories that are represented more commonly, especially in the Finnish documents, is *consumers*. The terms used in this category include also customers and sometimes users. It is important to note that the customer is in many cases a wider concept than consumer. Producers of goods and the industry can also be regarded as customers.

> "The central starting point of the strategy is customer-orientation. Taking into consideration the needs and expectations of the consumer is the key notion of the success of the food product chain, so the quality of products and activities must correspond to them" (Ministry of Agriculture and Forestry 2000, 7).

There are many contradictory views about the implications of citizens changing into consumers and the emergence of market governance. To some this means that consumers demand a growing degree of protection from the state and at the same time they accept a smaller role in decision-making (Bauman 1999). Contrary to this view, it has been also suggested that consumers are gaining more power in the market, which in turn increases democracy. This viewpoint encompasses the idea that power is being delegated from experts and the state to individuals, who bear a growing responsibility for their actions (Alasuutari & Ruuska 1999). Yet another standpoint claims that emphasising consumers instead of citizens results in the growth of industry's power (Keat *et al.* 1994).

Regardless of the view concerning the actual power of consumers, they are not actively involved in societal decision-making in Finnish documents. Consumers are, however, given more active roles than citizens, even though they have clear limits for their action. They act in the market, not in the society and make decisions concerning only themselves by buying or choosing not to consume. From this, the industry and decision-makers can make their conclusions. The basic idea in the consumer ideology in the documents is freedom of choice.

> "The consumer trusts that the products that are on the market and their ingredients are safe and of good quality. The consumer has the opportunity to choose goods that she wants. Different groups of consumers for example those with allergies and those with special diets because of other health related, ethical or religious reasons are taken into consideration in the production chain of foods" (Ministry of Agriculture and Forestry 2000, 10).

Personal freedom of choice and consumer rights resemble parallel concepts in the sphere of citizens who also have rights and freedoms. Citizens, however, have also responsibilities. Nobody punishes a consumer for buying products of "unfair trade". As consumers are not bound by societal obligations and they are only expected to choose for themselves, consumer approach does not entail real public participation.

Even more often than being regarded as consumers, Finns are perceived of as a *population*, while EU documents rarely contain this idea. Population as a type of publics is a class that is the target of action and governance. The population in itself is passive and does not bear any responsibility. Actions can be directed towards populations and they can be controlled. Sometimes the opinions of population are collected and turned into statistics. In addition to population, terms like the Finns, research subjects and in some occasions the public are used. This category is most common in regards to health related biotechnology and procreation.

The last category encompasses the idea of *human beings* as ethical subjects. Humans are seen as worthy as such, and their integrity should be cherished. Human rights and respect are key concepts in this category. Human beings and also individuals are used as terms when talked about ethics. This is both true of the Finnish and EU documents. The European Group on Ethics, for example, emphasises that there are three risks in relation to gene technology:

> "'merchandising' the human body, its components and products; new forms of discrimination stemming from the knowledge of the genetic characteristics of humans; the instrumentalisation of the human being through genetic manipulation of human beings" (European Group on Ethics 2000, 7).

Unlike the population category, human beings can be seen to have an active role. The activity and responsibility of humans is, however, only limited to themselves and sometimes to their family members. This active role is closely connected to the notion of autonomy (see Jallinoja 2002). Humans do not take active part in political decision-making or in the society, but are active in deciding about their own lives.

Perceptions of Publics and Modes of Governance

Even though ideas of public engagement are present in some EU and to a lesser degree in some Finnish documents the Public Understanding of Science (PUS) model or the educational type of governance prevails in the documents of the both parties. The most important mission for scientist, decision-makers and industry is seen to be educating and informing the public. This is apparent whether the public is seen as citizens, consumers, human beings or as a population.

Education and information are regarded to be important so that citizens, consumers and human beings can make responsible decisions. The views about knowledge and the outcomes of education are contradictory as it is recognised that knowledge does not necessarily lead to acceptance and at the same time it is stated that correct and adequate knowledge decreases resistance.

The educational relationship towards the public is connected to the still prevailing ideology of the welfare state, present in most of the Finnish documents. The state is the main bearer of responsibility and an important provider of services especially in the health care sector. In most of the documents, public trust on science, technology and its policy-makers is not questioned, which can be seen as typical for the discretionary model of governance. This underlying notion in the documents puts the public in the roles of the population and human beings.

In Eurobarometers (2001; 2000; 1997) and other surveys (Tiedebarometri 2001), Finns have been one of the most optimistic and trusting [?] people in Europe towards biotechnology and science and technology in more general. Finns are not uncritical, however (see Jallinoja & Aro 2000; Jauho & Niva 2000), but there has been little public discussion and protest about biotechnology compared to

other European countries. Because large-scale movements and opposition have not been born, there has been no need to discuss agonistic forms of action in the documents and a general public trust is still seen to exist. Even consumers are not seen as radicals who protest or boycott and thus cannot be regarded to have an agonistic role. Instead consumers make valid choices in the market, which points to market governance. Consumers are seen as individuals, whose preferences are mediated through involvement in the market and in relation to ready-made products. For this to work, it is seen that the state has to provide efficient control and regulation. In contrast to the discretionary governance, the consumers' trust has to be earned.

In some instances, however, it is noted that science, technology and governance should be more closely connected to the lives and views of the Finnish people and their opinions should be integrated in decision-making in an earlier phase. There are subtle references to a deliberative model of governance, but mainly in these instances the involvement of publics is seen to work through a corporatist way of governance. NGOs and other stakeholders are brought inside the existing system of governance that has been working throughout the welfare state period.

The educational and market types of governance represented in the Finnish documents contain an individualistic view of the public. Individuals are the relevant actors who consume in the market or receive education. Educational programmes have, however, been used to regulate specific citizen groups. This is also true of the corporatist and the discretionary modes. This distinction is important, because it tells about the prevailing structures of participation and ways of mediating opinions. The majority of these elements are based on representative rather than participatory structures. Individuals have influence power only through groupings like the NGOs and trade organisations or the parliament. Citizen activism performed directly and by individual citizens is not seen as an alternative in the Finnish documents.

References

Academy of Finland (1997): Kansallinen tutkimuksen huippuyksikköstrategia. Edita, Helsinki. [National Strategy for Centers of Excellence].

—— (1993): A Forward Look. Helsinki.

Advisory Board for Biotechnology (2001): Muistio muuntogeenisistä tuotantoeläimistä. [Memo on Genetically Modified Animals].

—— (1997): Geenitekniikka Suomessa. [Gene Technology in Finland].

Advisory Board for Electronic Data Processing Industry (1985): Suomi ja tietotekniikka. Ajankohtaisia kannanottoja tietotekniikan soveltamisesta ja sopeuttamisesta. (Finland and information technology). Komiteamietintö 1985:8. Valtion painatuskeskus, Helsinki.

—— (1980): Atk-poliittinen ohjelma. Komiteanmietintö 1980:51. Valtion painatuskeskus, Helsinki. [A Programme for Electronic Data Processing Policy].

—— (1978): Atk-politiikkaa Suomessa. Atk-alan neuvottelukunnan toiminta 1976-1978. Komiteanmietintö 1978:57. Valtion painatuskeskus, Helsinki. [Electronic Data Processing Policy in Finland].

Alasuutari, Pertti & Ruuska, Petri (1999): Post Patria? Globalisaation kulttuuri Suomessa. Vastapaino, Tampere. [Post Patria? The culture of globalisation].

Alestalo, Marja (1997): Variations in State Responsiveness. The Science System and Competitive Theories of the State. International Sociology, 1(1): 73-92.

—— (1993): Science and the Welfare State Program: The Growth of State Activism in Finland. Knowledge and Policy. The International Journal of Knowledge Transfer and Utilization, 6 (1): 52-66.

Allardt, Erik (1987): Tieteen edistämisen suuntaviivoista. In Valtion tiede- ja teknologianeuvosto: Tiede- ja teknologiapoliittinen katsaus, 7-15. [Guidelines of Promoting Science].

Bauman, Zygmunt (1999): In Search of Politics. Stanford University Press, Stanford.

Cabinet programmes in Finland 1987; 1991; 1995; 1999, 2003.

Castells, Manuel (2001): The Internet Galaxy. Reflections on the Internet, Business and Society. Oxford University Press, Oxford.

Castells, Manuel & Himanen, Pekka (2001): The Finnish Model of Information Society. Sitra, Helsinki.

Council of State (1985): Valtioneuvoston teknologiapoliittinen selonteko. Valtion painatuskeskus, Helsinki. [Council of State Report on Technology Policy].

Davison, Adam & Barns, Ian & Schibeci, Renato (1997): Problematic Publics: a Critical Review of Surveys of Public Attitudes to Biotechnology. Science, Technology & Human Values, 22(3): 317-348.

Elam, Mark & Bertilsson, Margareta (2002): Consuming, Engaging and Confronting Science: the Emerging Dimensions of Scientific Citizenship. STAGE discussion paper.

Eurobarometer (1997): The Europeans and Biotechnology. Eurobarometer 46.1, European Commission, Brussels.

—— (2000): The Europeans and Biotechnology. Eurobarometer 52.1, European Commission, Brussels.

—— (2001): Europeans, Science and Technology. Eurobarometer 55.2, European Commission, Brussels.

European Commission (2002): Biotieteet ja biotekniikka - strategia Euroopalle. European Commission, Brussels.

—— (2001): Science and Society - Action Plan. European Commission, Brussels.

—— (2000): Towards a European Research Area. European Commission, Brussels.

—— (1998): The Globalizing Learning Economy: Implication for Innovation Policy. European Commission, Luxembourg.

European Group on Ethics in Science and New Technologies (2000): Citizens Rights and New Technologies: a European Challenge. European Commission, Brussels.

European Parliament (2001): Report on the Future of the Biotechnology Industry (2000/2100(INI)).

Grossman, G.M. & Helpman, E. (1991): Innovation and Growth in the Global Economy. MIT Press, Michigan.

Hagendijk, Rob & Kallerud, Egil (2002): Framework for STAGE case studies.

Huuhtanen, Heidi. (2001): Tietoyhteiskuntaa rakentamassa. Gummerus, Helsinki. [Building the Information Society].

Häyrinen-Alestalo, Marja (2001): Is Knowledge-based Society a Relevant Strategy for Civil Society? Current Sociology 49:6, 203-218.

—— (1999): The University Under the Pressure of Innovation Policy - Reflecting on the European and Finnish Experiences. Science Studies 12 (1): 44-69.

Häyrinen-Alestalo, Marja & Peltola, Ulla (2002): The Problem of a Market-Oriented University (forthcoming).

Häyrinen-Alestalo, Marja, & Snell, Karoliina & Peltola, Ulla (2000): Pushing the Universities to Market their Products. In Kalleberg, R. *et al*. (ed.): Comparative Social Research. Vol 19. Comparative Perspectives on Universities. JAI Press, Stamford.

Information Society Advisory Board (2001): Tietoyhteiskunta-asiain neuvottelukunnan raportti hallitukselle 20.6.2001. http://www.infosoc.fi/ [The Report of the Information Society Advisory Board to The Government].

Jallinoja, Piia (2002): Genetics, Negotiated Ethics and the Ambiguities of Moral Choices. Kansanterveyslaitoksen julkaisuja A2/2002.

Jallinoja, Piia & Aro, Arja (2000): Does Knowledge Make a Difference? The Association Between Knowledge about Genes and Attitudes toward Gene Tests. Journal of Health Communication, 5: 29-39.

Jauho, Mikko & Niva, Mari (2000): Riski vai tulevaisuuden lupaus? Geenitekniikkaa elintarviketuotannossa koskevat käsitykset ja julkinen keskustelu. Ykköspaino, Helsinki. [A Risk or Promise of the Future? Opinions and Public Discussion about Gene Technology in Food Production]

Jääskeläinen, Jari (2001): Klusteri tieteen ja politiikan välissä. Teollisuuspolitiikasta yhteiskuntapolitiikkaan. Taloustieto Oy, Helsinki. [Cluster between Science and Policy. From Industrial Policy to Social Policy].

Kallerud, Egil & Ramberg, Inge (2002): The Order of Discourse in Surveys of Public Understanding of Science. Public Understanding of Science, 11: 213-224.

Keat, Russell & Whiteley, Nigel & Abercrombie, Nicholas (1994): Introduction. In Keat, Russell & Whiteley, Nigel & Abercrombie, Nicholas (eds.): The Authority of the Consumer. Routledge, London.

Kuusi, Juhani (1987): Teknologian kehityksen ja kehittämisen suuntaviivoista. In Valtion tiede- ja teknologianeuvosto: Tiede- ja teknologiapoliittinen katsaus 1987. Helsinki, 25-31. [About the Directions of Technology and Technological Development].

Law on Gene Technology 377/1995.

Lemola, Tarmo (2001): Tiedettä, teknologiaa ja innovaatioita kansakunnan parhaaksi. Katsaus Suomen tiede- ja teknologiapolitiikan lähihistoriaan. VTT Teknologian tutkimuksen ryhmä, työpapereita 57/01, Espoo. [Science, Technology and Innovations for the Good of the Nation. A Review of the History of Finnish Science and Technology Policy].

Lemola, Tarmo & Lovio, Raimo (1986): Technological Level of Finnish Industry as Measured by New Technology Indicators. In Science Policy in Finland – Studies and Documents, 2: 9-24.

Lipponen, Paavo (2002): Prime Minister's Speech at the opening of Biocentre 3 at Viikki, 19 September 2002.

Ministry of Agriculture and Forestry (2000): Maatalouden bio- ja geenitekniikkastrategia. Maa- ja metsätalousministeriö, maatalousosasto. [Bio- and Gene Technology Strategy for Agriculture].

Ministry of Education (2000): Biotekniikka 2000 -työryhmän muistio. Opetusministeriön työryhmien muistioita 31. Opetusministeriö. [Biotechnology 2000 Working Group's Memo].

—— (1999): Koulutuksen ja tutkimuksen tietostrategia 2000-2004. [nformation Strategy for Education and Research].

Ministry of Finance (1995): Suomi tietoyhteiskunnaksi. Kansalliset linjaukset. Tikas-ohjausryhmän loppuraportti. Painatuskeskus Oy, Vantaa. [Finland as an Information Society. National Guidelines].

Ministry of Social Affairs and Health (1998): Geeniseulontatyöryhmän muistio. Sosiaali- ja terveysministeriö. Työryhmämuistioita. [Working Group Memo on Genetic Screening].

Ministry of Trade and Industry (2001): Elinkeinopolitiikka uudessa taloudessa. Kauppa- ja teollisuusministeriön julkaisuja 6/2001. Edita, Helsinki. [Trade and Industrial Policy in the New Economy].

––– (1997): Tiellä teknologiavisioon. Suomen teknologian tarpeita ja mahdollisuuksia. Kauppa- ja teollisuusministeriön työryhmä- ja toimikuntaraportteja 12/1997. [Towards a Vision on Technology. Requirements and Opportunities of Finnish Technology].

––– (1993): Kansallinen teollisuusstrategia. Kauppa- ja teollisuusministeriön julkaisuja 1/1993. Tammer-Paino Oy, Tampere. [National Indusrial Strategy].

Ministry of Transport and Communications (2003a): Finnish Telecom Policy. Ministry of Transport and Communications, Programmes and Strategies 1/2003. Helsinki.

––– (2003b): Comparative Lessons and European Challenges. Report on the External Regulatory Environment of the Finnish Communications Regulatory Authrority. Ministry of Transport and Communications, Helsinki.

OECD (2001): The New Economy: Beyond the Hype. The OECD Growth Project. OECD, Paris.

Paija, Laura (2001): The ICT Cluster in Finland – Can we Explain it? In Paija, Laura (ed.): Finnish ICT Cluster in the Digital Economy. Taloustieto Oy, Helsinki.

Pelkonen, Antti (2003a): Tieto- ja viestintäteknologia teknologiavetoisen yhteiskunnan rakentajana ja yhteiskuntapolitiikan välineenä. (The Political Objectives of Information and Communication Technology – Towards a Technology Driven Society?) Politiikka 45:1.

––– (2003b): Citizens and Information and Communication Technology Policy. Paper presented at the International Conference "Innovation in Europe", Roskilde University, Denmark, May, 8.-10., 2003.

Pohjola, Matti (2001): The New Economy: Facts, Impacts and Policies. Information Economics and Policy.

Quah, Danny (2000): The Weightless New Economy. Paper presented at an EVA Seminar, September 8, 2000, Helsinki.

Romer, P. (1986): Increasing Returns and Long-Run Growth. Journal of Political Economy 5:94.

Science Policy Council (1975): The Outlines of Finnish Science Policy in the 1970s. Helsinki.

Science and Technology Policy Council (2000): Katsaus 2000: Tiedon ja osaamisen haasteet. Edita, Helsinki. [Review 2000: The Challenges of Knowledge and Competence].

––– (1990): Katsaus 1990. Tiede- ja teknologiapolitiikan suuntaviivat 1990-luvulla. Helsinki. [Review 1990. Trends of Science and Technology Policy in the 1990s].

Sitra (1998): Quality of Life, Knowledge and Competetitiveness: Premises and Objectives for the Strategic Development of the Finnish Information Society. Sitra, Helsinki.

Snell, Karoliina (2002): Biotekniikkapolitiikan kansalaiskuva: kansalaiset, kuluttajat ja ihmiset Suomessa ja Euroopan unionissa. To be published in Sosiologia 39 (4). [Citizens in Biotechnology Policy: Citizens, Consumers and Human Beings in Finland and the European Union].

Steinbock, Dan (2000): Finland's Wireless Valley. From Industrial Policies towards Cluster Strategies. Publications of the Ministry of Transport and Communications 36/2000. Edita, Helsinki.

Technology Committee (1980): Teknologiakomitean mietintö. Komiteanmietintö 1980:55. Valtion painatuskeskus, Helsinki. [Memorandum of the Technology Committee].

Tekes (2002a): Tulevaisuus on osaamisessaa. Teknologiastrategia – näkemys valinnoista. Tekes, Helsinki. [Future Depends on Competence. A Technology Strategy – a Vision of Choises].

––– (2002b): Ylihuomisen kilpailukyky ratkaistaan tänään. Teknologiarahoituksen tulokset ja vaikutukset. Tekes, Helsinki. [Future Competitiveness is Solved Today].

Tiedebarometri 2001 (2001), Tutkimus suomalaisten suhtautumisesta tieteeseen ja tieteellis-tekniseen kehitykseen. Tieteen tiedotus ry, Yhdyskuntatutkimus Oy. [Science barometer 2001. Survey on the Attitudes of Finns towards Science and Scientific Technical Development].