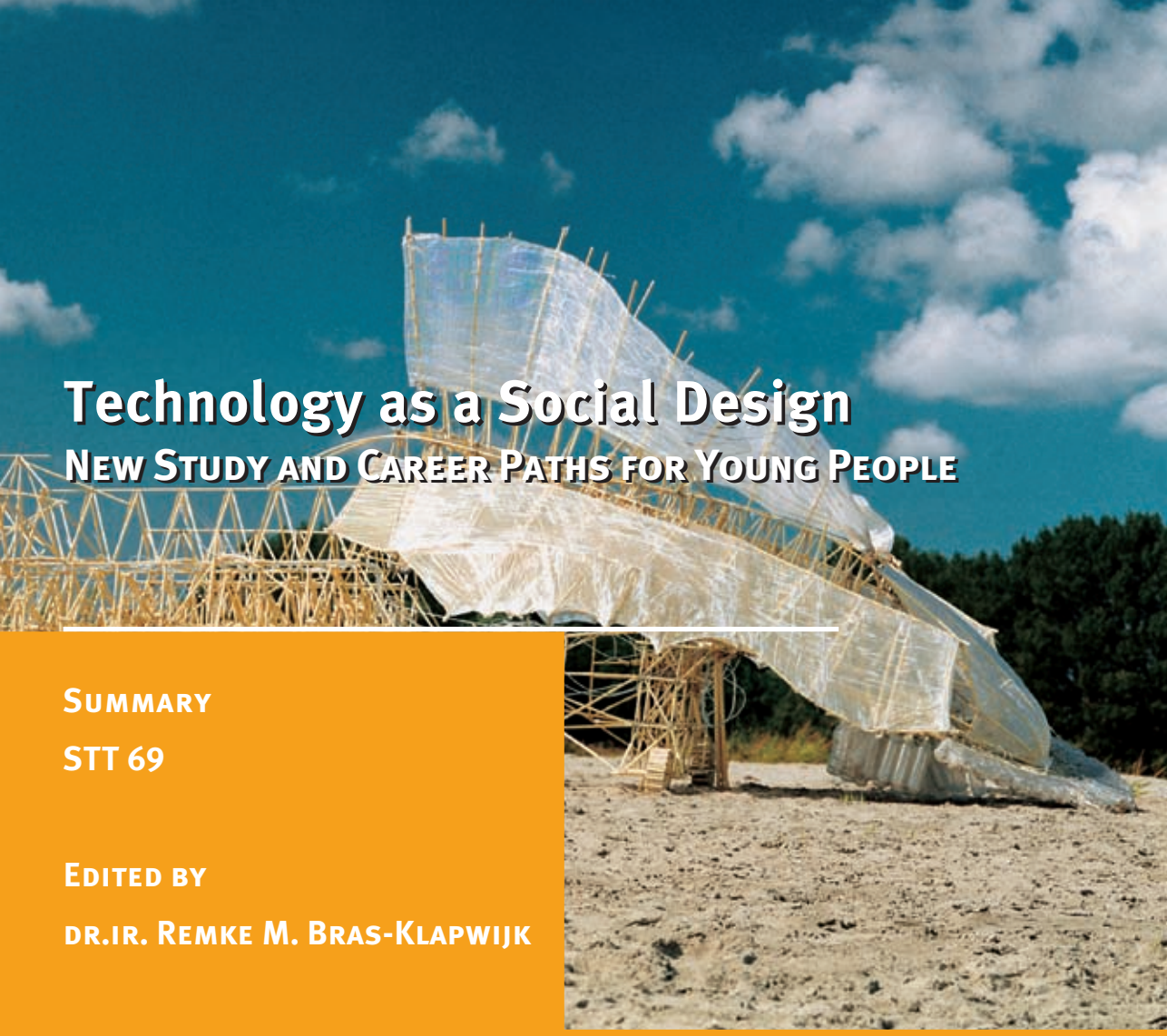

# Technology as a Social Design

## New Study and Career Paths for Young People

**Summary**

**STT 69**

**Edited by**

**dr.ir. Remke M. Bras-Klapwijk**

STT Netherlands
Study Centre for
Technology Trends

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The Hague, The Netherlands

# Summary

*Steering Committee Study Young People and Technology*[1]

This is a summary of the Dutch book *'Techniek als menselijk ontwerp; nieuwe opleidings- en loopbaanroutes voor jongeren' (Technology as a Social Design; New Study and Career Paths for Young People)*. This publication is the result of a study into the future by STT/Beweton. For this study the expertise and visions of many experts from the industry sector, knowledge institutes, government, education and organisations for technical activities have been gathered and integrated.

The book is meant for policy makers and key figures in education, business, youth organisations, organisations that carry out scientific and technical communication, knowledge institutes and for everyone else who is interested in involving young people into technology and/or educating young people for a creative economy.

The central question of the study is:

*Which encounters with technology promote an involved and active relationship with nature and technology and lead to sufficient interest, knowledge and skills among children and young people in view of the realisation of societal and economic objectives?*

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## Introduction

In this study a new perspective has gradually been developed to promote a positive relationship between young people and technology. By the end of 2003 the Delta Plan Science and Technology (Delta Plan bèta/techniek) was adopted by the Ministry of Education, Culture and Science, the Ministry of Economic Affairs and the Ministry of Social Affairs and Employment with the objective of increasing the number of students choosing an education in science and a career in technology. In this study we argue that the innovation objectives will have to be taken one step further because there is also a qualitative gap between education and the labour market which needs to be closed. There is a growing need for creative, synergistic professionals who combine their understanding of technology with other fields of knowledge and capacities. Education, however, offers few creative design programmes. Furthermore, humanities and social science students are insufficiently involved in technology due to the distinct division between technology and social issues. Below we will explain the need for a change strategy for both education and the various types of careers that will promote creativity and technical expertise among young people.

## Does innovation require more science and technology students or more creativity?

Government and industry argue that there will be a fair chance of a shortage of technicians and scientists if the interest of young people in these subjects cannot be maintained. This shortage will be caused by the fact that an increase in jobs is expected as a result of additional investments in research and development, and also by the ageing of technical employees, the decreasing number of young people and the fact that people with an education in technology and science often 'transfer' to non-technical positions. In order to increase the inflow into technical and scientific courses and professions, the Delta Plan Science and Technology was adopted.

Initiatives to educate young people for the future are very valuable. In order to gain some grip on the future, we have developed two scenarios that mainly differ on the issue of the source of prosperity. The first scenario is called the Lisbon Scenario, after the Lisbon summit of European heads of government held in 2000, during which emphasis was put on a future in which high-quality technological production would be concentrated within Europe. In order to produce technical complex products, basic scientific and technical research is to be reinforced. In this scenario the 'Dutch Knowledge Disease' is fought by

strong national and international networks in which employees in science and technical functions from various organisations exchange know-how and ideas. The most important competing factor or core value of this scenario is a leading position in the fields of science and the development of high-tech products.

The second vision on the future is called the Florida Scenario, after the American Richard Florida who seeks added value in socially complex products. This scenario takes as a starting point the increased importance of the emotional significance of products and services, the trend to customise products and services more often and to sell combinations of products and services instead of separate products. In order to recognise the needs and wishes of potential users and to translate these into new products and services, creativity and an open exchange between professionals with social and technical backgrounds are required. Especially the mono-disciplinary parts of the production will be moved to low-wage countries. Locally-oriented forms of semi-skilled and unskilled labour, such as plumbers, will remain. The most important competing factor in this scenario is creative, socially oriented entrepreneurship. Technicians form mixed networks with social and cultural innovators. This interaction leads to the development of interesting concepts for new, competitive products and services. From this point of view it is essential that young people with diverse talents (enterprising, investigative, designing, creating, artistic, and social) will identify themselves more with technology.

**Table 1**
*Characteristics of the Lisbon and Florida Scenarios.*

| | **Lisbon Scenario** | **Florida Scenario** |
|---|---|---|
| strategy for the development of products and services | technically and scientifically complex products | socially complex products and services |
| core value | technical and scientific capacities | creative capacities |
| network | science network | open and mixed network |

Nothing is more difficult than predicting the future. It is therefore impossible to determine which scenario has the most potential to become the script of the future and which kind of employees will be in greater demand. That is why an economic strategy based on both core values offers the best chance of success.

A sound innovation of education and career prospects focuses on both core values and promotes technical expertise and creativity.
Government, industry and technical educational institutes fear that technical expertise may be jeopardised by the decreasing inflow of students into technical and scientific courses. The interest of girls and women for these

courses is scant in the Netherlands and there is hardly any change in the gender segregation in the labour market for technicians. Also, increasingly fewer boys enrol into technical lower secondary professional education (vmbo), intermediate vocational education (mbo) or higher vocational education (hbo). Up till now, the interest per gender for the entire spectrum of scientific and technical curriculums in university education remains remarkably constant. At university level traditional mono-disciplinary courses, such as physics, mathematics and chemistry, are confronted with a decreasing inflow. It should be noted that, in the past years, the share of technical and scientific jobs compared to the total supply of jobs in the Netherlands has decreased. This may have an inhibiting effect on the inflow. Whether economic growth will result in an increase of technical jobs is unclear, as jobs are also moved as a result of globalisation. Nonetheless, the decreasing appreciation of young people for technical and scientific careers is alarming, as technically high-quality competences remain an important competing factor.

In this study, the increasing need for creativity and synergistic professionals expected by the Florida Scenario is plausible and substantiated with examples — such as the demand for creative and customer-oriented technicians and the inclusion of specialists in humanities and social science in teams that were previously staffed solely by technicians. Young people appear to be very interested in creativity and synergistic careers. In recent years, the interest in multi-disciplinary, applied technical courses, such as architecture, aviation and space technology, increased. However, many young people do not associate technology with creativity or with people. In addition, many parts of the education system do not focus on creativity and combining technical and non-technical knowledge.

The innovative measures should promote both creativity and technical expertise. The encounters that children, young people and starting employees have with technology should ensure a larger inflow of creative, synergistic professionals who combine their understanding of technology with other fields of knowledge and capacities. Furthermore, the appreciation for technical expertise should be increased as a result of which sufficient young people want to become experts in this field. This principle can be used as an evaluation basis for initiatives already taken, such as the aforementioned Delta Plan.

## Young people vary

In order to establish how to make young people with diverse talents and career wishes interested in technology, it is important to link up with the interests and wishes of young people themselves. To gain an insight into the differences between young people, we have used the work of two American scholars, John Holland and Edgar Schein. The first one has analysed personality profiles and the second one has researched the value anchors that secondary school students and starting employees use when choosing a type of education and career. In addition to these theoretical notions we introduce the patchwork approach to indicate how the current generation differs from the generations before.

### Holland's personality profiles

Career specialist John Holland thinks that the technical work environment is particularly suitable for people with an investigative attitude and for people who like working on things with their hands. He concludes that technical activities offer few starting points for social, artistic and enterprising personality types. Holland has reached this conclusion by linking technical professions to things and ideas. Research conducted within the context of this study shows

**Table 2**
*Holland's personality types. Source: Career Management Program of John Hopkins University (http://hrnt.jhu.edu/cmp/HollandTypes.cfm). Based on Holland's book 'Making Vocational Choices.'*

| Personality | Description |
|---|---|
| Realistic | Realistic persons are active and stable and enjoy practical or manual activities, such as building, mechanics, operating machines and sports. They prefer to work with things rather than ideas or people. They communicate in an open and direct manner. |
| Investigative | Investigative people are analytical, intellectual and observing. They are research-oriented and like mathematical or scientific activities. They are introspective and like to work with ideas. |
| Artistic | Artistic people are original, intuitive and imaginative. They like artistic activities, such as composing or playing music, writing, drawing and painting, acting or directing plays. They look for ways to express themselves. |
| Social | Social people are humane, idealistic and feel concerned for the well-being of others. They like group activities and helping, training and looking after people and advising them in their development process. They focus on human relations and solving people-related issues. |
| Enterprising | Enterprising people are energetic, ambitious, adventurous, sociable and self-conscious. They like activities during which they have to convince others, such as sales, and search for leadership roles. They use their interpersonal and managerial competences and convincing qualities for the objectives of the organisation, but they avoid routine jobs. |
| Conventional | Conventional people are efficient, caring, conformative, organised and precise. They would rather work according to clearly defined instructions than taking on a leadership role. They like organised, systematic activities and dislike ambiguity. |

that young people have a similar view. Technology and science are linked to things and only by exception to people and creativity. Young people see the non-social scientist as someone who retreats into a specialist field and does not know how to connect to other fields and subjects and often not to (other) people either. In addition, young people have an image of the 'cool' technician who likes to work with his hands and associates with his pals in a friendly, direct manner.

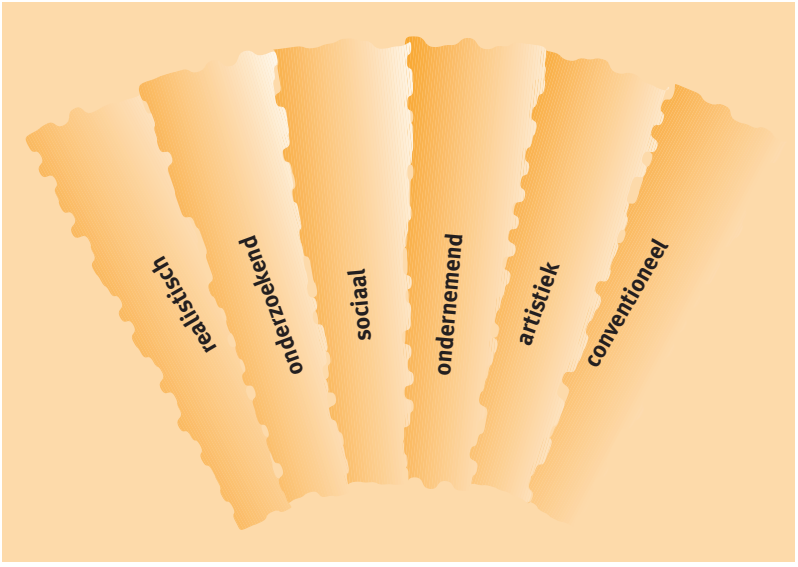



**Figure 1**
*Six personality profiles of Holland.*

## Schein's career anchors

We studied the values young people feel are essential in their future profession. Following organisational psychologist Edgar Schein, we distinguish career anchors, each with their own core work value, the value people do not want to abandon in a job, see table below. These career anchors show that the differences between young people are considerable and explain why it is difficult to get a grip on the decisive factors in the choice of career. There is not one single, efficient method to enthuse different young people for a profession that involves technology.

**Table 3**
*Edgar Schein's career anchors. Source: [Schein 1987; Schein 1985].*

**1 Technical/Functional competence[2])**

These people discover during their career that they are very talented and highly motivated for a certain type of job. Pursuing their talents and the satisfaction they derive from the knowledge of being professionals gives them 'a real kick'. Their competence may focus on any work environment and, consequently, does not have to be technical.

**2 Managerial competence**

These people prefer to become general managers rather than specialising in a certain functional field. They aspire to obtain a high status in the hierarchy within the organisation and are driven by the possibilities of additional responsibilities, contributions to the success of the organisation and a high salary.

**3 Autonomy/Independence**

People who have 'autonomy' as their career anchor cannot stand to be restricted by the rules of other people, procedures, working hours, clothing regulations, and other standards of an organisation. They want to do things their own way, in their own pace and according to their own standards.

**4 Security/ Stability**

These people are more engaged in the contents of the job than in the nature of the job itself. They want to feel safe and secure and often look for a job within an organisation that offers a permanent contract, has a reputation of avoiding dismissals, offers proper pension provisions and secondary elements of remuneration, and is known to be strong and reliable.

**5 Service/Dedication**

Some people choose for a certain profession in order to achieve certain ideals using their jobs. They are more focused on ideals such as serving humanity, helping a country, or improving the environment, than on actual talents or fields of competence which the job is about.

**6 Pure challenge**

These people find pleasure in their jobs by accepting and meeting challenges. They are competitive and ambitious to a high degree and do not concentrate on a single functional skill, but constantly seek variation and new challenges. Just like 'fighters' they look for confrontations with the 'enemy' and want to prove their own superiority in this fight.

**7 Lifestyle**

Lifestyle people feel that it is important to combine their individual needs with their family and career. They would rather look for a flexible attitude of an organisation than for a specific programme, an attitude that reflects respect for personal and family affairs.

2 In this book we use the term functional anchor instead of technical-functional anchor in order to prevent the unintended association with technical professions.

**Table 3 (continued)**
*Edgar Schein's career anchors. Source: [Schein 1987; Schein 1985].*

**8 Entrepreneurship**

Entrepreneurs want to create a new company of which they are the owner by developing new products or services or to build up an organisation according to their own specifications. They have a creative urge which can be linked to the entrepreneur's own efforts, who can survive on his own and is economically successful.

**9 Identity**

Although Schein has not included the value of identity as a separate value, this career anchor in particular appears to be of concern among students. In our study students who seem to be mainly motivated by the status of a profession, such as pop star, stewardess or astronaut, fall within this value. We also include students who seem to be mainly motivated by the 'masculine' or 'feminine' image of a profession.

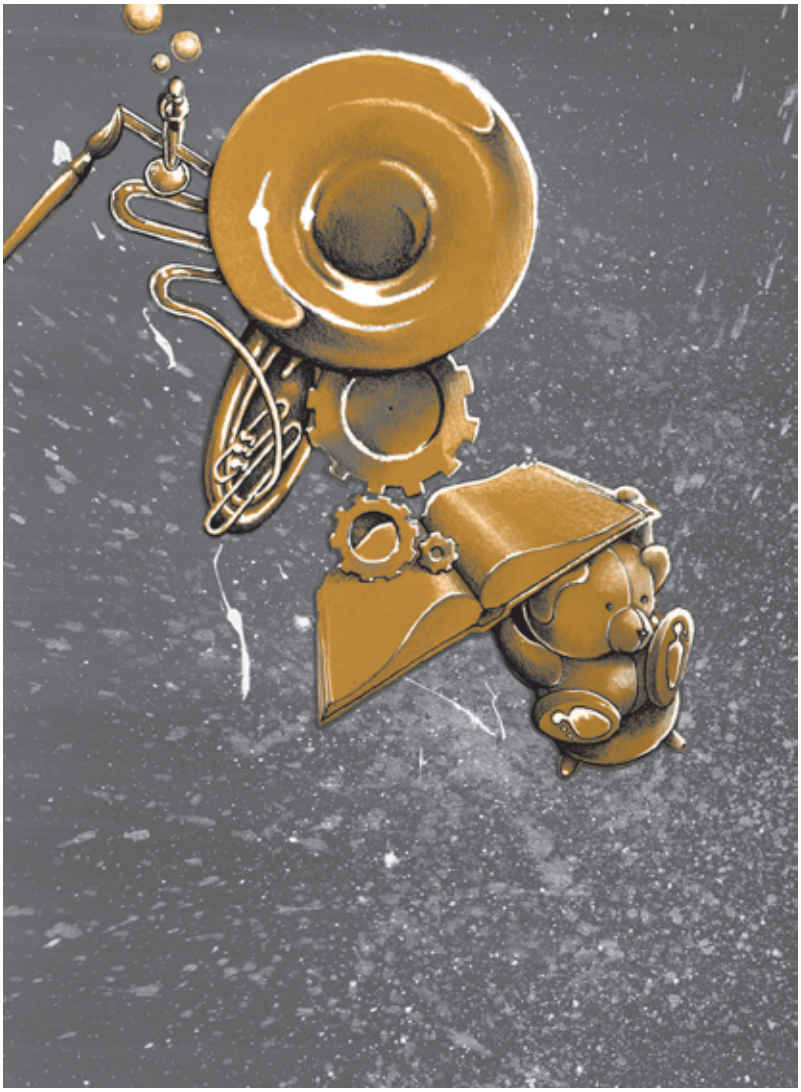
Our study has shown that career anchors can already be identified in secondary school students, although they then have not been fully developed yet. Regarding the choice of career, students between the ages of eleven and seventeen are in the tentative phase [Ginzberg, 1951]. At this stage a confrontation takes place between personal values, objectives and interests, self-assessed abilities and the opinion of others. A more realistic view of the profession is formed and this view is compared with the developing self-image of the adolescent: to which degree does the possible future profession contribute to the desired image of the adolescent himself. By using career anchors it can be explained why young people abandon a technical type of education or career, even when they had a positive attitude towards technology and technical professions at a primary school age. They keep checking whether the field of activity will enable them to realise their core work value.

## The Patchwork Approach

Finally, we introduce as a third theoretical notion the patchwork approach, which emphasizes the strong change in the way young people now deal with education and career. In the industrial and commercial society there used to exist a fairly linear relationship between education and profession. The labour market was relatively stable and education enabled an individual to prepare himself for a specific position and acquire the precise knowledge and skills appropriate for a certain continuation course or a future job. Subsequently, people could continue to work for a long time in the same field, in the same job, or with the same organisation, during which time they built up a specific ability. The security anchor fits in well with this scenario.

At present, the labour market is much more dynamic. The linear pattern has been replaced by patchwork-like patterns. The patchwork approach emphasizes

**Figure 2**
*The patchwork of Life.*



that people 'compose' their lives and constantly combine different elements, both familiar and new ones, to create a unity, in the way an artist produces a work of art [Bateson, 2000]. The rise of this pattern can be largely attributed to the increased emphasis on self-development. In addition, gaining diverse experiences is a new way to create 'security' in the sense of good prospects. The career anchor challenge is an outstanding example of combining very diverse experiences. People with this anchor have an extremely competitive and ambitious attitude. Contrary to the functional types they do not pin themselves down to a single functional skill, but they seek variation and new challenges by changing their professional field. The patchwork-like composing of young people seems to fit in well with the increasing need for creative, synergistic professionals.

## Mismatches between young people, technology and the economy

In order to stay involved in technology later in life, it is necessary — but not sufficient — to realise the following:

1 the child or young person has gained positive experiences with a wide variety of technical activities and does not only associate technology with 'working with things', but also with 'creative designing for people'.
2 the child or young person has the self-confidence that he or she is capable of handling technology.
3 technology fits in the idea of the future or professional image of the child or young person.
4 the child or young person has the skills and capacities to use and develop technology.

Although technology still manages to interest many young people, not all personality types and career anchors are addressed properly. For this, the supply of technical activities is not sufficiently varied. This already starts at a primary school age. Although there are plenty of interesting extracurricular activities organised for this age group, they are usually of a realistic or investigative nature. This also applies to the secondary school. The situation is black and white: either young people get fully engrossed in technology by following a realistic study path (vmbo), an investigative study path (havo/vwo, universitary courses) or a creating study path (polytechnic), or they stay aloof from technology altogether (other types of education). In the non-technical profiles, sectors and types of education there is hardly any attention for technology, whereas in a technical stream there is little attention for non-technical aspects. This division between technical and social aspects stifles young people, all the more because they must fully choose for or against technology and science at an early age. Think of the choice of profile in upper general secondary education (havo) and pre-university education (vwo), the sector choice in lower secondary professional education (vmbo), and the fact that almost all studies at upper secondary vocational education (mbo), higher professional education (hbo) and university education (wo) have been organised according to disciplines.

One consequence is that young people with creative, enterprising and social-oriented competences come to the conclusion that technology does not suit them. Young people at the secondary school associate technology mainly with a world of things and technical expertise, and far less with a world of people and creativity.
They often are little aware of the designing and creative aspects of technical

**Figure 3**
*Left: Cooperating on building a dam in a watertank.*
*Right: Fabrication of soap.*

professions: they see doing sums and tests as the core elements of technical professions or mainly see the external image of the profession: the overalls and the not so clean work environment. Another consequence of the distinct division between technology and non-technology is that there are few possibilities to follow synergistic paths where technology is embedded into other competences.

The view most students have of technical professions fits in with the functional career anchor, with security and pure challenge. Young people hardly associate jobs in technology with a number of different anchors that link up to the developments that are central in the Florida Scenario, such as creativity, management, service and autonomy. It is notable that young people who do choose a scientific or technical type of education — and who are better informed about the contents of technical professions through family, acquaintances or friends — more often make a connection between technical professions and other anchors, such as service and dedication.

The current study and career paths are insufficiently varied and unilaterally focused on technical expertise. In addition, they are insufficiently focused on or are insufficiently associated with work values such as creativity, service and autonomy and with entrepreneurial and social goals and processes. The problem that science and technology students develop too few social and enterprising activity skills within the context of technology is widely recognised en is tackled by initiatives such as the Delta Plan. Different types of technical education integrate social aspects into their curriculum and realise a more integral development of competences regarding technology. The reorientation of education and careers should be taken one step further by reducing the division between technical and other education streams, by including much more technology into the non-technical education streams.

## The reorientation of education

In order to address other personality types and target groups, more drastic measures are required in the short term than the Delta Plan Science and Technology can realise within the given mission. In our view, the division between technology and social issues and the unilateral focus on knowledge, speciality, and professional competence does not fit in with a dynamic knowledge society. For a long time — when a linear educational model was still used — this division performed a positive role. By dividing technology and science and by strictly, internally subdividing the fields of study into specialities, it was possible to train specialists and professionals. We assume that this isolation and the focus on a singular speciality have increasingly worked to the disadvantage of (genuine) technical and scientific studies and jobs. The time has come to place technology and science much more within the context of creativity and the orientation on people. It should become clear that technology is not only about things, but also about people, and that several relationships and roles within the context of technology are possible and required.

This can be achieved by organising education around the design and creation of products and services for people (and possibly also by including the selling and use of these products and services) instead of focussing on monodisciplinary subjects in the curricula.
In order to realize this in the education system:

- make designing and creating the focal point of the curriculum;
- emphasize the people-oriented, creative and enterprising side of designing and creating;
- include technical and scientific expertise into the curriculum as one of the roles within the context of technology;
- increase the extent of realistic studying and problem solving;
- make flexible — and in particular synergistic – study paths feasible.

Technology is about designing and creating technical functional products in order to serve people and solve social problems. Designing is pre-eminently a creative process in which a synthesis takes place between various elements of knowledge in the field of humanities, science, and social science. During this process something new is created and social aspects are linked to technical intrinsic aspects. By emphasizing on the designing in all study paths — not only on those in the technical and scientific domain, but also in study paths with a socially oriented context — young people will become more involved in technology and will also become trained in qualities that are important in the knowledge society. Already in primary school, children can start learning how to design, as illustrated in the book by the project ‘Build your dream’ (‘Bouw

je droom'). In secondary school they have good experiences with the designing methods that have been developed by Techniek 12+ and Techniek 15+. These designing methods start by using technology in all kinds of places in society — from theatre and hospital to company and spatial planning in their own neighbourhood. This point of departure makes the problems and wishes of people visible and gives meaning to technology.

Giving designing a key role does not go at the expense of technical expertise. On the contrary, we expect that within the context of designing and tackling problems in real life this knowledge and skill will be acquired more often. Especially when working on design projects, children and young people are motivated to figure out the ins and outs of technical and scientific aspects. This is expected to have a favourable effect on the appreciation for 'genuine' science specialists and problem solvers. Indeed, knowledge and skill no longer are isolated concepts, but they are linked to valuable technical applications.

Education should offer young people more freedom to compose their own life and more possibilities to follow unique, personal study paths. In literature making study paths more flexible is especially recommended because, as a result, education will gain more significance for students and increase their motivation. From the viewpoint of this study, flexible paths offer the possibility to present technology education in different ways and, above all, to better bridge the gap between social aspects and technical substantive aspects. The most important reason for this is that science, humanities and social science students can take the same subjects or courses and work on the same projects, thus cross-influencing one another and, as a result, initiate development on a higher level. This way education will appeal more to the large group of young people that wants to change their field of study or profession constantly and wants to make connections between unique fields. Presently, education mainly focuses on specialists in certain fields or it consists of pre-defined combinations of fields of knowledge. By using flexible study paths, realizing career anchors such as challenge and entrepreneurship wil become more feasible for young people within formal education.

A higher degree of realistic studying or studying in a problem-solving way is also a useful development for including all disciplines in technology, and for training young people in applying and linking knowledge. Students experience the different (professional) roles in the chain process of examining, designing, creating, selling and using technology. This strategy is increasingly often applied in the technical stream of the education system. It would even be better if the non-technical streams of education were to participate in realistic projects with a technical component as well.

**Figure 4**
*Technopolis: cycling on a cable at a height of 5.2 m.*

Students get in touch with professional labour communities and with applying (new) knowledge at a young age.

Below we will elaborate on the above points of departure by providing examples of possible integral approaches of technology and synergistic paths:

1 *A varied range of activities for students at a primary school age.*
In primary schools, extracurricular organisations and out-of-school care facilities there are few divisions between the different disciplines, meaning that there are relatively many possibilities to design products and services on a full scale. The distribution and development of social, entrepreneurial and artistic activities in the field of technology, now absent from the range of activities, requires direction. A solution could be to establish professional education centres for technology and creativity.
2 *To approach technology 'from the outside in'.*
Realistic studying would have to start more often in places where technology is likely to be used in order to confront students with the 'real' problems and wishes of users.
3 *To work in mixed groups on concrete problems or designs.*
Designing products and services for users, solving a social issue, establishing one's own business, or collecting scientific information for social objectives is the common point of reference. This could be, for example, a design subject for all profiles, as a free-elective subject or course in upper general secondary education (havo) and pre-university education (vwo) or for all students of different universities and faculties.
4 *Developing synergistic paths as an alternative for specialist paths.*
It must be possible to make (synergistic) roles that are suitable for enterprising, creative and social personality types and for career anchors such

as service, challenge, and entrepreneurship, more comprehensive. For example, someone who has a strong urge to become an entrepreneur can learn the skills that are required for this.

The above proposal links up with both the Lisbon and the Florida Scenario and as such is robust. The skills that are trained can also be used outside technology. In order to implement this proposal new players will have to be involved in technology education. For example, parties that use technology within a social context, and training institutes and teachers in the field of humanities and social science. Indeed, initiatives to this effect have been taken, but the urgency of such initiatives is still unclear. After all, the political and social debate mainly focuses on the quantitative shortage of 'genuine' science specialists, whereas the bottleneck mainly lies in the 'qualitative' shortage. Although technical educational institutes, technical companies and (science) knowledge institutes have already started to collaborate, the collaboration ought to be expanded to include the players mentioned above. This expansion does not have to result in very large networks. It is rather a plea for diverse collaborations which now mainly contain many similar alliances within the scientific and technical domain. The Jet-Net Project, which was launched in order to increase the interest in science and technology among students and teachers in secondary schools, for example, could be expanded by inviting students of all profiles on locations where technology is used.

**Figure 5**
*During the design process, secondary scool pupils empathise with the problems of a rheumatic patient.*

## The masculine identity of technology

Our study into the career anchors of secondary school students shows that differences between girls and boys are more important than just their genders. Girls have to overcome an additional blockade; even when technical professions fit in with their work values and personality, the masculine identity of technology often makes them choose for other work areas that offer the same conditions of employment as technical work areas, but have a neutral or feminine identity. Therefore, removing the masculine identity of technology is essential in order to recruit more women.

Although emphasizing the social side of technology is important and can be used to lessen the masculine image, it must also be ensured that the stereotypical image — the idea that women are mainly suited for technology because of their social and communicative contributions — disappears as well. The fact that women focus on 'things' should not be underestimated, nor the focus of men on people and services. At present, this is the case, because in places where women perform (feminine) actions — such as cooking, making jewellery, working with medical instruments — this often is not considered as technology or working with things. The current definition of technology has become inextricably connected with masculinity. Consequently, role models and activities focused on the substantive nature of technology are also needed for girls. Although organisations that organise various technical activities for children and young people make sure that there are role models for both genders, there are still too many projects where masculine role models dominate, as they are more often available.

The development of the self-image deserves to get more attention in activities involving technology. Working with technology without a personal approach is in itself, especially for girls, not sufficient to identify themselves with a technical profession and to see themselves as technically competent. Older primary school girls, in particular, show an ambivalent attitude: even when they like technical activities and are proud of their achievements, they feel that technology, and especially a technical profession, does not suit them. Therefore, positive (and honest) feedback of parents and teachers, having children recognize their own capabilities, and the gender role models mentioned above, are very important.

## Appealing careers

The following three different, complementary solutions will make working for technical organisations and/or in technical functions more appealing to young people in an intrinsic way:

1 Promoting diversity and an open culture.
2 Strengthening the identification with the technical work environment.
3 Offering space for talent: increasing the responsibility for the own career and space for various career anchors.

Promoting the diversity and an open culture will ensure that a larger group of young people will be interested in working in the technical sector. This is also required to optimally deal with the social complexity of designing and creating products and services. The trick is to link up a diversity of persons and tasks within the organisation. This requires a common objective and identity to which both creative, enterprising and social people and specialists can commit themselves. The entire technical sector ought to link up more with the Florida Scenario: performing successfully, taking an enterprising attitude, being creative, being service-oriented and having an eye for social aspects. As this new identity is constructed in a more empathic way, new groups can more easily identify themselves with technology.

The value of technology and of technical companies should be made perceptible to young people. This can be achieved by linking technology to the social environment of young employees, music, sports, and looking after people. It is also important to organise work in such a way that starting employees are also assigned interesting tasks with responsibility, in order for them to discover that they 'can make a difference' in the company.

A hierarchical, directive culture does no longer appeal to young people. They are used to the openness of households characterised by a negotiative dialogue. More openness and space from the very start will have a positive effect on both young people and companies. Offering space means giving responsibility to young people, giving them the chance to learn, and offering guidance. Because self-development and a broad employability have become important, an increasing number of companies offer young people the space to design their own career. Fixed career paths no longer exist. There is a growing tendency to take into consideration the perspectives of young people (and those of the company). Smaller companies can realise more career opportunities for their employees by collaborating at a regional or sector level.

The space to design one's own career fits in with the patchwork approach

described above and can be used to address groups with diverse work values. Schein's career anchors can be used to design new career paths. At present, technical positions are popular because of the challenge, the possibility to realise the functional career anchor, and the security offered. In principle, however, all career anchors can be realised in the technical work environment in its entirety, even when not all values can be realised in a single job.

– Strengthen the three values (challenge, functionality and security) that make technical jobs appealing at present.
– Emphasize the values that fit in with the Florida Scenario, such as management, entrepreneurship, service and autonomy.

Security was and still is an important reason to choose technology. In view of the pertinent concerns about this among young people, it is important to realize and communicate more security, especially for people with a secondary education. More security and opportunities are mainly realized by lifelong learning and by developing a broad employability. Locally-oriented professions are least troubled by these dynamics and still offer the best chances to employees at the level of lower secondary professional education (vmbo) and the lower forms of intermediate vocational education (mbo).

## Solid innovation

Innovation of education and career, as well as extracurricular technical activities should be solid. That's why a combined economic strategy, in which both creativity and technical expertise are being promoted, will be the best point of departure. From this combined strategy various needs ensue for employees who can fulfil very diverse functions involving technology. Besides scientific and technical specialists, many synergistic, creative professionals are needed who understand what technology is about and who can integrate this understanding into their competences in order to contribute to designing, creating and distributing products and services, in which technology is applied.

We feel it to be advisable to focus on creativity in activities involving technology and to make more use of the differences between young people. The development of creativity and technical expertise guarantees an effective development and use of products and services that contribute to social and economic objectives. The Delta Plan should be expanded to also focus on a positive attitude towards technology among non-technical young people. Design projects in which young people of all profiles, sectors and types of education (humanities, science and social science) participate play a crucial role within this context. Technology is used to solve problems and to achieve important

objectives. This way technology will have significance and will be more appreciated by young people. In addition, the creative combining of diverse elements will be trained.

Through design processes young people also develop an eye and appreciation for various roles involving technology, from an enterprising and socially-oriented role to the role of technical specialist. For many of these roles there are no educational and/or career paths as yet. The introduction of flexible paths and realistic education will enable people to change their speciality more often and to practise applying knowledge.

## Publication Techniek als menselijk ontwerp; nieuwe opleidings- en loopbaanroutes voor jongeren

STT publication nr 69 *'Techniek als menselijk ontwerp; nieuwe opleidings- en loopbaanroutes voor jongeren' ('Technology as a Social Design; New Study and Career Paths for Young People')* is available in Dutch at STT/Beweton (telephone +31 703029830) at a cost of 24,95 Euro excluding postage costs. VAT is not required. Members of KIVI NIRIA and COS receive a 15% reduction. (ISBN 90-809613-1-0).

The book is the result of a collaborative effort of many experts from industry, knowledge institutes, government, education and organisations for technical activities. STT/Beweton owes them many thanks.

This study is the result of a a cooperation between COS (Consultative Committee of Sector Councils for research and development) and STT/Beweton.
Information on these partners can be obtained from

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STT Netherlands Study Centre for Technology Trends

www.stt.nl

## Netherlands Study Centre for Technology Trends

The Netherlands Study Centre for Technology Trends (STT) was founded in 1968 by the Royal Netherlands Institution of Engineers (KIVI.
STT/Beweton has the following aims:

- To evaluate technological trends from the viewpoint of the engineering sciences and to explore their interaction with other developments in society as a whole.
- To give wide publicity to its findings as a contribution to a more integrated picture of the future of society in the Netherlands and elsewhere.

STT addresses itself to industry, government, science and the interested layman.

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