Technology and society / Ministerie van Economische Zaken.

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Foreword

Technology policy is in the full swing of development. Nor is this remarkable since technology and its environment are continually changing. In policy therefore new target groups and new activities are coming into view. This report is intended to launch a discussion with the new target groups of technology policy, a discussion that relates to the policy plans emerging from the Technology and Society project. The aim is to present these ideas in mid-1992 as part of the Technology Policy Strategy, but before we get to that stage, these plans will have to be worked out in greater detail. We want to do this in a dialogue with those immediately involved. Comments and good ideas are thus more than welcome.

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Part 1. Analysis

1. Introduction

Technology's success is determined by whether it is integrated into society. Such integration will only succeed if new knowledge and technology interlock with existing knowledge, customs, norms and values. Applicability, user-friendliness and desirability are thus the parameters dictating the success of new technological developments.

The successful application of technology is only viable if existing or future needs in the market place and social developments, in other words the demand side of the market, have been taken as the point of departure in developing that new technology. It is on this basis that appealing objectives can be formulated and subsequently achieved, for one thing by encouraging certain technologies.

Sometimes technology would seem to be an end in itself or its importance is solely emphasized on economic grounds. We have to move towards a situation in which there is greater attention for the demand side of the market and in which the most crucial issue is the degree of integration into society. It is the latter that will determine the return to be had from new technologies.

Of course we are talking about a dynamic process: a 'push' policy is appropriate where technology is in its infancy. But when technology is developing at a much faster rate than it is being applied, a 'pull' policy is obviously more opportune. Any gain in efficiency or potential for growth deriving from technology is likely to reside primarily in wide-scale social application both now and in the future.

This implies that policy should also focus on:

- the *use* of technology (areas of application),
- the *roles* in which people are confronted with technology (as consumers, employees, employers etc.)
- *specific problems of integration* (education, public attitudes, institutional obstacles).

The aim of technology and society policy is *to improve the integration of new technology in society.* Five to ten million guilders have been earmarked for this.
First of all we are going to look in greater depth at the interaction between technology and society.

2. Past history

Of course attention has been paid to the interaction between technology and society before now.

As early as 1979 the Rathenau report examined the interaction between technology and society in the field of micro-electronics. The Innovation report (Innovatie Nota) of the same year discussed subjects such as the acceptance of new products and services on the market and the norms and values of society. However, no consequences were attached to the findings in the latter.

The Report on the Integration of Science and Technology in Society (Nota Integratie van Wetenschap en Technologie in de Samenleving, IWTS) dating from 1984 and published by the Education Ministry was the next step in thinking about how technology should be embedded in society. The aim was "to promote a balanced and efficient decision-making on scientific and technological developments and the applications of these by paying explicit attention in good time to the gathering and dissemination of information on the relevant social and ethical consequences and to the forming of opinions in the social groups most closely involved."

Or, in other words, widening the decision-making on science and technology through technology assessment and promoting opinion-forming through the provision of information.
The Public Information Centre for Science, Technology and the Humanities (PWT) and the National Organisation for Technology Assessment (NOTA) are specific results of this process.

Part 1. Analysis

1. Introduction

2. Past history

3. Theoretical and practical underpinning (relevance for Economic Affairs)

The government, and the Ministry for Economic Affairs in particular as the 'technology' ministry, can actively intervene in the domain of interaction between technology and society. There are a number of good reasons for doing so and this section looks at the main ones.

3.1. Theoretical underpinning

Match and mismatch

The development and application of technology do not run parallel. The actual application of information technology available in the market sector, for example, is estimated at only 10 to 20% of the potential (OECD report 'Information technology and economic prospects'). It would appear as if the immense growth potential created through the efforts in the field of research and development is only partially being converted into actual improvements in productivity.

For the government the stimulation of the integration of new technology in society is the strategic answer to the widening gap between technological potential and actual application - and thus growth.

OECD/Technology Economy Programme (TEP)

The importance of integrating technology into society is internationally acknowledged. The OECD report entitled 'New technologies in the 1990s, a socio-economic strategy', commonly known as the Sundqvist report, is an apt example. Technological innovation, according to the report, is irrevocably tied up with the social and economic environment whether it is derived from scientific discoveries or demand factors.

The OECD's Technology Economy Programme (TEP) is an extension of this philosophy:

- It is the task of *government* to create a climate that is conducive to innovation. That entails among other things attention to education and training, to the forming of public attitudes through public relations and the provision of information and technology assessment.
- It is particularly important for *companies* to keep on investing in human resources and developing new forms of organisation that are geared to the potential of technology. Decentralisation of responsibilities, multi-disciplinary project teams and the involvement of workers are among the aspects involved.

Innovation as two-way traffic

Innovation increasingly is coming to be seen as ongoing interaction between the different functions of a company (research, production, marketing) or as interaction between the knowledge available in a company and the environment (infrastructure, market opportunities). Innovation is not a straightforward process running from basic research to acceptance by the market. Porter, in his 'Competitive Advantage of Nations', stresses the importance of the social environment for innovative strength.
An important aspect of Porter's analysis is the idea of learning effects.
User-producer relationships encourage products and services to be modified to meet customers' wishes and needs.
Innovation is also promoted through contact with and hence learning from subcontractors. Clusters and networks contribute to learning processes that may serve as a stimulus to improvement and innovation. At national level the learning system is even wider-ranging, comprising a common language and culture, standardisation, informal networks and social structures. Porter therefore asserts that despite the internationalisation of markets, the national setting remains of eminent importance for a country's competitive edge.

3.2. Practical underpinning

The demand side has a say

The pace of innovation is determined to a great extent by consumers or customers of new technologies. One can therefore ill afford to ignore matters such as acceptance, adaptation phases and user-friendliness. More generally, it is a matter of the demand for and the use of technology. And then one has to remember that the Dutch market, small though it admittedly is, may nevertheless be important for trying out new products.

The importance of a curious buying public that is receptive to new technical gadgets has emerged in a country like Japan. Innovative products there can count on a keen audience.
The Dutch have a different attitude. It emerged from the Psyche market survey conducted by the VNU and Admedia (1987) that only 4.9% are keen to buy a new product as soon as it is on the market while 65.6% say that they are not interested.

3. Theoretical and practical underpinning (relevance for Economic Affairs)

Public attitude

The perception of the social consequences of technology has an impact on the speed and direction of technological developments.
The support in the community can simply be gauged by adding up all the 'fors' and 'againsts' in society.
It emerged from the Social and Cultural Planning Office's Technology and the Public Survey (Publiek en techniek) that people in the Netherlands have come to think less positively about the diverse technologies in recent years. Internationally, the Dutch would seem to be less receptive to technology than other Europeans, to judge from the European survey 'Faits et opinions'.

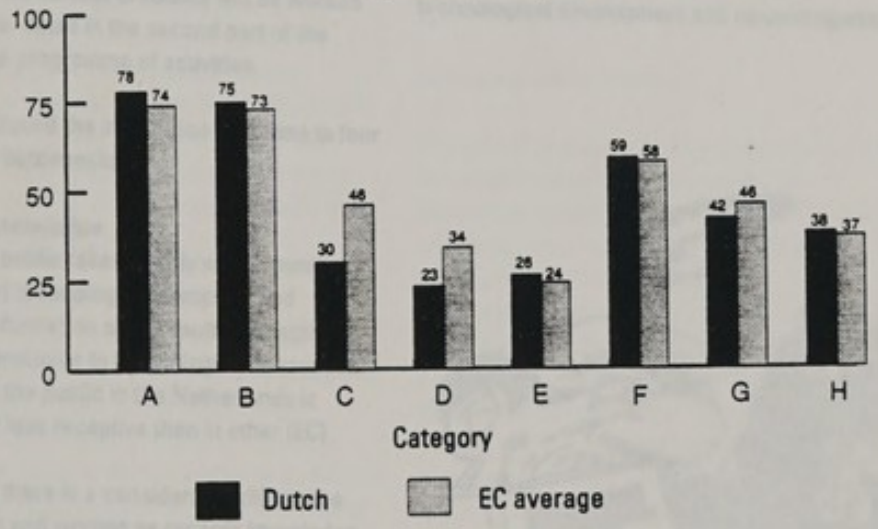
Opinions on science and technology

Percentage in agreement with the statement

Category

Dutch EC average

Source: Faits et opinions, EC, January 1990



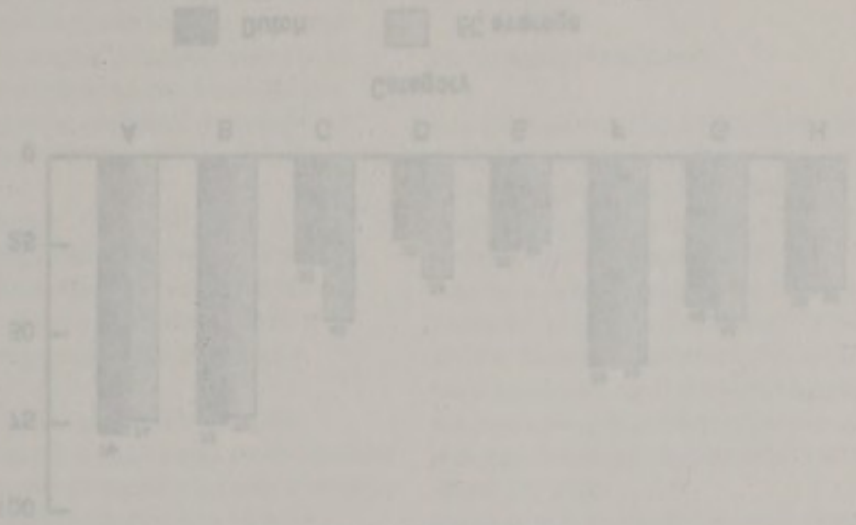
Labour market for technologists and researchers

There is a shortage of technical manpower in the Netherlands, partly because of the lack of interest in and low opinion of technology in the country. Figures from the Economic Affairs data bank on technology indicators (METING) reveal that the shortage of trained technical staff on the labour market is likely to grow much more in the future as a result of demographic trends. Between 2006 and 2010 the shortage of technical researchers (R&D staff) will rise to 11% at university level, 16% at higher vocational level and 20% at senior vocational level, according to the Research centre for Education and the Labour market (Research centrum voor Onderwijs en Arbeidsmarkt, ROA).
This prospect constitutes a serious threat to the development and application of technology in the years ahead.

3.3. Conclusion and role of Economic Affairs

The general conclusion is in any event that an effective technology policy must meet two conditions: it must keep in close touch with the environment in which technology is applied and it must pay attention to the climate for technological innovation.

The policy of Economic Affairs aims at contributing to sustainable economic growth. Technology policy is one of the key instruments for achieving this. However we can see that the growth potential, the technological opportunities are not being optimally grasped. *Broadening of technology policy and the removal of obstacles to the acceptance of new technology* is the strategy to be followed by Economic Affairs. This entails widening the *target group* to include the general public, social groups and other ministries besides businesses and widening technology policy in terms of *activities*.



The role of the Ministry of Economic Affairs will be to intervene in all fields where technological potential is not being used to the full. It is thus that a contribution will be made to technology that brings us closer to solving social problems. The role of Economic Affairs may differ depending on the area of application and problem and will have to be organised by means of cooperation between ministries. In any event, technology will always have to be considered as a possible solution (see also the report on Technology and Environment). The approach will be equally relevant as regards problems such as criminality, the care of the elderly, congestion, overburdening of the health services etc. By the same token the approach will apply to other agencies besides Economic Affairs. In the following we examine the policy themes which in conjunction may help to solve the problems of integration confronting technology policy.

4. Bottlenecks and themes

In determining a specific approach a choice has to be made from among all the items connected with the integration of new technology in society. We are opting for a pragmatic approach focusing on bottlenecks. The approach that is proposed in the case of the various problems will be worked out in greater detail in the second part of the report on the programme of activities.

We have reduced the integration problems to four (clusters of) bottlenecks:

1. Lack of knowledge

The general public takes a fairly non-committal view of (new) technology. Incomplete and erroneous information often result in an attitude that is not conducive to technological innovation. We saw that the public in the Netherlands is considerably less receptive than in other (EC) countries.

Besides this, there is a considerable difference between men and women as regards knowledge and attitude. The result is that women are lagging behind in technical studies and occupations. A problem deriving from this bottleneck is that demographic trends are exacerbating the shortage of technically skilled personnel on the labour market. The interest in technical training can be promoted by influencing public attitudes. It is particularly important that attention be paid to this at an early stage i.e. at primary school.

Approach:

The provision of public information is a crucial instrument.

Special attention has to be paid to young people and to girls and women. *Technical subjects at primary school* is also a relevant policy theme within the Technology and Society project.

2. Involvement of the demand side; an eye to the user

This is where the *relationship between the producer and user* comes in. It frequently only becomes apparent whether a user accepts the design or quality of the new technology once product development is complete. Better coordination between R&D and marketing would be one way out. Within companies the *role of employees* is also a matter for discussion, notably when it comes to their involvement in technological development and co-participation.

Approach:

Again *information* to consumers plays an important role. technology assessment (TA) as a policy theme has also been included so that social aspects of new technologies come into view in good time. This may help to prevent or minimise problems with applications while taking stock of the needs of users. It is on the basis of this knowledge that new technologies can be developed. The theme *user-producer relationships* is more specifically focusing on utilising learning effects in applying technologies. Lastly, the organisation of labour is the policy theme that looks at the role of workers in technological innovation.

The tackling of bottlenecks 1 and 2 requires Economic Affairs to play an *active* and *direct* role if necessary in conjunction with other ministries and with relevant agencies and companies.

3. Organisational obstacles

These range in type from questions of competence between ministries to legislation that serves to inhibit new developments (such as the Media legislation).
Economic Affairs wants to examine systematically the fields in which organisational obstacles exist and intervene in these, if necessary.

Approach:

The instruments to be deployed depend of course on the nature of the problem and on the policy field or area of application in question. *Technology assessment and public information* can in any event play an important role here too. Equally, the role of Economic Affairs *in intervening* must be given shape. This is why work is being done on a network comprising relevant sections of the various ministries. Based on the recommendation of the OECD/TEP (Technology Economy Programme) Economic Affairs is looking at the possible deployment of existing technological knowledge with reference to specific policy problems.

4. Ethical problems

New technological developments may result in highly diverse ethical problems. Is everything that is technically possible also justified? This question arises not only in the field of genetic manipulation but also when it comes to questions of privacy or the delegation of responsibilities or decision-making to technology. The Ministry of Education and Science is in the vanguard of policy on this front. It is a subject that is also high on the political agenda. The Ministry of Economic Affairs wants to join in the constructive thinking on ethical problems connected with technology policy.

Approach:

The responsibility for ethical questions rests in the first instance with the market. Legislation and codes of conduct serve as a guide. Economic Affairs, however, with the help of *technology assessment and public information* wants to anticipate in its policy. It is in this way that one can prevent ethical problems, based on lack of knowledge, acting as a brake on certain developments.

The approach to bottlenecks 3 and 4 requires Economic Affairs to play an intervening role. This involves for one thing developing a view of the part to be played by interdepartmental coordination. Economic Affairs after all is the coordinating ministry for technology policy. These bottlenecks also require active involvement in other policy fields in which technology is a topic of discussion or can help to solve policy problems.

Relationship to existing policy

Economic Affairs can tackle the bottlenecks mentioned from a number of different angles and with a number of different instruments. For example problems that are important in specific areas of technology are tackled as part of national technology programmes. Obviously different problems arise in the different areas of technology. Information technology, bio-material and environmental technology have their own domain and their own phase of development and are for this reason assessed differently by society. The Supply and Subcontracting Programme (Toeleveren & Uitbesteden) is developing policy that latches on to the relationship between the producer and professional users.

Summary: seven themes

The bottlenecks produce seven general themes for which Economic Affairs is or will be developing supplementary activities. The themes are closely interrelated. And it is precisely by being active on more than one front simultaneously that a sound contribution can be made to integrating technology in society. Theme 7 (monitoring) involves a fact-finding investigation of the relevant parts of the Technology and Society project. Such policy underpinning at the same time offers the opportunity of developing objectives against which policy can be reviewed at a later stage. The following THEMES are part of the Technology and Society project:

1. Public information
2. Women and technology
3. Technical subjects at primary school
4. Consumers; user-producer relationships
5. Technology assessment
6. Workers and the organisation of labour
7. Monitoring: indicators in the field of technology and society

Matrix bottlenecks/themes

bottlenecks	themes and approach
knowledge/attitude	information/TA/women/primary education/workers
users	information/TA/consumers/workers
institutional/organisational	information/TA/intervening role Economic Affairs
ethical	information/TA/intervening role Economic Affairs

The second part of the report shows how shape can be given to policy for the different themes in the coming years.

Part 2. Programme of activities

Part two of the report looks at the existing and proposed activities connected with the seven themes. Not all the themes have been worked out in equal detail in terms of actual activities. The provision of information to the general public already has a substantial past history and is therefore the most detailed. By contrast other themes such as technology assessment (theme 5) and workers (theme 6) are still in the early stages of policy development and will be expanded further along the proposed lines. We hope to exchange ideas on the further refining of these in a round of talks with the various organisations in society.

1. Provision of information to the general public

1.1. Identifying the problem

Given the unforthcoming attitude of the Dutch public to technology the provision of information to the general public has to be tackled in a thorough way if peoples' knowledge and attitudes are to be improved.
Recent research into the infrastructure for the provision of public information[1] in the Netherlands produced two differences with the state of affairs abroad:

1. little attention is paid to science and technology on television in the Netherlands
2. there is no public centre for science and technology (or a science centre) in the Netherlands.

Another conclusion from the report of the Public Information Centre for Science, Technology and the Humanities (PWT) is that the ministries support activities of independent PR organisations fairly arbitrarily and only on an ad hoc basis. And yet it is precisely these 'independent' intermediaries that are of immense importance for conveying the message that technology is interesting. The PWT proposes that a fund be created to provide support to these organisations on a more permanent basis. Economic Affairs is keen to see cooperation in the form of networks of existing organisations that provide information.

1.2. Existing policy

Economic Affairs has been active in the field of providing information on technology to the general public since 1986.
The aim of this policy is a) to better people inform informed and b) to encourage interest in new technological developments. The aim is on the one hand to promote knowledge and on the other to foster a positive attitude to (new) technology.
In most cases the means at the ministry's disposal serve both aims simultaneously. Heavy emphasis is placed on young people within the overall target group of the public at large. The intermediary organisations providing information are also a target group.
The PWT was set up by Economic Affairs together with the Ministry of Education and Science in 1986. The Centre operates to a large extent independently so that the information it offers is objective. Most of the budget is spent on subsidies to projects. PWT also functions as a knowledge centre for journalists for instance and runs activities of its own such as the Science Line, a telephone number for people to call with queries. The Centre's annual budget is 5 million guilders, half of which is funded by Economic Affairs.
A Committee of Experts that reviewed the PWT's activities since 1986 found that it was doing good work and proposed that it should continue to do so.

Economic Affairs also provides subsidies for projects being organised by intermediaries that focus on young people usually in cooperation with other ministries. One of these is the Youth and Technology Organisation (Stichting Jeugd en Techniek), a joint venture of Technica 10, Young Researchers (De Jonge Onderzoekers) and the Discovery Centre (Ontdekhoek). Television programmes are funded on an incidental basis sometimes in conjunction with organisations representing a particular branch of industry and/ or other ministries. The budget and the allocation among the various activities differs from year to year.

[1] Science and technology for a wider public, Advisory report of the Public Information Centre for Science, Technology and the Humanities(PWT), December 1990, Advisory Committee for the Review of the Public Information Centre for Science, Technology and the Humanities, May 1991.

Part 2. Programme of activities

1. Provision of information to the general public

1.3. Future policy

General considerations

Public information policy is being stepped up. Economic Affairs is earmarking a sum of 1.5 million guilders for this, bringing the total budget to around 5 million per annum. The aim is to enhance the status of technology and technical education. It is crucial for these to be coordinated with the other instruments that are directed at this goal. Economic Affairs wants *to introduce some consistency in the existing structure for providing information to the general public* through its activities. The preference is for a network which would be a sound remedy against fragmentation and inefficiency. The network would link up the regional activities of public information organisations (Stichting Jeugd en Techniek, Technica 10, De Ontdekhoek and De Jonge Onderzoekers) to the national activities of a public centre for science and technology. The government, business and industry and certainly also the PWT can encourage the combining of forces and support this with both money and sound advice. It is this way one can bring together organisations that are working to popularise science and technology.

Priority therefore will be given to creating cooperative ties. In doing so emphasis must lie on *long-term projects and an effective approach to the target group*. This entails providing information less via the mass media and more by means of interactive and permanent activities. Research has after all demonstrated that the effect of providing information at a great distance and aiming at a wide audience leaves a lot to be desired. That applies not only to the plethora of information on television but also to teaching material and folders. The evaluation of the campaign to encourage children to choose technical subjects 'Kies techniek' revealed that the open days organised by companies had the best effect. These are also the instances where there is interactive, direct contact and where an endeavour is made to latch onto the recipient's own interest in the form of a specific labour market prospect.

The spearhead of Economic Affairs' strategy is to get a public centre for *science and technology* off the ground. The idea is that *companies* should participate in information activities much more so than they have done in the past. With this in mind Economic Affairs is seeking to join forces with organisations representing branches of industry and which also stand to gain from technology having a better image. An endeavour is also being made to gain support from business and industry for joint information activities together with the Federation of Netherlands Industry (Verbond van Nederlandse Ondernemingen, VNO) and the Foundation for Society and Private Enterprise (Stichting Maatschappij en Onderneming, SMO).

Activities and policy plans

- the Public Information Centre for Science, Technology and the Humanities (PWT)

The Ministry of Economic Affairs is proposing that the funding of the centre be continued. The presence of an independent hub at the centre of the wheel is of vital importance for the situation in the Netherlands. The target group: the public at large with stress on young people and the unskilled/semi-skilled.

- public centre for science and technology

An instrument that exactly corresponds to the underlying philosophy. People can be familiarised with the principles of technology in an entertaining way while at the same time all the ramifications on work, training, business etc. can be demonstrated. A detailed proposal for a public centre of this kind has already been made by the NINT Technology Museum in Amsterdam. The target group is the general public with heavy emphasis on school-goers. The Ministries of Economic Affairs and Education and Science had in principle agreed at an earlier date to give their support to such a public centre.

- fund for television productions

Although the effectiveness of providing information on television is slight and the expense is high the medium may nevertheless contribute to the desired and necessary change in attitudes towards technology. Television has an immense audience so that it is a medium that cannot be ignored as part of the strategy. Television needs to pay more attention to technology. The Ministry of Economic Affairs is proposing an arrangement in which specific programmes are paid for from the normal broadcasting funds and/or through sponsoring by companies. For this purpose a fund can be set up which would be comparable to the current promotion fund for cultural productions. With a set-up of this kind some of the money for

broadcasting would be ploughed back into the broadcasting companies via a fund for programmes on science and technology. Given the reorganisations going on within broadcasting it is not exactly an auspicious time to be setting up new funds. This is why when it comes to deciding on further policy the proposal of the PWT review committee will be adopted: to allow the existing fund for cultural productions to be used for science and technology by way of an experiment. Economic Affairs will try to focus attention sharply on the production of programmes for youth. The target group: the public at large.

- technology week

An annually recurring week focusing attention on technology and involving open days in companies and institutions, educational activities, competitions and specific attention in the media. All of this is linked up with the National Science Week which is highly successful, since science and technology are closely allied and because such cooperation saves money. Our preference is for a gradual extension of the technology component. An assignment has been given this year for a number of activities to be started. The target group is school-goers with a spin-off for the public at large.

- funds for independent public relations organisations

We propose that the subsidies provided by the different ministries to independent organisations providing information to the general public on science and technology should be combined into a single fund. This will enable greater consistency to be achieved in dealing with these organisations and assessing them. A business relationship will be entered into with the organisations on a programme by programme basis. The target group is youth with a heavy emphasis on girls.

- Cooperation with business and industry and branch associations

Many technically-oriented branch associations put money into PR activities. They want to improve the image of the technical trades and enhance peoples' interest in such jobs. Economic Affairs now works together with the FME Association, the employers' organisation in the metal and electrical engineering industry. Economic Affairs is seeking to create types of public private partnerships through cooperation of this kind. A specific example of the latter is the junior technology prize. Economic Affairs, together with ten major companies, offers a prize of 50,000 guilders for an enterprising and appealing initiative for getting technology across to young people.

2. Women and technology

2.1. Identifying the problem

Women are under-represented in technical studies and occupations. Women and girls also have a different rating of technology to boys and men (see for example the Social and Cultural Planning Office Report, Public and Technology 1988). Exact participation figures for women in technology are not plentiful. The percentage of women in higher technical education rose from 3% in the early eighties to more than 7% in 1990. Twice as many boys as girls who have chosen science subjects opt to study a technical subject. By comparison with other EC countries the Netherlands is clearly lagging behind in this respect too.

Comparison of the Netherlands with other countries in the EC 1985/1986 or 1986/1987. Percentage of female students in higher education

	exact & nat.sciences	maths & comp.sciences	engineering
Belgium	36,9	29,9	14,7
Denmark	33,5	23,7	14,3
Germany	30,7	22,8	6,8
Greece	40,3	37,5	17,2
Spain	45,2	37,2	11,5
France	32,5	23,8	16,1
Ireland	?	47,7	9,5
Italy	51,4	43,3	6,5
Portugal	62,7	55,-	24,1
United Kingdom	34,5	?	8,6
The Netherlands	24,9	15,5	9,1

Source: Education and Science

What are the bottlenecks?

- differences in boys' and girls' upbringing (sex stereotypes);
- few women as role models; in addition teachers and counsellors focus more on boys;
- girls see technology in a different light;
- self image and expectation of success play an important role; these are lower among girls;
- job expectations in the world of male occupations are different among girls;
- the education system itself, teaching methods and content (not enough time is devoted to the social side of engineering/technical subjects).

Top 9 job preferences of boys and girls in 1989 (in per cent)

Boys	%	Girls	%
Policeman	5	nurse	9
pilot	5	teacher	7
computerassistant	4	carer	7
mechanic	4	hairdresser	5
farmer	3	doctor or dentist	4
regular soldier	3	secretary	3
doctor or dentist	3	administrative assistant	3
professional sportsman	3	artist	3

Source: Intomart, 1989, page 158.

2.2 Existing policy

A survey by the Ministries of Economic Affairs, Education and Science and Social Affairs and Employment revealed that the government is especially active in projects in the field of women and technology. However the activities are highly fragmented. They mainly involve providing information 'Choose a science subject'('Kies exact'), 'Women wanted for male work' ('Vrouwen gezocht voor mannenwerk') and education (e.g. the Women and Information Science Organisation). There are also activities geared to working conditions. Economic Affairs has provided support for one thing to the Women and Information Science Organisation and to the Association of Women in Higher Technical Education.

2.3 Future policy

Interventions, where possible, must have the widest possible impact on the selection process. In other words combined attention to the educational situation, the provision of information and guidance etc. Priority has to be given to directing the intervention at women and girls who are being or will be confronted with technology. It is clear that issues such as socialisation, self-image, attitude to technology and norms and values are of crucial importance.

Temporary experiments, one-off information campaigns and other 'one-shot strategies' have only limited usefulness.
More is to be gained from starting early at primary school, keeping it up over a long period and conducting simultaneous campaigns in more than one field. Economic Affairs expects a first step to be made towards an integrated intervention project from the Technical University at Eindhoven where the matter is being studied.

The public relations information activities referred to in the last section will, where possible, pay special attention to girls. Follow-up activities are being worked out for the 10-12 year old target group in an interdepartmental working party comprising representatives from the Ministries of Education and Science, Economic Affairs, Social Affairs and Employment.

The interdepartmental working party will function as a guidance committee. Any follow-up activities can be reported to the working party where they will be dealt with.

3. Technology at primary school

3.1. Identifying the problem

Education is vital for inculcating knowledge and interest in technology. The subject is shortly due to be given specific attention in secondary schools when it will be included in the basic syllabus. But it is crucial to start passing on knowledge about technology at primary school. It is vital to begin with the basic concepts and principles of physics and technology at primary school age (6-12). Technical subjects at primary schools in the Netherlands are much neglected. Technology is one of the subjects taught at primary school in countries such as the United States, Sweden, United Kingdom, Hungary and Germany. The main problems in teaching technology at primary school are:

- teachers have not been properly prepared for this (Primary teacher training colleges devote little time to technology or methods of teaching technology);
- there is insufficient lesson material and few teaching aids;
- the subject is 'difficult' and not easy to relate to the children's world.

3.2 Current policy

Naturally the Ministry of Education and Science carries first responsibility for primary education. But apart from commissioning the Organisation for Primary Schools and Technology, (Stichting Basisschool en Techniek, BASTEC) to develop teaching material little has been done in this field. There is also an initiative on the part of business and industry to equip primary teacher training colleges with lecture rooms for technology classes. Up to now Economic Affairs has only focused on primary education by means of providing information to the general public. Where possible Economic Affairs is seeking to latch on to activities in education.

3.3 Future policy

Economic Affairs cannot of course introduce the subject of technology into the education system. But Economic Affairs people can ensure that others become interested in this subject and can of course make a modest contribution to solving the problems mentioned earlier. Special attention can be given to primary education notably where the stepping up of public information programmes is on the agenda. A 'technology bus', a mobile classroom full of technical gadgets, will be visiting schools as part of the science and technology week. An endeavour is also being made to get schools to fit out separate classrooms for technology or discovery lessons together with the Organisation for Youth and Technology.

4. Consumers: user-producer relationships

4.1. Identifying the problem

Consumers determine whether new technologies become accepted. This is why it is crucial at an early stage of product development to find out what consumers think of new products. Their success will be determined by how the technology is used, whether it is user-friendly and whether it satisfies specific needs.
An American study by Nayak (Arthur D. Little) stresses the importance of responding to the consumer aspects. Successful companies devote a lot of attention to market research, lifestyle analysis and concept-testing on the principle that if 'customers don't want technology; let's go and find out what they want'. According to The Economist (23 March 1991) technological innovation will come to depend more and more on customer service and product quality. However, only 35% of the companies in the United States

involve consumers in their product development and only 30% measure customer satisfaction. There are no comparable figures for the Netherlands.
Economic Affairs was confronted before with the poor acceptance of chip card technology and the need to find out more about the demand in developing the market for intelligent homes. In the case of High Definition Television (HDTV) Economic Affairs has been active in helping to find a method to bring producers and users together: the HDTV platform.

- On the whole the problem is that consumers are frequently unaware of the right channels for expressing their ideas or complaints (e.g. the consumer association); on the other hand producers are not especially receptive to signals from the market.

- The impact of consumers on product development must not be overestimated; that influence is greater in the case of product improvement. Consumers are good at showing what they do not want or what is not good about an existing product, but they have difficulty in saying something about a new product in relation to their specific needs.

- A distinction must be made between professional customers and consumers. Professional customers are better able to indicate what (new) products or product improvements they want to see; they are moreover in a position to insist on their demands.

- Ergonomics is often low on the list of priorities in product development; however there is (among pioneers) a clear trend towards integral product development in which ergonomics is included at an early stage. Industrial design, a meeting ground for technical potential and user aspects, is a subject that is still in its infancy in the Netherlands.

4.2 Current policy

Matching supply and demand is of course a responsibility for industry itself. But the government has a meaningful role to play in trying to give support if problems are spotted over a wide area. It is thus that Economic Affairs has laid the foundations for comparative market surveys that aim at providing consumers with advice on purchases by supporting consumer organisations and research. Quite an important side-effect of these surveys is the contribution to product quality policy; alert producers modify their products on the basis of the results.

Economic Affairs is also endeavouring to involve consumers in a number of platforms (HDTV, Home Electronics Systems). Lastly, Economic Affairs also contributes on an incidental basis to pilot projects (e.g. in Woerden), in which priority is given to acceptance in use.

4.3. Future policy

The contribution of comparative product surveys to product development is an indirect one at present: the research primarily provides consumers with advice on purchasing. The pilot project on the spin-off of these surveys is designed to see whether they can also make an active contribution to product improvement and, by extension, product development. This can be done by making available the results of specific comparative product surveys to producers and importers in separate reports. Should the pilot project be a success, a type of comparative product survey may arise that can actively provide two target groups with information.

A research plan is currently being devised which would allow consumer behaviour, needs and trends to be conveyed to businesses (user-producer relations research). Cooperation between R&D and marketing departments will be the main issue.
Among the questions to be asked are whether differences between successful and less successful innovations are connected with the approach to consumers and which technologies or which applications specially lend themselves to involving users at an early stage.

5. Technology assessment

5.1. Identifying the problem

Technological developments bring about radical changes in society. A number of the social repercussions of technology give rise to opposition. Changes at the work station, ethical problems and privacy issues are examples of these. Technology assessment is a method of exploring the social repercussions of technological developments at an early stage. Having gleaned such knowledge, developments can be opportunely steered in the right direction in good time.

Recently a less defensive approach to technology has been adopted which aims at tracking down potential applications. This is called constructive technology assessment. It shifts attention from counteracting possible drawbacks to making better use of the available advantages. Constructive technology assessment also involves the relevant interested parties in the decision-making on and implementation of new technology.

5.2. Current policy

The NOTA organisation was set up to commission technology assessment studies and supervise these. The Ministry of Education and Science provides funding of three million guilders per annum. Examples of subjects that have been tackled in the past years are:

- waste prevention
- sustainable energy supplies
- biotechnology
- artificial intelligence
- information technology in education.

The involvement of Economic Affairs in projects up to now has been limited to the *Prisma* waste prevention project, but regular consultations with NOTA were introduced not long ago, which will enable Economic Affairs to put forward its ideas and wishes regarding the programme of work.

The Future Shape of Technology Foundation (Stichting Toekomstbeeld der Techniek, STT) has been in existence since 1968 and was created by the engineering world. STT conducts exploratory studies into new technological developments and their social relevance. STT has a budget of approximately one million guilders per annum, about a quarter of which is funded by Economic Affairs.

European research also pays attention to technology assessment in the form of the FAST (Forecasting and Assessment of Science and Technology) and SAST (Strategic Assessment of Science and Technology) programmes. The secretariat of the Monitor commission that advises on both programmes is paid for by Economic Affairs and is housed at NOTA.

5.3. Future policy

After an initial period which was by no means straightforward hard work is currently being done in NOTA to strengthen the organisation. This will also involve looking at the nature of the cooperation between Economic Affairs and NOTA.
Technology assessment researchers emphasize that in the future there will have to be a closer link-up with technology policy and that technology assessment research must also be closer to policy.

A better coordination (network forming) of STT, PWT and NOTA needs to be looked at in any event in the years ahead. The current reviews of STT and NOTA can be used for this purpose.

Technology assessment on a European scale is currently being challenged. Technology assessment has been dropped as a research area in the third Framework programme. The organisational form of European technology assessment policy moreover leaves much to be desired, because of the numerous parties involved and countless different 'clients'. The Dutch delegation to Monitor (the advisory committee for FAST and SAST among others) is preparing decision-making on this to ensure that technology assessment remains a subject on the European agenda. Part of the proposal is to strengthen the combination of technology assessment and the provision of information to the general public on science and technology on a European scale both financially and organisationally.

6. Employees and the organisation of labour

6.1. Identifying the problem

One of the most striking consequences of technological innovation is the change in the work place. Some work is disappearing, new tasks are arising and existing posts are changing. Opposition arises particularly in those places where employees have no influence on the introduction and application of new technology. The angle in approaching this theme is to use the learning effects on the shop floor through an active involvement of employees in technological developments. It is also vital that technological innovation be coupled with innovation in the organisation. Numerous surveys reveal that organisational change remains a crucial bottleneck in introducing new technology (see the ITS survey in 1988 into failed computerisation projects).

6.2. Current policy

The research programme on technology, work and organisation (TAO) aims at an integral approach to technological innovation within organisations. It is a multi-year research project funded by the Ministries of Education and Science, Social Affairs and Employment and Economic Affairs. The programme will run for five years and will cost 6.5 million guilders. Research themes are:

- innovation management
- integral product renewal
- innovative personnel policy
- labour relations.

The research will be concentrating on two focal points: one for the services sector at the Erasmus University Rotterdam, led by Professor Raymondt and one for industry at the Maastricht Economic Research Institute of Technology, State University of Limburg, led by Professor Den Hertog. A new TAO committee has been set up with Mr Blankert as chairman. Companies where projects have been started are DAF, Stork, Aegon, Van Nelle and the port of Rotterdam.

Economic Affairs, together with the Ministry of Social Affairs and Employment, has been supporting the trade union movement for some years in setting up centres for advice on technology. A total of six million guilders has been set aside for a period of four years for this. The six million was allocated as follows: 4 million to the Federation of Netherlands Trade Unions (FNV), 1.5 million for the National Federation of Christian Trade Unions (CNV) and 0.5 million for the Union of Middle and Senior Staff (MHP). The subsidy has allowed the unions to build up knowledge and to transfer this and to set up a structure for answering questions on technology posed by members of works councils and the unions themselves. The centres have also provided support to various other projects.

6.3. Future policy

The TAO programme will run up until the end of 1993. From that point onwards the research will have to be in a position to stand on its own two feet. It will still be possible to make use of the knowledge and expertise gathered on a project basis.

The centres have not been able to do what was expected of them. No huge demand for information on technology was forthcoming. Apparently people would seem to have fewer problems with technology than was originally thought or they do not see them as fundamental problems. At the same time a great many questions did arise on organisations and working conditions. And these of course do have technical aspects. In talks with the trade unions, Economic Affairs wishes to ask how the involvement of workers can effectively contribute to a sound organisational embedding of new technology. This does not mean that Economic Affairs is intervening at the micro level of the company. It will be sitting down to talks with the unions in the near future with the aim of:

1. making a further evaluation of the technology advice centres,
2. ascertaining how existing Economic Affairs instruments such as training, the provision of information to the general public and technology assessment can be used to so that the involvement of employees in technological innovation is put on the agenda.

7. Indicators in the field of technology and society

As part of the fact-finding and quantitative underpinning of the Technology and Society project a number of indicators have been drawn up for which purpose data are gathered with some regularity. In part these are indicators that are already systematically collected elsewhere. For the rest they involve material for which Economic Affairs itself has to commission the research. The results of the research are regularly included in the reporting on METING. METING is the Economic Affairs data bank for technology policy.
The main indicators are:

- public attitude;
- scientific literacy;
- the Watanabe-index: proposed by the vice-president of *NEC* (if you ask children what they will be later at least 50% should answer scientist, technician or engineer, (Jeugd '91);
- workers involvement in new technology (Cressey & Williams);
- attention devoted to science and technology in the media (KUN);
- the number of students on technical courses (on-going, CBS, Central Bureau of Statistics);
- innovative purchasing behaviour;
- women and technology.