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TA-SWISS Broadens its Perspective

Technology Assessment with a Social and Cultural Sciences Orientation

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Working Paper of TA-SWISS Centre for Technology Assessment

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Foreword

The TA-SWISS Centre for Technology Assessment enters unknown territory with the present report, which looks into the fundamentals and the design of an approach to technology assessment from within the social and cultural sciences[1].

The report, which was commissioned by TA-SWISS and the Swiss Academy of Arts, Humanities and the Social Sciences (SAGW), was triggered by the observation that in studies conducted by TA-SWISS up to now, technologies have often been treated as a "neutral," context-independent subject. Moreover, today TA-SWISS mainly assesses "natural science" technologies, understood as measures, installations, and methods that serve the practical exploitation of findings from the natural sciences.

From a social and cultural science perspective, this means that there is too little focus on the social / cultural context as well as a lack of assessment of the "social technologies." Attention to the social / cultural context takes into account that technologies are dependent upon society and embedded in a particular societal context. The term social technologies refers to technologies that attempt to apply social and cultural science knowledge towards solution of concrete, practical societal problems.

The present report addresses first and foremost the question: If social and cultural science considerations were built into the technology assessment agenda, how would this affect the content of the object of investigation of technology assessment? While consideration of the social / cultural context aims at improving and systematizing the existing field of activity, making social technologies the subject of analysis and discussion is tantamount to *broadening* the field of activity. The following report starts out from an "as-is" analysis of technology assessment, taking current technology assessment projects in Switzerland and other countries as examples. Then, tak

[1] The translator did not translate "Kulturwissenschaft" as cultural studies, but chose to make a direct translation: "cultural sciences". This counts on the readers being familiar with that discipline in the German tradition.

ing into consideration social / cultural context and social technologies, it sketches out possible desiderata and evaluates them with regard to future-oriented technology assessment.

Many thanks are extended to the two researchers who prepared this report and to the members of the supervisory group.

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Brief Summary for Readers in a Hurry

From the editor

“TA-SWISS broadens its perspective” is an apt way to describe the intention that led to the issuing of the mandate “For Technology Assessment with a Social and Cultural Sciences Orientation,” or SoKuTA, for short. The will to enter unknown territory stands behind this venture. For one, SoKuTA is to be carried out by consistent consideration of the social / cultural context in which the technologies under assessment are situated. For another, it will mean also assessing social technologies. In the opinion of the two social and cultural scientists who prepared this report, both of these things fall short in the work of TA-SWISS today.

Technologies do not appear out of the blue

Technologies and their developments are embedded in a societal context. Technology assessment (TA) projects can make essential contributions to analysis of this social / cultural context. The social and cultural science perspective also opens up new areas of investigation for technology assessment, namely, assessment of social technologies. Social technologies are technologies that attempt to make social and cultural scientific knowledge usable for solving practical problems in society. Both social technologies as new areas of study for TA and analyses of the social / cultural context should ultimately increase the policy-related relevance of TA projects and their findings.

Science researchers examined recent TA studies

The Steering Group of TA-SWISS – together with the Swiss Academy of Arts, Humanities and the Social Sciences (SAGW) – commissioned the two science studies researchers, Sabine Maasen at the University of Basel and Martina Merz at EMPA St. Gallen and the University of Lausanne, to take stock of recent technology assessment (TA) studies. The researchers examined whether and in what way TA projects in Switzerland and abroad built the social science perspective into technology assessment. In addition to this “as-is,” or current state analysis, the researchers

were also asked to formulate desiderata, desirable elements and approaches for future TA projects, from the perspective of the social sciences. This included also suggestions for future assessments of social technologies.

Possible new topics for TA projects

For both participatory projects and TA studies, the two researchers recommend that in future TA-SWISS choose starting points in social areas, such as the world of work (for example, administration), everyday life (for example, senior citizens), and innovation (for example, industry). In this way, the social / cultural context is also taken into explicit consideration already from the outset – in the very selection of the research topic and in the call for proposals.

Technology assessment of social technologies would be completely novel. Up to now, assessments of this kind have not been conducted by any of the TA institutes abroad looked at by the researchers. For this reason, they recommend as a first step the working out of a conceptual basis before selecting particular social technologies to be investigated (second step). The researchers are of the opinion that the following areas are possible subjects for assessment: New Public Management in public administration, coaching of management level executives in business organizations, or civic engagement as a new model of activity aimed at public welfare.

A new perspective on technology

For the development of TA grounded in the social and cultural sciences, the researchers present the TA-SWISS Steering Committee with a comprehensive list of starting points. Taking up on the suggestions would result in a new perspective on technology. In addition to the consequences of technologies, a new aspect comes into view: the social and cultural determinants of the emergence, acceptance, and application of these technologies. This perspective starts out from the assumption that the development of technologies can be understood as a social process.

Summary

In the following report on approaching technology assessment from within the social and cultural sciences, part one takes a brief look at the social science frameworks that make technology assessment necessary. Heightened awareness of the social dimensions of technology results in broader concepts not only of technology but also of technology assessment. Technology assessment in the proposed sense is interested in the social and cultural determinants of the emergence, acceptance, and/or utilization of particular technologies.

The second part of the report turns to analysis of the current state of TA-SWISS technology assessment, based on four recent TA-SWISS projects (Nanotechnology in Medicine, Transport Telematics, Pervasive Computing, Road Pricing). The analysis is presented following systematic points of view and illustrates aspects that we would like to emphasize in particular. Following that, we sketch out concepts of technology assessment as utilized by selected institutes in other countries (NL, DK, UK, F, D) and, based on that, present a summary of aspects that are worthy of consideration with regard to building the social and cultural science perspective into TA-SWISS studies.

The third part of this report deals with social technologies. What is meant by the term is explained and expanded in analogy to the general term of technology. We then present a particularly suitable object of study for social technology assessment (STA): control models based on (self-) management in public administration, business organizations, and politics. This will be outlined taking the examples of New Public Management (NPM) in public administration, coaching of management-level executives, and civic engagement in politics.

Part four of the report emphasizes first that TA institutions and instruments are located at the interface of science and politics and therefore face dilemmatic demands: In any technology assessment study, orientations to science (technology studies) and to politics (policy advising) must always be balanced out. In addition to the orientation towards policy advising taken up to now, we recommend taking stronger orientation from the (social and cultural) sciences. We then formulate desiderata that re-

sult from this orientation with regard to process, content, structure, and quality of future TA and make some recommendations.

The fifth and last part of the report is a summary evaluation of a social and cultural sciences orientation, concluding that it improves the effectiveness of TA with regard to reflection, clarification, and the advisory function. In particular, consideration of societal factors does justice to the increasingly rapid dynamics of technology development and technology assessment in society.

1. Science & Technology in the Knowledge Society

1.1. Science in the knowledge and risk society

The relation between science and society is currently undergoing rapid change. More and more areas of life, both everyday and professional, are based on scientific and technical knowledge. This finding, first emphasized by Robert E. Lane (1966) in the 1960s, when he spoke of a “knowledgeable society,” is acknowledged generally today. Strong statements for support of the concept, in particular by Nico Stehr (2003) and Peter Weingart (2001), have led to the ascendancy of this self-description of present-day societies.

The concept of the knowledge, or knowledge-based, society carries with it a promise, namely, that a social order based on knowledge is more socially just, economically efficient, politically rational, ecologically adaptive, and therefore better altogether. However, this hope stands in conspicuous disproportion to a number of other topics in the public discourse: Where scientific knowledge increasingly drives societal and technological development, reservations, and from time to time, resistance, against the risks and dangers of this development also grow. Especially in connection with large technical installations (such as nuclear power plants) or recent technologies (like genetic research, nanotechnology), the insight has become widespread that the risks and unintended side-effects multiply – in parallel to scientific-technical progress and as a result of that progress. From this perspective, the knowledge society is at the same time a risk society (Beck 1992).

For the appraisal and assessment of the benefits and legitimacy of knowledge in society, this finding has serious consequences. Where scientific-technical progress produces not only opportunities but also risks, there is a threat of a loss of trust in experts and experts’ opinions. The threat is increased and reinforced by the fact that especially in publicly debated controversies on what are called risk technologies (such as pharmacogenomics, embryonic stem cell research), different experts arrive at contradictory results. It now has to be assumed that science no longer functions as the producer of unambiguous knowledge (Grunwald 2002: 45).

Furthermore, increasing scientification increases the pluralization of social action and political decision-making:

> *'Scientification' of areas in society therefore takes place, but it does not result in standardization of social action and political decision-making, but instead confronts society and politics with normative ambiguity, uncertainty, and non-knowledge (Wehling 2003: 121, freely translated here).*

The sciences respond to this feeling of uncertainty in society by turning to reflective forms of self-observation. The program of science and technology studies (STS) is not least due to this change in perspective. In this way it comes increasingly into view that in the knowledge society, not only knowledge and risks but also knowledge and non-knowledge grow in parallel (Maasen 2004; Böschen, Wehling 2004).

1.2. Technology assessment

Originating in the early 1970s, technology assessment (TA; German *Technikfolgenabschätzung*) attempts to analyze and evaluate the impacts of applications of scientific-technical knowledge in modern society (for example, arms technology). The problems were sketched out above: scientific expertise is undergoing a not insignificant loss of trust; possible side-effects are seen as less and less predictable and controllable; the perception of uncertainty and non-knowledge is constantly increasing.

In reaction to negative experiences with large-scale technologies (such as nuclear energy technologies) the hope grew that by analyzing and evaluating future technologies, knowledge relevant to action, prognosis, and orientation could be produced in advance for responsible handling of the technologies. The implicit belief that public policy can shape technology left behind to a certain extent the technology-determinist way of looking at things by earlier technology analyses and evaluations. A paradox remained, however (Collingridge 1980): in order to generate policy-relevant action knowledge, the (undesired) consequences of a technology have to be already predicted. But the time point at which this becomes possible is often enough

too late to be able to regulate and control the technology at all. Measured against technology assessment's own ideals, namely, to be anticipative, comprehensive, and oriented towards decision-making, Werner Rammert (2000), sociologist of technology in Berlin, identifies three dilemmas of technology assessment:

- *The timing dilemma*: As an early warning system for technology impacts, technology assessment is confronted with the difficulty that it must make a decision on the point in time for study and control or correction interventions. The earlier the study begins or actions are taken, the less possible it is to predict impacts clearly. The later the study begins, the greater the probability that the technology is not amenable to control, because certain impacts and side-effects are already irreversible.

- *The identification and integration dilemma*: In order to be able to assess the entire spectrum of possible impacts (comprehensive assessment), the participation of as many different scientific disciplines as possible is required. However, if a common object of study is not identified and the various disciplinary perspectives are not integrated, there is a greater danger that the attempt will fall apart into study of discipline-specific isolated issues and misjudgments made.

- *The effective control dilemma*: In order for the findings of technology assessment to have a real and correcting effect on development of the technology, technology assessment must address all actors that are involved in applying the findings. However, as government, the economy, and science all follow their own different rationality standards, the problem of how there can be steering (control) of all actors remains ultimately unsolvable.

  Again, the trap for technology assessment can be summarized as follows: If conducted too soon, it is in danger of being incorrect; if too late, it can hardly turn things around. If it is to be comprehensive as to subject matter, the result can be isolated findings that stand in no relation to one another; if it reduces complexity too much, it may contain "blind spots" in observation. If it is con-

> *ducted socially speaking in differentiated institutions, interpretation of the findings into the different rationalities of the institutions delay and distort control effectiveness; if it is integrated too strongly within one single institution, it loses both legitimacy and control effectiveness. (Rammert 2000: 25)*

Technology assessment has become increasingly aware of its methodological and strategic dilemmas in recent years and has begun to test and implement new methods. Informed by the latest results from the field of technology studies, it has expanded its methods to include sociology of technology and organizational sociology approaches. The “strategic framework” (“strategisches Rahmenkonzept”) of technology assessment (Paschen, Petermann 1991) is undergoing change: innovation analysis, social construction of technology and social shaping of technology belong to the most important conceptions in the new strategic framework. In this connection, moreover, the conception of technology is no longer being restricted to physical technologies (things, artifacts), and a conception of technology development as a process is finding increasing acceptance (Grunwald 2002: 53).
In the following, we would like to sketch out briefly the assumptions and findings of technology studies that underpin this development, with special emphasis on the following research approaches: social construction of technology and social shaping of technology. We aim to explain in what way and with what methodological and research strategic consequences social and cultural science knowledge plays a role in the development, use, and evaluation of technology. In the German-language original text of this report, the conceptual extension of *Technik* to *Technologie* will be especially important (see Box 1).

Box 1: A note on the distinction made between *Technik* and *Technologie* in German

In the original German-language text of this report, we have so far used *Technik* and *Technologie* largely synonymously. This is also because the English word “technology” would not be translated into German as *Technologie* but as *Technik*. This distinction goes back to Aristotle, who distinguishes between *Technik* as an ensemble of particular skills, action schemata, and technical specifications (products) and *Technologie* (from the Greek roots *technè* = skills and *lógos* = reason, rationality), which is based on a particular rationality. Following Aristotle, *Technologie* goes beyond the material solution to include also the rationality that lends plausibility criteria to a particular technical method and determines the appropriateness of the chosen technical means with regard to the desired purposes. This rationality essentially refers to the strategies for effective action that form around technical apparatuses, namely, *legitimacy strategies* (for example, obtaining acceptance), *implementation strategies* (for example, legislative process), and *qualification and ability strategies* (for example, operating instructions, training requirements).

Technik and *Technologie* will be used synonymously in the rest of the original German-language report, but please note that also when we speak of *Technik* or *Sozialtechnik*, we never mean exclusively a technical or social technical specification of a particular solution to a problem – again, a problem mostly already defined as technical – but instead a systemic understanding in the sense of *Technologie*.

1.3. The importance of the social in technology

The social construction of technology and social shaping of technology are research directions that conduct technology studies with a strong social and cultural science approach (see Maasen 2004). Methodologically oriented to social constructivism

(see Merz 2005), they reject the basic assumption of technological determinism and operate with an extended understanding of technology as a process:

- Technological determinism, which sees technology development as independent of societal development, is countered with the concept of the *interpretive flexibility* (see Box 2) of technical artifacts. With this, the in principle flexible, open to experience, and multidimensional processes of technology development and technology use become the focus of attention.

- Closure of the interpretative flexibility of technical artifacts to a particular purpose of use is not determined already beforehand by the intrinsic properties of the artifact itself but by social negotiation processes between relevant social groups (inventor, entrepreneur, user, associations) involved in the development and use of the artifact.

Trevor Pinch and Wiebe Bijker (1987) provide instructive examples of this in their classic investigation of how the safety bicycle became dominant (see Box 2). In a detailed empirical examination, they show that in the development of the safety bicycle, technology development took place in a multi-dimensional process of the networking of different social actors in technology, industry, and the public. By focusing on the social processes in heterogeneous actor constellations (see Box 2), the authors sharpen our awareness for the sociohistorical dependencies of technology development.

Box 2: The social construction of the safety bicycle

Taking as an example the development of the mass-produced bicycle in the years 1860-1890, Bijker (1995) demonstrates that the changes to the material product resulted from solutions to problems that individual actors had (for example, the development of air tires; see Box 3). The analysis is conducted in four steps and provides, for social and cultural science technology assessment, indications about the sounding out of the acceptability of a technology. Step 1: Identification of the relevant social groups, that is, those groups that participated or are participating in the development of the technology and that each have their own ideas about type and function (*interpretative flexibility*). Step 2: Identification of the specific problems of the individual relevant social groups. Step 3: Identification of possible solutions, which leads to design changes in the technology. Step 4: Analysis of the question of how closure and stabilization of the technology occurred. Closure describes the reaching of agreement within a social group; the stabilization process describes the reaching of agreement among several social groups – and thus the diminishing of interpretative flexibility. One meaning becomes dominant; the technology in question has now 'hardened.'

These and other studies on various levels have contributed to technology analysis that has a social and cultural science orientation:

- By now, the focus of attention has turned mainly to the social practices that play a role in technology development, technology diffusion, and technology use. The social actors, the social factors that enable a technology and the diverse forms of utilization are examined in detail (see Box 3).

- When speaking of the social factors that enable a technology, it is also important to speak of the *path dependence of a technological* development, that is, the dependence of an established technical solution on past developmental pathways, the entire sequence of decisions made by actors. From this per-

spective, the interest is in innovation and implementation systems of technology. Thomas P. Hughes provides an example of how the complex network structure of actor constellations in development of a technology favors particular technical solutions (and does not favor others) in his study *Networks of Power: Electrification in Western Society, 1880-1930* (Hughes 1993). In a comparative study of the history of the power networks of Chicago, London, and Berlin, Hughes found that the "invention" of a particular form of such a large-scale system occurs in close dependency on the actor constellations in which it is embedded. Thus, in addition to investigation of the concrete, "hard" technical solution, the analysis is directed towards *institutions*, *action patterns*, *interconnections among actors*, and so on. In this respect, the perspective is broadened, to put it roughly, from investigation of the artifact in its hard form to the "hardening" of the artifact. Hughes' concept of *technological momentum* (Hughes 1993) states that when a technology is young, society has more control over it. But the technological system then gathers its own momentum due to material specification of the technical solution; the economic investment in the new technology, which encourages the investors to maintain and support it; the political stability of spheres of vested interest, and the cultural power of self-perpetuating practice by scientists/engineers and users of the technology.

- In this connection, recent technology studies make the specific form of knowledge (scientific, economic, political, and so on) and knowledge production the subject for discussion, which is revealed in these investigations. One speaks here of *hybrid, or distributed forms of knowledge production*, meaning two things: For one, technology as material specification is seen as the result of social negotiation processes. Here it must be emphasized that not only scientific-technical but also non-scientific forms of knowledge play a role. For another, the term 'hybrid' refers to a social ontological level that assumes equal ranks for the technical and non-technical artifact: technology and technology users influence each other mutually. Michel Callon and Bruno Latour's actor-network theory (1992) continues to be very influential here.

- Insofar as technology studies takes an explicit cultural science orientation, it starts out, on the one hand, from *the way that people deal with technical artifacts*. On the other hand, cultural science technology studies always ask about the situatedness of technology in everyday life. This is the experience dimension of technology. The aim of investigation is to analyze the open or hidden, conscious or mostly unconscious influence of technology on the way that people shape their lives (Hengartner, Rolshoven 1998).

Once these shifts in perspective have found acceptance, the emergence, diffusion, and utilization of particular technologies can be described according to the *strategies of technicization* that are used by the actor groups involved. Thus, a technology may emerge as an artifact, but at the same time its form, function, or aesthetic has inscribed itself into social and cultural practices. In this way, technology always remains more or less open to new – and also unforeseeable – interpretations and uses. This also has consequences for the type of consideration of ethical, legal, or economic aspects. These aspects are increasingly being described in their interaction:

- In the controversies on future technologies both within the sciences and within society there is a lack of agreement in the normative ethical dimension. Here, evaluations of the consequences and impacts of technologies, and their desirability, play an important role. The dissenting opinions concern both possible risks and assessment of technology's compatibility with health and the environment, societal acceptability, and social compatibility (Skorupinski 1998). In technology discourse, this is called the "normative turn" (Ropohl 1996), which makes itself noticeable in technology assessment in the fact that ethical deliberation in technology assessments is becoming commonplace.

- Insofar as new technologies mark out legally unregulated terrain (mainly in the areas of biomedicine and information technologies), normative deliberation includes considering the opportunities and risks of legal regulation, that is, regulatory impact assessment [Gesetzesfolgenabschätzung] (Böhret, Konzendorf 2000).

- Beyond that, of especial importance is the new form of consideration of *economic arguments*. There is increasing interest in the sustainability of economic systems and in evaluation of alternative (technical) options. The economic efficiency of products or methods is also being considered more often in connection with other criteria, such as acceptance, safety, and sustainability (Schade 1992).

Taken all together, these re-orientations show technology and its development as an open-ended process that is open to interpretation and re-interpretation, use and change of use. Not least the *diversity* and *interaction of the factors of technicization* prove the necessity for a social and cultural science perspective on technology development: In today's society, we understand technology development as the result of material, legal, ethical, economic, social, and cultural determinants and deliberations. Technology assessment that seeks to consider the entire process of technology development and evaluation must, therefore, redefine itself.

Box 3: Technology development as a sociotechnical system

A case in point is the history of the bicycle air tire (see Bijker 1995; see Box 2): The inventor of the pneumatic tire, John Boyd Dunlop, saw the air tire as an anti-vibration device, the best solution to the vibration problem, increasing comfort while riding the bicycle. This was correct in the technical sense but not in a social sense, for bicycle riding was seen as a risky sport by the dominant cyclists of the day, the "young men of means and nerve." Making bicycle riding more comfortable was not a concern to the sport cyclists; on the contrary it meant a decrease in prestige. It was only when cyclists riding bicycles with air tires began to win the races that this group changed its opinion of the new tire technology: the comfort tire was re-interpreted as a "high-speed device" and won out as a solution to the "need for speed."

1.4. Towards a broader perspective in technology assessment

“In culture there is (virtually) nothing that could not be called technical. Modern culture is *technomorphic*, that is, its essential manifestations are technologically molded” (Böhme 2000: 164). In extending this thought, technology assessment based in the social and cultural sciences examines not only the consequences but also the meaning and societal use of technology. The supposition that our culture is technomorphic has further implications: It leads to:

- first, an *extended concept of technology*. In addition to “material,” or physical, technologies, what now comes into view is, for one, technologies that create sociality (for example, process methods like New Public Management, civic engagement, or participatory technology assessment); these produce specific forms of community or society and in this sense are “social technologies” (see part 3 below). For another, we can think of Foucault’s “technologies of the self” (for example, widespread and highly diversified practices such as therapies or self-management), by which people constitute themselves as specific subjects using disciplined methods of working on the self;

- second, the insight that all technologies as sociotechnical systems should be analyzed in principle in three dimensions – that is, with regard to their *material, social cultural, and subjectivity-related* determinants and consequences and with regard to the interaction of these dimensions (see Box 3);

- third, the adoption of a *systemic perspective*: While you can choose to not own a car, because you believe cars to be uneconomical or damaging to the environment, as a pedestrian your behavior is still shaped by conformity to cars, or you choose another means of transport. The question of sustainable, ethically responsible, socially just technology development can be answered only relative to technological systems (here, the transport system).

As a consequence, it is just as impossible to escape the technomorphic definition of society as it is to escape the ambiguity of its cultural and political effects (Ropohl

1985). Each physical, sociality-creating, or subjectifying technology indeed contains *codings of handling* it (Böhme 2000: 177) and shapes options for action. At the same time, it does this in a non-deterministic way, for there are socially / culturally specific (such as milieu-specific) assignments of meaning and forms of use.

For technology assessment, arising from the fact that it cannot restrict itself only to the impacts of technologies, there is a need to extend the perspective to encompass social (for example, access to particular technologies) or cultural (for example, changes in forms of communicative interaction) dimensions. And further, the task is to take into consideration the social and cultural determinants of the emergence, acceptance, or utilization of particular technologies.

This systemic and ambivalence-friendly dual perspective on social / cultural *determinants* and *consequences* of certain technologies is particularly advisable for “future” technologies like nanomedicine. Precisely in the early stages of technological innovations, culturally shaped expectations of the technologies, articulated through narratives, metaphors, utopias, or dystopias, are very informative regarding their development. But expectations also accompany the innovations in later stages and have an influence on forms of use and acceptance thresholds.

At the end of this part, we should once again note that by using *Technik* and *Technologie* (see Box 1 above) synonymously, the focus of the study of specific technologies broadens to encompass the sociotechnical systems within which they arise. This includes the great variety of and interaction among *factors of technicization* (for example, material, cultural, ethical) as well as the *strategies of technicization* (for example, changes of use*)* utilized by the actors involved.

2. TA Projects in Switzerland and Abroad ("Current State" Analysis)

Note from the editor:
How were the TA-SWISS projects selected for the following analysis of the current state of TA? The goal of the mandate was to examine whether and to what extent social cultural shaping and social technologies have already found their way into current studies conducted by TA-SWISS (and by European TA institutions).

The authors of this report checked for these two aspects by looking at examples of recent projects: For the aspect of social shaping, at least one study conducted within each of the current fields under study by TA-SWISS ("Life Sciences and Health", "Mobility," and "Information Society") was examined more closely.

To examine whether social technologies have been made a subject for discussion, the authors of this report looked at projects at other European TA institutions and at the TA-SWISS project "Publifocus on Road Pricing."

The TA-SWISS projects examined here were selected independently of any evaluation of content. Direct references to individual studies were largely deleted from the present report.

2.1. Projects conducted by TA-SWISS Centre for Technology Assessment

The following considerations were based on examination of four TA-SWISS projects:

- Nanotechnology in Medicine[2]

[2] See www.ta-swiss.ch/www-remain/projects_archive/life_sciences/nano_e.htm for a description of the nanotechnology study and links to the complete study report (German, 124 pages) and to "Cutting nature's building blocks down to size: Abridged version of the TA-SWISS Study «Nanotechnology in Medicine»" in English (10 pages).

- The Precautionary Principle in the Information Society. Effects of Pervasive Computing on Health and Environment (*Das Vorsorgeprinzip in der Informationsgesellschaft. Auswirkungen des Pervasive Computing auf Gesundheit und Umwelt*)[3]

- The Networked Vehicle. Transport Telematics for Road and Rail (*Das vernetzte Fahrzeug. Verkehrstelematik für Strasse und Schiene)*[4]

- publifocus Road Pricing[5]

The studies that we selected for examination represent a collection of topics that are considered to be of particular importance to society and in need of regulation. The fact that these areas became the subject of technology assessment shows that they were given expert-based, methodologically-guided, and systematic consideration. This is always done with the aim to in this way provide a scientific basis for political and legal decision-making under consideration of further factors (for example, economic, ethical, and medical aspects). The studies have different foci and preferences: whereas some of the studies find it important to describe their methods explicitly, others explain unexpected or counter-intuitive impacts of technological innovations or attempt to plumb the depths of the mutual interaction between people and technology by examining individual aspects. The "publifocus" (participatory) study on road pricing takes into heightened consideration social and cultural science issues. The following examination of the studies is organized according to systematic aspects and illustrates points that we would like to emphasize in particular. Although important positive aspects of the projects are stressed, the following analysis concentrates mainly on the issue as to where and how a social and cultural science per-

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[3] See www.ta-swiss.ch/www-remain/projects_archive/information_society/pervasive_e.htm for a description of the pervasive computing study and links to the complete reports in German (349 pages) and in English (353 pages) and to a summary in English, "Our everyday life caught in a network of smart objects. Summary of the TA-SWISS study «The Precautionary Principle in the Information Society»" (14 pages).

[4] See www.ta-swiss.ch/www-remain/projects_archive/energy_mobility/verkehrstelematik_e.htm for a description of the traffic telematics study and links to the final report in German (105 pages) and to an abstract in English, "On the road to intelligent mobility. Abstract of the TA-SWISS report «The Networked Vehicle.Transport Telematics for Road and Rail»" (15 pages).

[5] See www.ta-swiss.ch/www-remain/projects_archive/energy_mobility/roadpricing_e.htm for a description of the road pricing study. The report in German (53 pages) is available at www.ta-swiss.ch/www-remain/reports_archive/publications/2004/Bericht_PublifocusRP_dt.pdf and in French (56 pages) at www.ta-swiss.ch/www-remain/reports_archive/publications/2004/Bericht_PublifocusRP_fr.pdf

spective would allow for a more comprehensive evaluation of the technology in question.

2.1.1. Defining the field

While all of the projects examined deal in detail with technologies that have social and cultural importance, it is conspicuous that social or cultural aspects tend to remain unconsidered (the road pricing study is somewhat of an exception here). This finds expression first in the technology concept used: all of the TA studies examined start out from a *narrow conception of technology*. This is the case in three, related regards: First, all of the studies take as the starting point of their evaluations a *physical (future) technology* rather than, for instance, a sociotechnical context. Second, all of the studies take a rather *technological deterministic* perspective: material technology is the driving force behind all developments, also social and cultural developments. Third, the studies focus on the *consequences* of the technologies being analyzed. In this connection, interest centers as a rule on ethical and, following that, economic and legal consequences or environmental impacts. None of the studies addresses the determinants of the emergence and development (genesis) of particular technologies. The question would therefore be: What makes these technologies possible and necessary?

In addition to that, the legitimacy and fundamental desirability of all of the technologies evaluated are beyond question; the TA studies focus on assessing possible specific side effects. A further aspect is the issue of possible *technological and legal obstacles to development*. This issue in this connection is social *acceptance* of a technology and its possible developmental dynamics: also from this perspective the studies examine only the impacts of a technology on individuals or groups.

The studies do not, as a rule, examine the societal context in which a technology is *situated culturally and historically*. However, this is already set down in the way that TA-SWISS formulates the research study commissioned: according to the instructions, the technologies to be analyzed and evaluated are to be isolated to the largest degree, to be structured internally in a pragmatic fashion, and consequences of the above mentioned types to be specified (for the study on pervasive computing, the

research instructions explicitly restrict the analysis to impacts on health and the environment).

2.1.2. Technology impacts

All of the studies are aware of how difficult it is to identify the possible consequences of a technology and to make recommendations on how possible negative consequences can be countered through political or legal measures. They rightly point out that their statements are dependent on a particular point in time, and they often recommend ongoing technology assessment in order to prevent reliance on snapshots that quickly become obsolete.

- Our look at the selected TA projects of TA-SWISS revealed first of all that they do not precisely define the *concept of risk* utilized but instead refer to a colloquial meaning of the term risk. This is also true of the research mandates formulated by TA-SWISS. Where the concept is defined more precisely, it is defined individually. This fosters a certain degree of arbitrariness, for one, and in any case non-uniformity as to risk assessment. For another, in this way the studies are unable to connect with the risk debate in the social sciences, which could give further support to the design of the TA studies and findings. In particular, there is a lack of explicitly listed criteria for the assessment of opportunities and risks.

- Due to their use of a materially-oriented and deterministic concept of technology, all of the studies focus exclusively on 'impacts,' 'effects,' and 'consequences' of specific technologies and leave the *determinants* of science and technology development largely unconsidered. This also finds expression in the fact that 'technical' and 'social' risk assessment are mostly dealt with separately. The way society deals with comparable technologies is mentioned in only one case, but it is not worked out systematically. None of the studies considers the fact that the public is already sensitized by diverse risk debates and that this must be taken into consideration in the technology study being conducted. For example, one could ask what fears and hopes are triggered *in*

general by biomedical technologies and, upon that background keep an eye out for *specific* fears that people may have about nanotechnology.

- It is precisely in the case of future technologies that *visions* play an important role. The problem, however, is that visions, or future-oriented "imaginaries," are treated as supposed, or anticipated uses. Completely left aside is the aspect that visions also contain utopias or dystopias and altogether should themselves be seen as socially / historically specific sketches of present society. Instead, they are held to be descriptions of future realities that in turn can be subjected to 'vision management.'

- None of the studies deal with the *semantic* and *communicative side* of technology assessment: The impact of stories, metaphors, forms of speech, and images in particular would be an important part of the analysis of future technologies. By way of what (language) images do we think about and communicate thoughts on *nano*medicine, traffic *telematics*, *pervasive* computing? The exception here is the Road Pricing project, which deals explicitly with "linguistic traps" that come up when problematizing this technology. Instead, the calls for proposals and the studies frequently use symbolically laden images themselves. For example, they speak of "*Technologien zur totalen und nahtlosen Vernetzung von Mensch und Maschine*" [technologies for total and seamless networking of man and machine] (text from a call for proposals). Images such as this should be avoided, or they should be explicated by the study commissioned.

2.1.3. Methods and empirical understanding

All of the studies employ methods that are adequate and combine diverse methodological approaches. This accords with the transdisciplinary character of all technology assessment topics and takes their complexity into account. The problems that we observed are in part also typical of interdisciplinary work in general: in particular, the problem of integrating the diverse findings is notoriously difficult.

- The projects for the most part do not discuss their *methodological approaches* systematically. Usually, the methods applied are simply listed, and the reasons for selecting them are not given, even though this would be possible. The studies also leave open the criteria according to which the data are gathered, interpreted, and integrated in the reports. Here again, if transparency were increased, the technology assessment studies would have better connectivity to other findings and investigations.

- With one exception, all of the projects follow *methodological individualism*: they enquire about the impacts of particular technologies on individuals or groups of individuals. Society – in the sense of social communication on technologies – and culture – in the sense of culturally specific ways of dealing with technologies – lie outside of the methodological framework.

- The subjects for study mostly demand an *interdisciplinary perspective*, as TA-SWISS also explicitly requires. While as a rule the studies were conducted by multidisciplinary teams, no explanations are given for selecting a particular combination of disciplinary expertise for different parts of the studies or for how this affects the findings. Beyond that, to make the most sense of the findings and recommendations, it would be useful if the researchers addressed the possibilities and difficulties entailed in integrating heterogeneous areas of knowledge.

- The projects are characterized by a specific *empirical understanding*: As the topics are not set into relation with social or societal theory, their internal structure often seems plausible but not compelling. On what basis is the particular sketch of the problem legitimate? Somewhat confusing is the further tendency to deal with numerous, quite detailed phenomena, which then receive only cursory treatment. We believe that well-founded, systematic selection and description of fewer dimensions or case studies, with only some illustrative examples treated in depth, would contribute towards a more precise understanding of the technology in question. In this connection, the call for proposals for the Traffic Telematics project is illustrative: it called for narrowing down the

topic of traffic telematics to some typical applications or case studies. But the researchers who later conducted the studies were able to convince those commissioning the studies that the scenario technique had advantages over the suggested procedure by arguing, among other things, that a few cases could not cover the whole area of traffic telematics.

- For the same reason, the ‘exactifying’ mode of some of the projects seems problematic: sets of figures and tables for detailed phenomena tend to disguise the overall evaluation of the technology studied rather than throw light upon it. Here again, well-founded, systematic selection and description of fewer dimensions and the use of only illustrative, or perhaps qualitative, data material would be preferable.

2.1.4. (Lack of) social, societal, and cultural concepts

As indicated above, the TA-SWISS projects tend to be oriented to assessment of the impacts of specific technologies based on methodological individualism. Although society and culture are mentioned, when these terms appear they are used either in a pretheoretical, non-explicit way or in restricted definitions or meanings. While technology assessment studies should not be overloaded with concepts and explanations from the social and cultural sciences, making use of more substantial concepts would increase their analytical depth in detailed examination.

- Consequences or problems that arise for society are mostly *captured indirectly* as ‘ethical aspects’ or as ‘sustainable aspects.’ In alternative fashion, fields such as medicine and health or environment are singled out and focused on as evident ‘societal’ topics. In parallel to this, a number of important social / cultural dimensions of technology are touched upon very briefly, either to delegate the issues to future research or to deal with them *ad hoc*. For example, one of the projects treated the important topic of the compatibility of work and family in only one short paragraph. This means that the social is often treated as an isolated category rather than viewed as an integrative, constitutive part of sociotechnical systems. This distinctly separate treatment of technological possibili-

ties and social factors reinforces the impression that technological processes are neither situated in nor shaped by society and culture.

- The most frequent implicitly used meaning of society in the projects is that of '*acceptance*': Here society appears as an anonymous vis-à-vis, whose consent has to be gained and whose resistance one fears; for this reason 'potential conflicts' are sought. In correspondence with this configuration, many of the projects use 'control rhetoric': How can societal obstacles to development of certain technologies be best avoided? Public discourse is also viewed one-sidedly as a 'control option.' This blocks from view the fact that public discourse and technology assessment itself can be understood as a resource for problem perception and communication. Also not taken into consideration are various forms of dealing with one and the same technology and the opportunities that arise for the acceptance of a technology precisely because of its possible heterogeneous uses and applications (for example, differing forms of appropriation of new medical technologies by men/women, youth/the elderly).

- Obviously, no single study and no participatory method can clarify all of the fundamental issues connected with the topic under investigation. This holds especially for basic anthropological assumptions. Nevertheless, it is not entirely sufficient to relegate topics belonging to the area of 'what we are as humans' to a residual category called '*philosophical questions*.' Instead, in relation to the technology being assessed, each single project should be able to examine the question of 'what kind of society we want to live in' or 'what the condition or state of our culture is' in which the specific technology will be implemented. Insofar as they pose questions of this kind, the projects that we examined state them generally and leave the answers up to 'societal discourse.' That is, questions raised by the social and cultural sciences are often dealt with by the projects by indicating that there is a need for *participatory methods* or by leaving them up to political decision-making. Even if technology assessment in fact can not replace public discourse, technology assessment studies still have the important task to treat the issues intensively and thus provide important input and impetus to public discussion. This does not mean that technology assessment

studies should themselves give answers that set the direction, but they can indeed help to provide structuring. This refers, on the one hand (as has been done up to now), to clarifying potential medical dangers or technological risks, but it also means exploring ethical dilemmas, group-specific acceptance problems, or culturally shaped expectations (hopes and fears) of specific technologies. These aspects can be compiled as criteria for public and/or political debate and consultation.

- It seems advisable to state what users the experts of the individual projects are addressing and for what reasons. Up to now, there is a lack of systematic treatment of the various *user categories*, on the one hand, and the in part ambivalent *forms of use*, on the other. User categories are not differentiated systematically according to social categories (for example, age, education, social background) but instead varied arbitrarily according to aspects of the subject matter. Specific groups are occasionally picked out (such as drivers of cars, patients, office workers, mothers) or part aspects of society addressed (such as the market), but the criteria for making the selection are not disclosed.

Without a doubt, technology assessment studies face the difficult task of considering the opportunities and risks of a future technology in such a way that all relevant dimensions are taken into account; what is more, all this has to be transferred into a feasible, comprehensible study that is plausible for all parties that are involved in deliberation and/or decision-making. Technology assessment projects do not have the resources to conduct several years of academic study, nor are they addressed to an academic community of specialists. That is the reason why technology assessments must perform a balancing act between scientific respectability and the goal of communicating knowledge to policy makers. In many ways, the projects handle this balancing act successfully. However, the way in which the balancing act is conducted can profit from a stronger social and cultural science orientation in various respects:

- First, a social and cultural science perspective supports consideration of *further relevant dimensions* of each technology development. Some examples of this

are historical experiences in dealing with new technologies, culturally specific uses, or potential conflicts in the implementation of innovations.

- Second, and going beyond that, the social and cultural science perspective urges a *systemic* view of technology development: 'strategies of technicization' are observed and evaluated; these strategies contain material, but also social and subjectifying aspects. The combined examination of technological potentials, individual wants, collective expectations, and culturally shaped images of technology, as well as consideration of the interaction of the various factors, are prerequisites for an improved understanding of technology development on the one hand, and for impact assessment that is appropriate to the technology studied, on the other.

- Third, this perspective definitely has *new topics* in store for technology assessments (see part 3 below).

- Fourth, the social and cultural science perspective, through stronger inclusion and reference to social and cultural science research, allows for a division of labor with the scientific discussion and can focus more strongly on policy and communication-oriented dimensions.

2.2. Technology assessment with a social and cultural science perspective at institutes in other countries

Within the framework of the mandate of the present report, investigation into technology assessment with a stronger social and cultural science orientation is by necessity exploratory in nature. The intent is not to make a direct comparison of TA-SWISS and TA institutes abroad with respect to thematic foci, methodological approaches, or project structures. Instead, we are interested in what impetus can be identified in the TA activities of partner institutes abroad for a possible reorientation of TA-SWISS towards a program with a stronger social and cultural science direc-

tion. Accordingly, the following account does not document in great detail the thematic foci of the institutes that we looked at. In particular, we do not mention projects and topics with a conventional TA understanding, which are also found at all of the institutes. Instead, we put the emphasis on exploring the great variety of topics and approaches across institutes and on finding out where these differ from current practice at TA-SWISS. For this reason, we deal explicitly only with those institutes that stand out particularly with stronger social and cultural science approaches to technology assessment and define the topics of their studies more broadly than is usual in conventional technology impact studies. As criteria for selecting the institutes examined, we chose members participating in the *European Parliamentary Technology Assessment* [6] (EPTA) network, which include TA-SWISS and TA organizations in eleven other countries, and STOA (Scientific and Technological Options Assessment), the technology assessment office for the European Parliament. In addition, we also included the *Akademie für Technikfolgenabschätzung in Baden-Württemberg*. Information on the institutes' goals, their thematic foci, and projects was taken from the institutes' Web sites, which without exception all provide substantial material documenting the activities of the institutes. The short descriptions and project working papers provided by the institutes' Web sites contain all the relevant information.

2.2.1 Rathenau Institute (The Netherlands)

The *Rathenau Institute,*[7] serving as the technology assessment office for the Netherlands Parliament, is presented here first, because it is more strongly than other institutes engaged in social and cultural science oriented technology assessment. The projects conducted by the Rathenau Institute combine a great variety of methods and approaches. At the same time, the Rathenau Institute is innovative in the selection and constitution of the topics and issues studied. As stated in its program:

> *Technological and scientific developments often generate more social and political questions than answers. To stimulate both research and*

[6] See www.eptanetwork.org/EPTA/

[7] See www.rathenau.nl/showpage.asp?steID=2

> *discussion, the Rathenau Institute enables politicians and citizens to judge issues that are linked to these developments. (Rathenau Institute)*[8]

The Rathenau Institute applies the following broad definition of the term "technology":

> *practical knowledge used to adapt man's natural and social environment. Technology is not just a product of scientists and engineers. It is no independent external force influencing society according to an inner dynamic. (Work programme 2003-2004, Rathenau Institute, p. 11; pdf file accessible at http://www.rathenau.nl/showpage.asp?steID=2&ID=2089)*

The Rathenau Institute also applies a broadened concept of technology assessment. The projects seek not so much to focus on the impacts of a technology as they do to situate a technology in a specific social / cultural environment and to analyze what effects that this has. Accordingly, the starting point of a project is not necessarily a technology, but rather a *societal problem*. This shift in perspective is demonstrated very vividly in the Institute's project on "Healthy Eating."[9]

Instead of simply examining the impacts of functional foods, a product of modern science and technology, the Healthy Eating project defines the subject of research more broadly. It starts out from the observation that today our nutritional and everyday habits are currently undergoing great change. This process, called the "snackization" of eating culture, is contributing to increasing incidence of diseases of civilization ("lifestyle diseases"). To the question of how this development might be turned around, various actors provide different answers. The project compares two proposed solutions, the functional food approach and the balanced nutrition approach favored by the World Health Organization. In addition to the topic of healthy eating, a further problem is brought into view: the responsibility of consumers, the state, and industry. The framing of the research topic thus on the quiet redefines the technology concept. In this perspective, *technology* is a *sociocultural practice like any other*. By comparing and contrasting a (traditional) "technical" solution and a "social" solution,

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[8] www.niwi.knaw.nl/en/oi/nod/organisatie/ORG1237018 Accessed 5 May 2005

the project raises new questions concerning social, cultural, and economic implications. For example, there comes to mind the question of reversibility or the question of the social selectivity of procedures and measures (for example, of a health policy increasingly oriented to self-sufficiency) targeting health promotion.

The Rathenau Institute's project on "Everyday Medical Practices"[10] also makes use of a research design that compares and contrasts various technologies. The focus is on how medical technologies come to play a significant role in our everyday lives, and connected with this, how medical practice itself comes to take on an everyday character. The project examines a range of technologies, including thermometers, iodization of drinking water and salt, pain killers (NSAIDs), and the mobile defibrillator (an electronic device that delivers targeted electrical current to the heart to reestablish normal heart rhythm in case of atrial or ventricle fibrillation). In addition to everyday practices hardly recognizable today as medical, this thus also makes the use of the most modern technological products the topic of discussion. Here again, the research question is situated and problematized in a life-world context. For example, the project points out the political issues of accountability that arise in a complicated fashion when medical practices are implemented also by non-experts and are possibly fraught with negative effects.

The stronger social and cultural science view of the project "Everyday Medical Practices" on the modern knowledge and risk society is also manifested in the *choice of methods*. In a historical part, the project traces the cultural historical changes that have accompanied the developing everyday nature of medical technologies. A social science part of the project looks at the present and the future and examines the issues of accountability, access, socioeconomic differences, and the connection between the "medicalization" of everyday life and autonomy. The cultural historical case studies complement and complete the analysis of present and future "everyday technologies." The premises that underpin the prognoses for the future can be tested for plausibility based on the historical considerations. The research design has been chosen to increase learning effects within the project. The project findings can be

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[9] www.niwi.knaw.nl/nl/oi/nod/onderzoek/OND1293552 (in Dutch)

[10] www.niwi.knaw.nl/nl/oi/nod/onderzoek/OND1293551 in Dutch and www.rathenau.nl/showpage.asp?steID=2&item=1333&searching=everyday%20medical%20practices in English.

expected to be at one and the same time well-founded in the social and cultural sciences and generally understandable.

The two projects described here illustrate that the projects conducted by the Rathenau Institute often cannot be characterized as technology assessment projects in the narrow sense, although projects of the latter kind are nonetheless also part of the institute's repertory. What is of particular interest for the present report is the experimental exploratory approach taken by the Rathenau Institute in the conception of the projects.

2.2.2. The Danish Board of Technology (Denmark)

The *Danish Board of Technology*[11] is an independent body that was established by the Danish Parliament in 1995. The Danish Board of Technology stands out with its method of choosing the topics to be studied: the choice is made on the basis of a compilation of ideas from the wider public. Each year, the Board issues an open call for ideas for new technology assessment projects. The initiative for choosing the topics is thus turned over to "society." Ideas may be suggested by members of the Danish Parliament, political parties, the government, authorities, education system, action groups, researchers, corporate organizations, and private citizens. In 2004, the secretariat of the Board received 180 suggestions, which were reviewed and written up as theme descriptions. The Board of Directors then selected six projects for the Board's coming work schedule. As the collection of topics selected for the year 2004 illustrates the broad spectrum of issues examined by the Danish Board of Technology, it is useful to present them here in brief.[12]

Some of the topics are "classical" technology assessment topics as are commissioned or studied by other institutes as well. In 2004, these were: a project on "Pervasive Healthcare" and what importance it will have in the health sector as well as in the information technology sector in coming years; a project on "Data Security and Private Life" on the risk of changed limits of access of personal data for citizens and private data for companies, maintenance of data security and integrity of the individual as caused by increased focus in IT security and antiterrorist legislation; "New

[11] See www.tekno.dk/subpage.php3?page=forside.php3&language=uk
[12] See www.tekno.dk/subpage.php3?article=893&toppic=kategori10&language=uk

Applications to Gene Technology – New Debate," centering on new and future "molecular crops," which cause a need to initiate a renewed debate in the public; "The Danish Energy System," working out long-term scenarios concerning the energy sector to explore on the connection between climate, economy, and technological development.

In contrast to the four projects listed above, the remaining two projects for 2004, each in their own way, transcend the technology-centered framing of traditional technology assessment studies. The project "Globalization of Knowledge Requiring Work" examines the connection between work that is increasingly independent of time and space on the one hand, and the labor market and consumer behavior, on the other. What is innovative here is an approach that compares two factors influencing change in work – new technological possibilities and globalization in the form of outsourcing work to other countries. The design of the projects does not distinguish in principle between technology and social-economic processes, which allows both to be made the topic of discussion as socially shaped and socially shaping processes.

The project "Breakdown of the Borderline between Working Life and Other Life?," finally, shows the strongest departure from the topics and orientation of traditional technology assessments. In the context of the increasingly blurred separation between working life and "other life," the project examines the norms and expectations that are developed together with new (information) technologies. Technology and work organization appear here, in agreement with the principles of the constructive technology assessment (CTA) approach, as mutually determining factors.

These last two projects are in their conception not unlike the projects conducted by the Rathenau Institute. At both institutes, however, they are still in the minority, with traditional technology assessment studies dominating in number.

The Danish Board of Technology also stands out with its use of a broad repertory of *participatory methods* (assessment by experts, stakeholder participation, consultation of the public, advisory). It developed the instrument called the 'voting conference,' which is a way to include lay people in the assessment of technological and social problems and challenges and brings lay people, experts and politicians together. The method is based on the assumption that there are conflicting opinions

not only between but also within these groups. Hence it takes account of social science knowledge about the pluralization of areas of knowledge and opinions in society. Furthermore, members of the Danish Board of Technology take a well thought-out methodological approach, assigning a variety of participatory methods to the topics under study (Klüver 2002).

2.2.3. Parliamentary Office of Science and Technology (United Kingdom) and Office Parlementaire d'Evaluation des Choix Scientifiques et Technologiques (France)

Neither the *Parliamentary Office of Science and Technology* (POST)[13] nor the *Office Parlementaire d'Evaluation des Choix Scientifiques et Technologiques* (OPECST)[14] conducts or commissions studies that follow a broadened conception of technology assessment studies of the type followed by the Rathenau Institute or the Danish Board of Technology (see projects described above). However, these two offices share another quality: they do not restrict themselves in the topics analyzed to classical topics of technology assessment but instead also study issues *in public policy related to science, research, and technology*. The United Kingdom Parliament states this clearly in its description of what POST does:

> *POST provides independent and balanced analysis of public policy issues. (EPTA Web site)*[15]

Accordingly, one of POST's areas of work is in the area of "Science Policy"; the others are "Biological Sciences and Health," "Environment and Energy," and "Physical Sciences and IT."

At the Parliamentary Office for Evaluation of Scientific and Technological Options (OPECST) in France, projects on issues in research and technology policy are integrated into the topic areas "Energy," "Environment," "New Technologies," and "Life Sciences" and not labeled separately. All in all, the projects appear to be strongly oriented towards *economic interests* and deal with the research position of France and Europe. One of these projects analyzes the causes and effects of the state of

[13] www.parliament.uk/parliamentary_offices/post.cfm
[14] www.senat.fr/opecst/english.html

the biotechnology sector in France and Europe. Another examines existing and desirable political, economic, and scientific-technological framework conditions for a reorientation of space research as well as the importance of very large research facilities for public and private research. The telecommunications sector and the pharmaceuticals industry are other topics of interest.

In the United Kingdom, the “Science Policy” part of the POST program sets different thematic foci than its counterpart in France. For one, POST directs interest to *education policy*, conducting projects in science education in primary and secondary schools. For another, POST conducts projects analyzing social and cultural aspects of the science and research system. The project “Peer Review” presents an overview of strengths and weaknesses of the peer review process and considers possible improvements. Another project deals with the topic of “Women in Science, Engineering and Technology.”

Of great interest with regard to the issue of a social and cultural science orientation in technology assessment are documents published by POST that examine, methodologically and reflectively, *communication between science and the public* and *methods and approaches of TA*. POST science publications of this nature have titles such as “Handling Uncertainty in Scientific Advice,” “Getting Opinion Polls Right,” “Public Dialogue in Science and Technology,” “Science Centres,” “Science Shaping the Future? – Technology Foresight and its Impacts." However, the publications listed above are only four-page “POSTnotes,“ or briefing analyses, that do not go beyond summary overviews of the issues. These are not, therefore, independent studies of scientific calibre. But they do document an interest in scientific debates on methods and approaches and in reflection on policy measures at the interface of science / technology and society / the public. The "POSTnotes" publications respond to the explicit request by both Houses of Parliament to “to keep them informed on public dialogue activities in science and technology.”[16]

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[15] www.tekno.dk/EPTA/members/uk.php3. For additional information on POST, see www.parliament.uk/parliamentary_offices/post.cfm

[16] www.tekno.dk/EPTA/members/uk.php3

At this point we should at least mention that also the Institute for Technology Assessment and Systems Analysis (ITAS)[17] within the Karlsruhe Research Centre [Forschungszentrum Karlsruhe] focuses on issues in science and research policy. ITAS' areas of research since 2004 are: Knowledge society, knowledge system and knowledge policy; New technologies, innovation processes, technology impacts; and Environment and resource management.

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2.2.4. Akademie für Technikfolgenabschätzung in Baden-Württemberg (Germany)

The former *Akademie für Technikfolgenabschätzung in Baden-Württemberg* (also called the TA-Akademie) was established in 1991 by the state government of Baden-Württemberg and closed on their authority in 1995. However, the *TA-Akademie* still has a media presence, as its Internet portal "TA-Net-BW," which served as the information and communication platform of the former institute, is still being maintained (by the Materials Testing Institute at the University of Stuttgart).[18] In the circle of TA institutes, the TA-Akademie is highly regarded, which also justifies its inclusion in the present report.

According to its statutes, the TA-Akademie served "scientific purposes," and described its tasks as follows:

> *The projects and major topics evolve around the center's objective to investigate and assess the consequences of technology and to initiate and coordinate public discourse about technology assessment. (Source: Web site: Innovations Report. Forum for Science, Industry and Business)* [19]

This situates the activities of the TA-Akademie in the field of tension between two poles, scientific inquiry and the task of communication. For one, the TA-Akademie worked on a scientific basis in close cooperation with partners at other scientific institutes and saw itself as a junction in a scientific network that brought together the knowledge and experience of various researchers, areas of research, and research

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[17] See "Research Areas," www.itas.fzk.de/eng/fb/uebersicht.htm
[18] See www.ta-net-bw.de/index_TA_Net_BW.asp
[19] www.innovations-report.com/html/profiles/profile-1005.html

institutes. For another, the TA-Akademie felt a responsibility to *initiate and coordinate public discourse* by providing information. Because one of the foci of its work was communication with the public about technology and technology impacts, it developed, tested, and implemented in practice various forms of communication.
Up to its closing in 1995, the TA-Akademie worked in six areas: (1) conditions for sustainable development, (2) innovation for the economy, labor, and employment, (3) quality of life through infrastructure development, (4) environmental quality through the reduction and prevention of noxious emissions, (5) conditions and consequences of the life sciences, and (6) communicative and discursive methods.[20] For the present report, in view of the interest in broadening traditional TA topics and TA approaches, it was worthwhile to take a closer look particularly at areas (2) and (3). In the area *innovation for the economy, labor, and employment*, the TA-Akademie studied the "significance of technological innovations for the 'new economy,' the challenges and opportunities for policy and administration, changes in gainful employment, and the role of the region in the processes of economic innovation.“[21] It may be surprising that some of the projects, despite being integrated institutionally in a technology assessment institute, seem to lose sight of technology altogether. One example is the project "Transformation of Work in the Transition to the Knowledge Society," with a sub-project on e-commerce and the new and contradictory demands on employees and another sub-project on the "employability" of older technical specialists. The first sub-project started out from the assumption that a successful IT strategy requires support and qualification of employees and thus made technology the topic of discussion at least indirectly. In the project goals of the second sub-project, however, technology is not mentioned at all. For an appraisal of technology assessment with a stronger social and cultural science orientation, this means the following: Whereas broadening the perspective to include issues like work practices, qualifications, and employment relationships is to be welcomed, it is regrettable that in doing so technology seems to retreat from view and that these studies on innovation research lack a sociotechnical component. In these projects, a connection with technology assessment is not so much interest in the impacts of technology as it is in

[20] www.innovations-report.com/html/profiles/profile-1005.html

a methodological dimension. The authors of these projects made use of methods from the arsenal of participatory methods of technology assessment and took care to include various actors in the research and to "develop innovative solutions in discourse with the participants."

In the area *quality of life through infrastructure development*, TA-Akademie projects focused on waste accumulation and disposal, energy needs and supply, transportation and spatial structure, and the health care system. Here the individual projects start out from the central concept of infrastructure systems, which are seen as independent part-systems of society and characterized by the development of specific technological and organizational systems and by their anchoring in specific economic constellations, and so on. This approach allows, in an interesting way, technological, organizational, economic, legal, and other features to be analyzed multidimensionally and captured in their combined interaction with the environment, economy, and society ("quality of life"). All in all, these projects aim to "work out approaches towards holistic evaluation" of infrastructure systems. For this reason, they place explicit emphasis on the complex interaction of differing factors in society's dealing with problems such as transportation, waste, or supply of energy.

2.2.5 Summary

In sum, the projects of the TA institutes examined combine elements of technology assessment more strongly oriented to the social and cultural sciences (in the sense sketched out above) in various constellations.

- The projects conducted by the *Rathenau Institute* come closest to the form of social and cultural science-oriented TA favored here. They start out from a comprehensive concept of technology and, therefore, also understand TA in a wider sense: as analysis of technology and its impacts as situated socially and culturally. The projects make use of a diversity of methods and approaches from the social and cultural sciences and seek to fulfill solid scientific requirements. Their aim is to stimulate public discussion and research equally.

[21] www.ta-akademie.de Accessed 5 May 2005.

- The *Danish model* is instructive in three ways. First, society is involved as early as in the topic selection phase (even though the final selection lies in the hands of a committee of experts). Second, similar to in the Netherlands, the study topics are at least in part framed from a social and cultural science perspective. Third, the deliberative methods (for example, consensus conferences) are adapted to the pluralized areas of knowledge and pluralized values.

- The *British model, more so than the French,* is in a more comprehensive sense guided by the social sciences as it deals with issues in science and technology policy. However, we could not discover any cultural dimensions in the work. Especially interesting for technology assessment with a social and cultural science orientation is the direct problematization of the relation between science and society.

- The *TA-Akademie in Baden-Württemberg* covered a very broad range of topics, whereby particularly the topics in the area "*innovation for the economy, labor, and employment*" are anchored firmly in the social sciences. The work provides new impulses for a social and cultural science orientation in TA, first of all in the variety of the methods used. Second, with the world of work, new areas of society move into the center of interest. Third, the complexity of interactive effects is explicitly made a topic for study.

The upshot is that none of the institutes looked at is worthy of consideration as a direct model for TA-SWISS and its possible reorientation towards technology assessment with stronger anchoring in the social and cultural sciences. However, each of the institutes examined provides starting points for this new orientation, which we summarize in brief as follows:

- Although all of the TA institutes looked at have a more or less strong orientation towards social science research, only at the Rathenau Institute could we find also *cultural science* approaches. Precisely what cultural science oriented TA could look like is therefore largely undetermined. This opens the field for conceptual development, which should be accomplished prior to or concurrently with practical implementation of a cultural science-oriented TA project.

- For widening the subject of study, the institutes examined provide a number of different ideas. Appearing prominently are the topics *technology and innovation* and *technology and the world of work*. The problematization of technology in connection with issues in innovation or the work world requires and makes possible direct reference to various areas of study within the social and cultural sciences. In this way, the forging of connections between TA studies and the corresponding research areas is assured, which is also manifested in that the studies are typically conducted by social (and more rarely, cultural) scientists.

- As another subject of study, *science, research, and technology policy* is firmly anchored in the programs of several TA institutes. The activities connected with this are conceived of by the institutes not so much as a broadening of TA but rather as a complement. Instead of studying the impacts of technology, the studies deal with the shaping and steering of science and technology development through policy. Regrettably, the studies typically do not appear to be related directly to studies on the significance of technology in society, with the result that they do not fully exploit the potential of conducting TA and studies on technology policy in parallel. There could be added value in including the issue of policy shaping technology (and ability of policy to shape technology) consistently as an important perspective in a broadened technology assessment.

- In the projects that we examined, the determination of the relation between technology and the subject under examination is paradoxical. With the exception of a few studies at the Rathenau Institute, we gained the impression that the studies that define their subject area adequately with regard to the social and cultural sciences lose sight of the *technology*. That is, and put in overstated form: Either the studies start out from technology and its impacts and are therefore mostly technical determinist, or they start out from "society" and deal with technology only indirectly, as a "black box." The constructivist paradigm seems up to now to have truly arrived only at the Rathenau Institute.

- Finally, at none of the institutes did we discover approaches to studying social technologies.

3. Social Technologies as Subject of TA

Before we can deal with the topic of "social technologies," this imprecise term requires clarification (section 3.1). In section 3.2, we connect the term to the concept of sociotechnical knowledge regime and, taking three examples from the area of "control through self-management," explore questions that are raised by a social and cultural science oriented technology assessment of social technologies (section 3.3).

3.1. Social technology: Meaning of the term

It was Gunnar Myrdal (1944) who, in a study of the condition of African-Americans in the United States (*The American Dilemma*), first used the term "social engineering," meaning efforts to systematically manage social behavior on a large scale, in a conscious methodological manner.

Nevertheless, the term social technology and its synonyms, sociotechnology and social engineering, which has become a part of our general vocabulary, have not been used systematically in the social science literature. In 1962 the controversy over "value-laden" and "value-free" sociology broke out between Hans Albert and Erwin K. Scheuch on the one side, and Theodor W. Adorno, Jürgen Habermas, and others, on the other. Parts of this controversy are documented in Adorno's (1969) *Positivismusstreit*, in Koch and Senghaas' (1970) *Texte zur Technokratiediskussion*, and in the four volumes of *Theorie der Gesellschaft oder Sozialtechnologie* by Jürgen Habermas and Niklas Luhmann (1971-1975). However, in more than 1,000 pages of text there is to be found no definition of social technology, nor is it often mentioned. Even the frequent use of the word sociotechnology in a report titled *Technical Change and Economic Policy* by the Organization for Economic Co-operation and Development on Technical Change and Economic Policy (OECD, 1980/1981) did not manage to establish use of the concept, beyond casual use, for specific phenomena (see Müller 1984).

Still, isolated social scientific definitions of the term are found, for example, in encyclopedias of sociology. Lüdtke (1994; freely translated here) describes social technology as follows: "in analogy to the methods used in physical technology, the targeted (and specified) implementation of effectives measures to solve social devel-

opment, planning, and organization problems. Depending on the purpose and structure of the system, the measures can be simple or complex. Examples: control and incentives of social performance in organizations, systematic speech training (...) in a training program, scientific management, organization of communication networks for targeted groups, influencing of the public through the mass media."
This definition sets the direction in the field. Social technology aims towards methodological steering of individuals and groups in important societal areas, mainly: work and politics. Conceptually, however, the term needs to be fit into the framework concept of the sociotechnical knowledge regime.

3.2. Social technologies as sociotechnical knowledge regimes

With a view to assessing social technologies, it also seems advisable to broaden the focus of social technologies systemically and to examine the sociotechnical knowledge regimes, as they are called, within which they emerge. This includes the variety and interaction of factors of technicization (see section 1.3 above) and the strategies of technicization utilized by the actors involved (see section 1.4 above). In accordance with the descriptions above, we place emphasis on three characterizations:

- First, here again it is recommendable to keep to a broadened concept of technology. The point is not to replace a one-sided focus on physical technologies with a one-sided focus on social processes, instruments, or methods. Social technological innovations such as *New Public Management*, *coaching* as an instrument of management in business organizations, or *civic engagement* (see section 3.3 above) have both social and subjective aspects *and* physical aspects (for example, information and communication technologies or performance evaluation methods). All technologies, including social technologies, therefore, as sociotechnical regimes should in principle be analyzed in three dimensions, that is, with regard to their *material*, *social-cultural*, and *subjectivity-related* conditions and impacts as well as with regard to connections among these factors.

- Second, a systemic perspective is important also in the case of social technologies (see section 1.4 above, transportation system example): One can be

of the opinion that a social technology like civic engagement also has dysfunctional consequences (such as competitive distortion of the job market) and distance oneself from voluntary work of this type. But, in a society that increasingly relies on the engagement of the individual, each individual will have to show increasing self-initiative, providing and caring for public welfare – albeit with varying emphases. The question of whether a specific social technology is not only economically efficient but also environmentally sustainable, ethically tenable, and socially just can be answered only by examining it as a socio-technical regime relative to the social political system in which it is situated, that is, relative to the neoliberal, individualistically-oriented social security system.

- Third, we understand also social technologies and their development to be an *open-ended process*. Social technologies, too, are open to interpretation, reinterpretation, use, and change of use. The variety and interaction of the various dimensions show social technologies to be the result of material, legal, ethical, economic, social, and cultural potentials and considerations.

For technology assessment that takes social technologies into increasing consideration, these aspects are momentous in two respects. For one, new topics and areas for study come into view; for another, it now becomes imperative to consider social and cultural science perspectives. All of this raises the question of what aspects of social technologies can be studied in the form of social technology assessment (STA) and how these might complement and connect with those aspects or questions that are reserved for more academic treatment.
In the following section, we illustrate these questions at least in brief, taking as an example an area for study: control models in public administration, business organizations, and politics that are based on (self-) management.

3.3. Examples of social technologies in administration, business organizations, and politics

For social and cultural science oriented technology assessment of social technologies, a possible subject of study that has come up recently are all those processes, instruments, and methods that aim to increase the self-management competency and performance of individuals in society. Modern society is showing the characteristic tendency in ever more areas of life, especially in the areas of everyday life, work, and politics, to induce people to manage themselves competently. For everyday life, an increasing number of advice and counseling services are on offer that undertake to instruct individuals in competent time management and self-management. Individuals apply these abilities not only for self-orientation and self-steering within their private lives (as evidenced by the continuing booming market in self-help books); what is more, this ability and willingness for self-management is also being used increasingly by public administrations, business organizations, and politics. Control – which formerly was as a matter of priority taken over by heads of administrations, business organization management, or political authorities – is now being made increasingly the responsibility of the individual. Some examples are *New Public Management* in administration (section 3.3.1), *coaching* of employees in leadership positions in business organizations (section 3.3.2), and the growing importance of civic engagement in politics (section 3.3.3).

All of these processes, instruments, and methods are united by the fact that they have entered into sociotechnical knowledge regimes: in addition to physical technologies (such as IT-based procedures for evidencing performance), they contain also *legitimacy strategies* (for example, procurement of acceptance), *assertion strategies* (for example, performance contracts), and *qualification strategies* (for example, performance indicators). The shift from organizational and political control to forms and procedures of self-management in ever more societal areas can be viewed as a powerful social innovation that can be expected to have ambivalent consequences for individuals and organizations. It is true that these effects are already the subject of academically-oriented work, with respect to general social and political science issues. For instance, a field called *governmentality studies* exam-

ines the forms and functions of neoliberal processes (see, for example, Rose 1999). However, what is largely lacking is examination of the *specific* effects on *individuals* and *groups* in organizations and on *organizations* themselves. It is here that social and cultural science oriented social technology assessment, in the sense described above, can be conducted. The individual areas are sketched out in the following.

3.3.1. New Public Management in public administration

New Public Management (NPM) is considered the most important administrative reform of recent years. The principles behind it, concepts, and instruments are based on insights from the social and economic sciences and from organization and management studies. Beyond that, elements from consulting and based on the knowledge possessed by the social actors involved (such as administrative experts in public administrations) flow into New Public Management. To the principles of NPM (see Ferlie et al. 1996) belong, among others, increased market orientation, transparency, and productivity with regard to all internal and external administration. The instruments that at once implement and control these principles are also diverse: here we find especially benchmarking but also performance indicators, productivity indicators, global budgets, performance contracts, and audits.

However, connected with NPM is the loosening up of hierarchies, the implementation of work teams and project teams, and regular conducting of performance and success controls; the effects of these show that NPM should be viewed not only as administrative reform but also specifically as a social technology: First, NPM establishes new forms of self-management techniques of employees through the specific organization of the work process. Second, NPM confronts those 'administrated' with demands that require methodological examination of one's own claims: they are aimed towards "knowledgeable clients" that can competently articulate their needs to the administration. Third, the structure and identity of the organization itself changes decisively: through NPM, administration becomes dynamic; it becomes a "learning organization." All of this makes possible a paradigm that utilizes administrative structures, which are based on control through self-management of employees as well as clients, as a systematized form of activation.

The social science and political science literature on NPM takes a rather academic perspective and focuses on mainly conceptual, evaluative, and control-theoretical issues. However, there remain a number of important ethical issues that arise out of the perspective of social technology assessment:

- How is NPM implemented, that is, put into practice? What flexibility or rigidity do the concepts and instruments of NPM have?
- What are the specific effects of the heightened efficiency orientation of NPM on individuals (individual employees, clients), groups (departments), and the organization as a whole?
- In the other direction, how do actors influence the concrete shaping of NPM, and in doing so balance material, economic, legal, social, and ethical factors?
- How are the social factors interwoven (in detail) with the physical technologies (for example, with information and communication technologies)?

An important concept that could guide the work on questions such as these is the concept of *co-construction*; that is, NPM can be observed and evaluated only as a local specific phenomenon and as a result of concrete, collective negotiation processes among various stakeholders.

These and further questions could be bundled together for a case study of the NPM administrative reform that is currently in progress in Switzerland but is being implemented to varying degrees by the federal administration, the cantons, and the municipalities. The cantons took on a pioneering role, and the first cantons have already instituted the shift, but implementation at the federal level is advancing far more hesitantly, and only a few municipalities have begun to deal with NPM (see Lienhard 2004, Ritz 2003).

Selected in-depth studies are also conceivable here, for example a special study on the conditions and effects of client-oriented administration, or a social technology assessment of NPM in organizational comparison: public administration – university – business companies.

3.3.2. Coaching of executives in business organizations

Coaching is a form of providing guidance to employees with management and leadership tasks (especially executives). Using a combination of individual, supportive problem coping and personal advice and supervision, a coach provides direction to the client primarily at the process level (*How* should I make a decision?). The basis for this is a voluntary and supportive relationship. In the current discussion on corporate governance, coaching represents an important instrument for increasing efficiency. This instrument first affects employees: they are required to implement their work capacity flexibly, autonomously, and responsibly and to develop the corresponding "managerial competencies." The coaches hired by the companies provide suitable training techniques and legitimize a new form of 'control through autonomy.' The companies ultimately demand nothing less than 'total commitment': Precisely in that employees bring their own goals into alignment with the goals of the organization, their self-realization is *at the same time* service to the company.

Although numerous social science studies are available on relevant issues – such as studies on the subjectification of work (Moldaschl/Voss 2003), the productive subject (Rose 1999), or the polemical study on 'Pleasure in Work' (Donzelot 1997) – it would be extremely important to examine in a social technology assessment the special impacts of the coaching technology and its continual refinement in competitively oriented companies. The study should examine in particular how this social technology affects work satisfaction, performance, and sustainable management (including human resources management). The available scientific studies suggest that these instruments are effective in the short term but bring about dysfunctional side effects in the medium term. To consider are health impairments (burn out) but also unrealistic guidance on the part of the coach (Schwertfeger 1998) and – resulting from that – dysfunctional effects on the company itself. Increased fluctuation in personnel and a lack of stability in performance criteria and processes can work counter to the desired development of the organization, namely, continuous improvement of effectiveness in solving problems and achieving goals.

In analogy to the questions examined in a social technology assessment of NPM, similar questions can be applied to the subject of coaching of executives in business organizations. Again, these would deal with the co-construction of proceedings, in-

struments, and processes by executives, individuals, or groups of employees and the existing structures of the company itself. What are the specific conditions and effects of and the types of resistance to the technology of coaching? Social technology assessments in this area could enrich the somewhat more generally conceived social science, political science, and economics studies by providing more detailed investigations. Also, they address central concerns of technology assessment and would deliver valuable argumentation and intervention aids for shaping and participatory measures in policy and legal areas.

3.3.3 Civic engagement as a new model of public work

The term "civic engagement" generally encompasses voluntary, unpaid, work performed by citizens in the common interest. That this is not the same as older forms of engagement, such as serving in honorary posts, is indicated by the qualification "civic," which ascribes different meanings and values to this work: it is not about pleasing God, or about honor, living a moral life, or saving your soul. Instead, civic engagement is about the public good and democracy. Moreover, civic engagement makes possible a connection between traditional honorary activities and new forms of engagement, for example, between traditional communal political activities and modern protest activities such as citizens' groups, but also between religiously motivated engagement in the church parish and voluntary activities that have a lot to do with self-realization (Roth 2000).

For the *state*, the diagnosis of a need for new types self-steering and for expansion of the potentials of civil society poses a new task: the state is supposed to provide the required conditions for an appropriate mixture of individual civic engagement and state support and, at the same time, activate the individual. This model of the 'activating state' is expressed in the currently much heard slogan "Fordern und Fördern" in German-speaking regions (Schröder 2002). For the *citizen,* there has been a shift in motives for civic engagement, from "obligation" to "self-regard motives," which accords with a value change from "duty" to "self-realization values" (Enquete-Kommission 2002). The acquisition of skills, personal development, and self-realization – as opposed to altruistic values – move to the forefront. People's sense of themselves and interest in the common good become linked. Responsible action

encompasses self-interest, whereas, in turn, only people that are important to themselves and have self-regard can take on responsibility.

Here again, the central starting point for the targeted promotion of civic engagement is activation. Through targeted influencing of individuals' motivation structures, the goal is to promote competency in problem solving, which was formerly seen as a task for institutionalized politics. If and to the extent that responsible citizens make civic engagement one of their goals in life, self-realization and the common good coincide. Guides and manuals on civic engagement and communal civic and volunteer centers can support citizens in this.

The 2004 report on volunteer work in Switzerland (*Bericht zur Freiwilligenarbeit der Schweiz*) by the Swiss Federal Statistical Office (Bundesamt für Statistik 2004) also places emphasis on the great importance of civic engagement and recommends further incentives for promoting volunteer work (social security bonuses) and examination of possible legal bases that would aid promotion. In the framework of a social technology assessment, the relation between paid work and volunteer work in specific areas of activity (such as care for the elderly) could be investigated. As to civic engagement by corporate actors (companies), the study could focus not only on opportunities but also on dysfunctional, anti-democratic side effects: If you donate more money, do you have a greater say? Specific social technology assessments could also investigate possible misuse of civic engagement as an instrument for labor market policy (civic engagement *to replace* unemployment assistance, social welfare support, and so on). Upon the background of the conditions and effects of civic engagement that are only now starting to come into view, a social technology assessment of this phenomenon that included consideration of the issues of social justice, ethical acceptability, and political counteraction could be very important.

These control models based on self-management appear to be particularly suitable subjects for study in social technology assessment with a social and cultural science orientation. Social technology assessment can offer specific contributions that would complement existing social and cultural science studies. For one, it offers analysis of *concrete factors and strategies of technicization*; for another, it has much to offer with its *specific arsenal of methods*. Participatory methods and broad consideration of stakeholders could contribute to a better understanding of the societal conditions

and effects of precisely those social technologies that often conceal their drawbacks and downsides behind attractive, but one-sided, labels such as 'responsible citizens' (civic engagement), 'control through autonomy' (coaching), or 'breaking down hierarchies' (NPM). These are, for example, engaging people for tasks that are state tasks (civic engagement), increasing control through autonomy (coaching), intensification and subjectification of administrative work (NPM). With this, technology assessment would do justice to its important political control and intervention function also with respect to knowledge-based social technologies.

3.3.4. Summary

While technology assessments of social technologies as described above open up special themes for research, they are not a special case with regard to technology assessment with a social and cultural science approach: In this case again social, professional, institutional, physical technologies and processes, cultural ways of dealing with things, and techno-historical specific knowledge contents and values are integrated. *Social technology assessment,* which would then always also contribute to technology research and, in a division of labor, should interact with technology research, investigates in each specific individual or comparative case:

- societal way of dealing with new technologies and forms of their problematization and normalization,
- the socialization, culturalization, and subjectification forms of technological innovations,
- the dynamics of transfer and translation of technological developments in different areas of society, between forms of organization or actor groups,
- the often conflict-ridden interactions between technological knowledge, values, and new forms and forums of social negotiation.

This version of social technology assessment not only provides starting points for the ways in which society can deal with the new but also with risk and lack of knowledge:

it aids and supports also society's analysis of the production of and the dealing with new (social) technological developments.

Precise description of the conditions and effects of a particular social technology in a clearly defined domain is exactly what makes possible the formulation of robust statements for public debate and for policy advising. At the same time, this is also what allows, through a division of labor, connections to be drawn to the social and cultural science discourse: In this way, both – social technology assessment and the social and cultural sciences – can mutually enrich each other and thus do justice to the dynamics of a technomorphic society that requires *ongoing observation* by *multiple and diverse kinds of reflection.* We suggest that technology assessment that is broadened in its perspective to encompass a social and cultural science approach can make a specific contribution here.

4. Desiderata and Recommendations ("Target State")

Technology assessment institutes and processes are situated at the institutional interface between science and politics and are therefore subject to systematic dilemmatic demands. The basis dilemma is one between science orientation (technology studies) and policy orientation (policy advising) – and the resulting differing rationalities. In principle, dilemmas cannot be solved: For this reason, technology assessments as a rule tend towards *either* science *or* policy. The TA-SWISS projects *that we examined* can be assigned more to the policy advising type. This has consequences with respect to their scientific nature, which we mentioned in section 2 in greater detail. For the reasons mentioned, we make a plea in the following for a stronger scientific basis, but not for "scientification" as an end in itself. Instead, a stronger scientific basis serves quality assurance and improved connectivity with (social and cultural) science and at the same time with policy. As a positive result, we expect in particular that the technology assessment studies will show greater professionalization and comparability.

All of the projects show a gap that we might call the "analysis / recommendation gap": the TA-SWISS projects examined tend to be technocratic-oriented, as described above, whereas their recommendations, in contrast, tend to be "social" or "political" in orientation, even though the preceding analysis does not provide a sufficient evidence base to underpin those recommendations. This is a typical phenomenon in experts' reports of all kinds and is, at the same time, an expression of the dilemma described above. Nevertheless, a stronger orientation to the social and cultural sciences, already from the outset during conceptualization and during analysis, can contribute towards closing this gap somewhat. Moreover, consideration of quality criteria of science and a professionalized TA community can make it possible to produce robust findings and *therefore* also robust policy statements. In normative terms, the *sole* orientation to writing readable texts to be used in preparation for decision-making is a poor guideline for solid knowledge production that is also informed by the social and cultural sciences.

Based on this preface, the recommendations in the following address two levels. At the first level are desiderata for technology assessment projects underpinned by the social and cultural sciences. At the second level are recommendations for institutional framework conditions that TA-SWISS must set up in order to provide the most comprehensive support for realization of the first desiderata.

4.1. Desiderata for technology assessment underpinned by the social and cultural sciences

Technology assessment underpinned by the social and cultural sciences must not restrict itself to the impacts of technology, nor is it sufficient to broaden that perspective by the addition of social or cultural dimensions. Going beyond that, it must consider the social and cultural conditions of the emergence, acceptance, and use of particular technologies. In addition, technology assessment based in the social and cultural sciences must fulfill certain needs with respect to definition of the subject for study, research design, and methods. However, addressing individual points of criticism will not suffice. What is needed is a new perspective on technology, for which the following catalogue provides starting points:

Definition of the subject for study

- Social and cultural science-based technology assessment analyzes technologies and technology impacts as situated socially and culturally.
- It investigates the ways that society deals with technology in its material, social, and subjectification aspects.
- In defining the subject for study, it starts out from a sociotechnical knowledge regime, not from an (isolated) technology.
- It examines social and cultural conditions of the genesis of particular technologies as well as their effects.

- It makes the legitimacy and fundamental desirability of the technologies a topic for discussion.
- It seeks to discover how the technology is situated in the cultural and historical context.
- It states terms and concepts such as 'society,' 'culture,' '*Lebenswelt*,' or 'everyday life' more precisely instead of introducing them only indirectly via the issue of technology acceptance.
- It connects with the social science debate on risk, states the risk concept more precisely, and explicates its criteria for the assessment of opportunities and risks.
- It makes visionary ideas a topic for discussion as socially and historically specific sketches of contemporary society and not as unproblematic predictions.
- It directs interest to the impact of stories, metaphors, manners of speaking, and images as an important part of the analysis of future technologies.
- It utilizes public discourse as a resource for problem perception and communication.
- It grasps systematically the heterogeneous possible uses of a technology as well as various user categories and ambivalent forms of use.
- It takes its bearings from the social and cultural science research and literature.
- It aids structuring and puts together parameters and categories of criteria for public and / or political deliberation.

Research design and methods

- Social and cultural science-based technology assessment explains the reasons for the research design and the framing of the problem and categorizes it under a social theory and with reference to the subject under investigation.
- It gives reasons for and explains the methodological decisions and approaches taken.
- It works with a systematic selection and description of a few dimensions, or case studies, using examples to provide greater depth.
- It favors a qualitative approach as opposed to a purely quantifying approach.
- It makes use of comparison in a strategic way in order to better contextualize specific cases, in that it, for instance, discusses society's way of dealing with comparable technologies.
- It includes diverse societal actors in the study as providers of information.
- It explains and problematizes the way in which the diverse findings (interdisciplinary, multidisciplinary) can be integrated.

4.2. Recommendations for institutional framework conditions

In order to meet the detailed desiderata for technology assessment based in the social and cultural sciences, suitable framework conditions are required. These have to do with (1) the project process – from preparing, to planning, to conducting the project, (2) the issue of the possible reorientation of TA-SWISS, and (3) the issue of structural changes. The processes, structures, and measures currently implemented by TA-SWISS today already provide a good basic framework with regard to the goal to conduct technology assessment with stronger underpinnings in the social and cultural sciences. For this reorientation, the current framework would only have to be adapted, or fine-tuned, somewhat. Already implemented factors that are adequate to the task (for example, interdisciplinary approach, multidimensional arsenal of meth-

ods) are therefore not listed explicitly in the following. The following explanations are based on information about the current TA-SWISS framework taken from two TA-SWISS brochures: "Interne Richtlinien für das Projekt-Management" [Internal Guidelines for Project Management] (October, 2001) and "TA-SWISS Porträt" [Portrait of TA-SWISS] (Juin, 2004).

4.2.1. Process: Project preparation, planning, and implementation

It is recommended that, …

For the selection of subjects for study

- … the subjects for study of the projects are selected in agreement with the desiderata regarding definition of the subject for study (see section 4.1).

- … the "Relevanz für die Fachwelt" [relevance for experts in the field] in the catalogue of "Aspekte für die Auswahl von Projekt-Themen" [aspects for the selection of project themes] in TA-SWISS "Interne Richtlinien" (p. 10) should make direct reference to the circle of specialists in the social and cultural sciences.

- … the project preparation group should include, as external experts, at least two representatives of the social and cultural sciences involved.

For the call for proposals for a project

- … calls for proposals for new projects should be written in accordance with the desiderata for definition of the subject for study and research design and methods (see section 4.1).

- … calls for proposals should indicate that university cooperation partners are also much desired.

- … a project-specific scientific advisory committee should be involved in developing the call for proposals (more on this below).

- … calls for proposals should be sent out in a targeted mailing also to social and cultural science associations that maintain mailing lists and Web sites for circulating information (such as Swiss Association for the Studies of Science, Technology and Society (STS-CH), Gesellschaft für Wissenschafts- und Technikforschung (GWTF), H-Soz-u-Kult: Kommunikation und Fachinformation für die Geschichtswissenschaften).

For the evaluation of project proposals

- … in addition to the catalogue of criteria in the "Interne Richtlinien" ("Anhang 4"), also the desiderata listed in section 4.1 above be taken into consideration.

- … the catalogue of project criteria be extended to include the criteria "scientific quality and connectivity with scientific theory and research“, "scientific disciplines involved," and " "social and cultural science competencies and qualifications."

- … the scientific advisory committee should be involved in the evaluation process.

For supervision of the project

- … it be assured that the project team fulfills the desiderata listed for technology assessment with social and cultural science underpinnings with regard to both the subject for study and the methods of the particular technology assessment study.

- … the supervisory group include, as experts, at least two demonstrated experts in the social and cultural sciences.

- … the project-specific scientific advisory committee be granted a scientific quality assurance function (see below)

For the experts' report on the final project report

- … external experts especially from the circle of the project-specific scientific advisory committee are asked to evaluate the final project report; this committee should also be consulted prior to the issuing of the final report.

4.2.2. Content: Thematic orientation of TA-SWISS and TA-SWISS projects

It is recommended that …

- … project activities in the existing areas of TA-SWISS studies be guided as to subjects for study and methods by the desiderata (see 4.1 above).

- … project activities be more strongly developed in specific social areas, such as the world of work (for example, administration), everyday life (for example, senior citizens), and innovation (for example, the economy and industry), and these activities be networked consistently with similar projects conducted by institutes in Switzerland and in other countries.

- … new project activities be initiated, commissioned, and supervised that take a specific case and develop and explore approaches for technology assessment that is primarily oriented to the cultural sciences; this will require pioneering work in conceptualization and methodology.

- … new projects activities be initiated, commissioned, and supervised in the area of social technology assessment; in a first phase the activities should be devoted in particular to the conceptual development of social technology assessment (corresponding to section 3 above) prior to focusing, in a second phase, on conducting technology assessment studies of various social technologies (such as NPM, coaching, civic engagement).

- … project activities in the realm of participatory methods be strengthened both in the social areas mentioned above (world of work, everyday life, innovation) and for social technologies (see section 3 above).

4.2.3. Structure: Organization of TA-SWISS

It is recommended that …

- … the TA-SWISS Steering Committee be enlarged to include further professors and qualified members from the social and cultural sciences (especially in the area of science and technology studies).

- … a scientific advisory committee be assigned to the projects, made up of experts in the relevant fields and research areas from Switzerland and other countries, whereby the committee should include at least one member working in the social and cultural sciences and one member working in social and cultural science-based technology assessment. – The scientific advisory committee should support TA-SWISS in the commissioning, conception, and conducting of the studies and should conduct peer reviews of the studies.

- … a structure be created for the exchange of information and experience between TA-SWISS activities and activities in the area of technology policy. As the resulting added value, we expect that questions about policy shaping of technology will be more consistently considered in a broadened technology assessment and that, in turn, technology assessment approaches and concerns will be more strongly taken up and considered in technology policy.

- … a venue for reflection be set up at TA-SWISS (working group or similar), which would discuss TA-SWISS activities with regard to instruments, contents, and results as well as discuss more general issues, such as communication at the interface between science / technology and society / the public. – In the longer term, the venue could become a meeting place between a technology assessment audience, scientific actors (universities, academies, and so on), and a wider public.

5. Evaluation

Broadening technology assessment to encompass a social and cultural science perspective provides important new impetus to technology assessment. It also strengthens technology assessment's potential to stimulate and support social negotiation and the cultural framing of technological and social technological innovations. By connecting up with the relevant social and cultural science research, technology assessment can take on its own, complementary role. In this way it gains depth of field, without having to overload its own work oriented to specific cases.

Social and cultural relevance and consequences

First of all, the proposed broadened perspective on technology assessment gains in relevance by not only assuming that its topics for study have societal and cultural significance but by *explicitly drawing out and elaborating* the topics' social and cultural relevance. This entails examining not only the consequences but also the social and cultural conditions of technology development and evaluation. To do this, a technology assessment study takes into consideration the variety and interaction of material and social / cultural *factors* as well as the *strategies* of the actor groups involved that determine the specific cases of technicization and are themselves influenced by those technologies. This can all be illustrated taking the case of 'anti-aging medicine': the developmental course and evaluation dynamic of a controversial technology can be revealed only in the interaction of the various actor strategies. Biotechnology companies hope to make profits, the medical profession would like to see 'regenerative medicine' become established and funded, and the citizens of the 'aging society' are hoping for therapeutic effects. Physical technologies, ethical judgments, and health policy desirables are interacting in a highly dynamic way and affecting both the shape and evaluation of medical technologies in a specific way. Second, technology assessment gains greater social and cultural relevance because *new* topics in the area of social technology are studied that pervade the *Lebenswelt* and world of experience of the citizens. Here, a technology assessment study or social technology assessment study can have an *informative* function, particularly as everyday phenomena often go unnoticed and yet have deeply stamping and possibly

dysfunctional consequences. Taking the example of NPM could show *en détail* how heightened efficiency also increases the scale of control and multiplies the forms of control.

Political relevance and consequences

In that technology assessment increasingly takes into consideration societal and cultural factors of technology development and evaluation, it becomes clear just how strongly developmental status and evaluation of technology determine each other mutually. For example, stem cell research, which until recently was considered to be highly problematic from an ethical standpoint, is now being viewed far less critically – not least due to what seems medically feasible today. This means that ethical judgments, but also other dimensions of evaluation, constantly interact with the technological possibilities. For technology assessment not to fall short of this dynamic, it seems important, at least for certain questions in particularly active areas in science and technology, to conduct technology assessment or social technology assessment on an ongoing, long-term basis. This would apply for the field of medicine, especially biomedicine and nanomedicine. Technology assessment broadened to include social and cultural science underpinnings gains in relevance also politically if it can ensure continuous monitoring in this field. This includes in particular the use of participatory methods and broad stakeholder involvement. With this, technology assessment, particularly with regard to the observation and evaluation of knowledge-based social technologies, would do justice to its important *policy control and advising* function.

Individual and social ethical relevance and consequences

Finally, it is important once again to emphasize that in the context of the broadened concept of technology proposed here, all three dimensions of technology development and technology use should be viewed in interaction: material, sociality-creating, and subjectification conditions and functions form inseparable key elements of every (social) technology assessment. In this respect, also the individual and social ethical relevance of technology developments and evaluations are newly defined: in the perspective of technology assessment with social and cultural science underpin-

nings, also ethical considerations and dissent can be examined sensibly only in connection with other factors. Is a particular medication so expensive that not every one can afford it? A question like this must be discussed in connection with the question of whether this is socially acceptable and sustainable. Ethical deliberations in technology have become more complex, and they become even more complex from a technology assessment perspective broadened to include the social and cultural sciences. But this is also advantageous: in that technology assessments work on complex subjects in an institutionalized and routine way, they fulfill their important function of *reflection and aid to decision-making* at a level commensurate to the subject under study.

For broadened, social and cultural science based technology assessment, both the tasks and connections with other bodies of reflection in society increase: this kind of technology assessment not only looks at the situatedness of technology in everyday life, but instead is itself situated 'in the midst of society.' In this sense, we make a plea for strengthening technology assessment institutionally through collaboration between the Swiss Science and Technology Council and centers and persons at universities and academies and for making technology assessment more complete in content by taking a consistent social and cultural science orientation.

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7. Appendix

Two experts were asked to review this final report; their reviews are provided below in full and in the languages in which they were written.

7.1. Expert's report by Prof. Dr. Thomas Hengartner, Institut für Volkskunde [Institute for Folklore Studies], University of Hamburg

Von wenigen Ausnahmen abgesehen ist die Technologiefolgen-Abschätzung – auch im internationalen Rahmen – einem einseitigen Technikbild verpflichtet: „Technik“ wird dabei isoliert und als Gegenüber der Gesellschaft betrachtet. Dies verkennt den Umstand, dass Technisches mittlerweile ein fester, allgegenwärtiger Bestandteil unseres Alltags und seiner Wissens-, Handlungs- und Orientierungssysteme ist. Kurz: Technik hat sich in Kultur, Gesellschaft und den Menschen eingeschrieben und schreibt sich auch weiterhin ein.
Der Auftrag, die Möglichkeiten einer systematischen Berücksichtigung des soziokulturellen Kontexts von Technik/Technologien für die Technikfolgen-Abschätzung auszuloten, erscheint daher als ausgesprochen sinnvoll und notwendig. Dies gilt auch für den Ansatz, das Verständnis von Technik noch einmal weiter zu fassen und auch Sozialtechnologien, d.h. den zielgerichteten, praktischen Umgang mit sozial- und kulturwissenschaftlichen Wissensbeständen, als Gegenstand einer Technologiefolgen-Abschätzung zu erörtern.

Ein allgemeines Fazit vorweg: Eine sozial- und kulturwissenschaftliche Erweiterung der Perspektiven und Fragestellungen der Technologiefolgen-Abschätzung erhöht nicht nur deren momentane Relevanz, sondern stellt sicher, dass das „Instrument“ TA auch zukunftsfähig aufgestellt ist. Der „Schlussbericht“ stellt dies auf verschiedenen Ebenen einleuchtend dar:

- Er arbeitet die Defizite des bisherigen, engen Verständnisses von Technik heraus (Technikdeterminismus, fehlender soziokultureller Kontext) und erläutert plausibel die Notwendigkeit eines erweiterten Begriffs und Verständnisses von Technik/Technologie (Prozesshaftigkeit, Komplexität technischer Entwicklungen, Offenheit der Technik für unvorhergesehene Interpretationen und Nutzungen, „Technizität“ der Kultur).
- Er verweist auf die Notwendigkeit, Technikfolgen-Abschätzung nicht auf die Ermittlung der Folgen einzelner Techniken zu beschränken, sondern um die Bedingungen von deren Entstehung, Aufnahme und dem Umgang mit ihnen auszuweiten.
- Er analysiert bestehende Projekte der TA-SWISS auf Desiderata und Potenziale und arbeitet heraus, dass eine konsequente Berücksichtigung soziokultureller Faktoren a) die Ermittlung zusätzlicher Dimensionen der Technikentwicklung, b) mehr Stringenz und Systematik und c) auch neue Themenfelder verspricht.
- Er skizziert die Ansätze von TA-Institutionen aus dem europäischen Umfeld und stellt fest, dass sozial- und kulturwissenschaftlichen Ansätzen und Fragestellungen nicht nur innovatives Potenzial innewohnt, sondern diese auch zusätzliche Perspektiven – etwa in Richtung „Arbeit“ oder Technologiepolitik – bieten. Gleichzeitig hält der Bericht fest, dass in den verglichenen TA-Einrichtungen sowohl kulturwissenschaftliche Fragen unterrepräsentiert sind, als auch die Thematik der Sozialtechnologien bislang noch gar nicht aufgegriffen wurde.
- Er entwirft in Umrissen Möglichkeiten zur Operationalisierung des Konzepts der Sozialtechnologien (i.e. im engeren Sinne – parallel zum engen Begriff der Technologie – der zielgerichtete Einsatz effektiver Mittel, in einem erweiterten Sinne – als „soziotechnische Wissensregimes“ – eine offene, prozesshafte Größe). Dieses bietet die Möglichkeit, die Beschränkung auf „physikalische“ Technologie zu überwinden und soziale Techniken, die in Gruppen, in institutionellen oder anderen Rahmen zum Einsatz gelangen (und in denen

„physikalische“ Technologie durchaus eine Rolle spielt), ebenfalls auf ihre Bedingungen und Folgen hin zu befragen.

- Er konkretisiert anhand exemplarischer Themenbereiche aus Verwaltung, Wirtschaft und Politik mögliche relevante Anwendungsfelder einer Sozialtechnologiefolgen-Abschätzung.

Zur Einschätzung im Einzelnen:

Darlegung des state of the art

Die Verfasserinnen des „Schlussberichts“ sahen sich vor die Aufgabe gestellt, die Aussagen und Ansätze einer im *sozial- und kulturwissenschaftliche*n Bereich keineswegs kohärenten *Technikforschung* zu sichten, sie auf ihre Eignung für die Problematik der Technikfolgen-Abschätzung hin zu bewerten, sie zu bündeln, zu verdichten und erst noch auf knappem Raum darzustellen. Dies ist in hohem Masse geglückt. Besonders hervorzuheben ist, dass es zudem gelungen ist, Ansätze mit unterschiedlichen theoretischen Grundlegungen im vorliegenden Konzept schlüssig zusammenzuführen.

Dass bei einer solchen Ausgangslage zwangsläufig einzelne Facetten des Themas unberücksichtigt bleiben, ja unberücksichtigt bleiben müssen, versteht sich von selbst und tut der Substanz des Berichts in keiner Form Abbruch. So sind beispielsweise – auch ohne dass explizit Ansätze oder einzelne Exponenten genannt werden – medienwissenschaftliche Überlegungen durchaus implizit in die Vorschläge zur Erweiterung des Technik- und des Verständnisses von soziotechnischen Wissensregimes eingegangen. Gerade für die weitere Auseinandersetzung mit diesem Punkt – genauer: für das Ineinandergreifen und das Nebeneinander unterschiedlicher Wissensbestände wie Expertenwissen und „praktischem Wissen“ – ist zudem auf die Beiträge einer an den Cultural Studies orientierten Techniksoziologie hinzuweisen.

Für das neue Feld der *Sozialtechnologiefolgen-Abschätzung* legt der „Schlussbericht“ erste Modellüberlegungen vor. Auch dies erscheint stimmig, zumal Begriffe wie Soziotechnik, *social engineering* oder Sozialtechnologie zwar schon seit über fünf Jahrzehnten im Gebrauch sind, ohne dass allerdings ein festes Konzept dafür aus-

gearbeitet worden wäre. Im „Schlussbericht“ steht daher folgerichtig im Vordergrund, diesen zwar geläufigen, aber bislang wenig trennscharf verwendeten Begriff zu akzentuieren und gleichzeitig auf innovative Weise die notwendigen Erweiterungen des Technikbegriffs in das Konzept zu integrieren. Es bedarf aber auf jeden Fall – wie auch in den Empfehlungen vorgeschlagen – schon für die Ausschreibung entsprechender Projekte eines wissenschaftlichen Beirats und weiterer flankierender Massnahmen, um das Profil einer Sozialtechnologiefolgenabschätzung weiter auszubauen und zu schärfen. Durch deren sorgfältige und umsichtige Implementierung kann aber – über eine Kurskorrektur hinaus – der Arbeit und den Ansätzen der TA-SWISS gerade auch im internationalen Vergleich eine Vorreiterrolle zukommen.
Es empfiehlt sich, Wege und Möglichkeiten der Operationalisierbarkeit und der inhaltlichen Ausgestaltung eines Ansatzes zur Sozialtechnologiefolgen-Abschätzung an Pilotprojekten auszuloten. Die im „Schlussbericht“ vorgeschlagenen Themen sind zwar komplex, im Falle des *New Public Management* und des *Coachings* von Führungskräften aber nicht nur handhabbar, sondern auf jeden Fall geeignet, über die zu erwartenden, konkreten Aussagen und Empfehlungen hinaus das Instrumentarium einer Sozialtechnologiefolgenabschätzung weiter zu entwickeln. So wichtig das Feld des bürgerschaftlichen Engagements von seiner soziopolitischen Bedeutung her ist, so scheint es aufgrund seiner Komplexität angebracht, diese Thematik erst nach der kritischen Sichtung der Ergebnisse der beiden erstgenannten Projekte anzugehen.

Hervorzuheben ist schliesslich, dass im „Schlussbericht“ auch die Arbeiten ausgewählter *Institutionen* aus dem Bereich *der Technologiefolgen-Abschätzung* auf den Miteinbezug sozial- und kulturwissenschaftlicher Fragestellungen hin gesichtet worden sind. Das heterogene Bild, das sich dabei ergibt, zeigt zum einen, dass die soziokulturelle Dimension (wenngleich in unterschiedlicher Intensität) Eingang in das Arbeiten gefunden hat, allerdings noch nirgends wirklich systematisch einbezogen worden ist. Dieser Befund legt zweierlei nahe:

a) sozial- und kulturwissenschaftliche Ansätze erschliessen neue Felder; sie bringen Technologiefolgen-Abschätzung und Gesellschaft näher zueinander; sie sind geeig-

net, forschungspolitische Impulse zu vermitteln und streichen die Bedeutung heraus, die der Berücksichtigung von Wissensbeständen zukommt.

b) Will sich die Technologiefolgen-Abschätzung in der Schweiz neu positionieren, so kann sie dies vor allem mittels einer konsequenten Erweiterung um sozial- und kulturwissenschaftliche Fragestellungen tun.

Zur Bedeutung und zum Beitrag einer sozial- und kulturwissenschaftlichen Erweiterung für die Technologiefolgen-Abschätzung

Wie im „Schlussbericht“ u.a. als Resultat der kritischen Sichtung vergangener Projekte der TA-SWISS dargelegt, vermag der systematische Miteinbezug des soziokulturellen Kontexts in die Technikfolgenabschätzung ein enges, von der Technik her argumentierendes Verständnis dessen, was unter den Folgen von Technik/Technologie zu verstehen ist, maßgeblich zu erweitern: Insbesondere schärft die sozial- und kulturwissenschaftliche Perspektive den Blick für die Offenheit und die Prozesshaftigkeit der Aneignung von, des Umgangs mit und der Bedeutungsaushandlungen von Technischem und vermag damit das Bild einer einseitigen Anpassung des Menschen an die Technik zu korrigieren.

Damit ermöglicht eine sozial- und kulturwissenschaftlich erweiterte Technikfolgen-Abschätzung zum einen eine Erweiterung der bisherigen Ansätze, zum anderen kann und soll sie aber auch zu einer grundsätzlichen Neuorientierung führen – einer Neuorientierung, die sowohl das aktuelle Potenzial und die bisherigen Stärken der Technikfolgenabschätzung integriert, als auch gleichzeitig deren gesellschaftliche und politische Relevanz erheblich steigert:

- Sie nimmt Technik/Technologie nicht erst dann in den Blick, wenn sie bereits „in die Welt gesetzt“ ist, sondern bezieht auch das mit ein, was in Technik eingeschrieben ist, d.h. sie widmet sich auch der „Genese“ von Technischem und dabei nicht bloss dem Artefakt, sondern auch den Vorstellungen und Wünschen, Ängsten und Hoffnungen, die dieses bündelt. Nicht zuletzt berücksichtigt sie nicht nur Handlungsanforderungen, sondern auch Handlungsoptionen, die sich aus dem Umgang mit Technik ergeben.

- Sie betrachtet Technik/Technologie nicht isoliert, sondern reflektiert auch deren „Sitz im Leben“, d.h. den offenen oder verdeckten, den bewussten oder meist unbemerkten Einfluss von Technischem auf die Art und Weise der Lebensgestaltung.
- Sie entwickelt einen umfassenden Ansatz, der nicht nur der ethischen, rechtlichen, ökologischen und der ökonomischen, sondern stets auch der dinglich-materiellen, der soziokulturellen und der „subjektbezogenen“ Dimension Rechnung trägt.
- Damit löst sie sich von einer isolierten Sicht auf Technik/Technologie und fokussiert stets auch deren Kontextgebundenheit.
- Darüber hinaus berücksichtigt sie in ihrem Ansatz die „Technizität“ von Alltag und Gesellschaft, d.i. der Umstand, dass Technisches mittlerweile ein fester, allgegenwärtiger Bestandteil unserer Wissens-, Handlungs- und Orientierungssysteme geworden ist.
- Nicht zuletzt verpflichtet sie sich damit einem erweiterten Verständnis von Technik; einem Verständnis, das schliesslich auch erlaubt, Technik/Technologie nicht notwendigerweise an deren dinglich-physikalische Technik zu binden, sondern auch den Umgang mit der zentralen Ressource „Wissen“ in den Gegenstandsbereich der Technikfolgen-Abschätzung zu integrieren.

Kurz: eine sozial- und kulturwissenschaftlich erweiterte Technologiefolgen-Abschätzung führt hin zu einem zeitgemässen Verständnis von Technik/Technologie. Sie trägt der Verwobenheit von Technik, Gesellschaft und Kultur Rechnung und führt das Projekt Technikfolgenabschätzung aus der „technoiden Ecke“ in die Mitte des Lebens.

Anschlussfähigkeit

Was potenzielle Partner und Ansätze aus der Wissenschaft anbelangt, so ist der Zeitpunkt für eine sozial- und kulturwissenschaftliche Orientierung der Technikfolgen-Abschätzung gut: Gerade in den vergangenen Jahren haben sich in der Technik- (und in der Wissenschafts-)forschung Ansätze etabliert, die eine fruchtbare Basis für Kooperation bilden können. Unerwünschte Überschneidungen und Mehrspurigkeiten sind dabei kaum zu erwarten, im Gegenteil: genau so wie in der Technikfolgen-Abschätzung die Berücksichtigung sozial- und kulturwissenschaftlicher Ansätze der Technikforschung weitgehend ein Desiderat darstellt, ist bei diesen der Blick auf Technik-Folgen nur wenig ausgeprägt.

Die zentralen Anschluss-Möglichkeiten einer sozial- und kulturwissenschaftlich orientierten Technikfolgen-Abschätzung sind im „Schlussbericht“ bereits in substantieller Weise inhaltlich aufgearbeitet: Viele der vor allem im einführenden Kapitel zitierten Autorinnen und Autoren stehen für eine erweiterte Technikforschung und kommen auch als Ansprech- und Kooperationspartnerinnen und -partner in Frage. Die folgende – nur beispiel- und zugleich lückenhafte – Aufzählung orientiert sich daher weniger an einzelnen Personen, sondern vielmehr an Ansätzen, die sich für die Berücksichtigung im Rahmen einer erweiterten Technikfolgen-Abschätzung anbieten:

- Von den Ansätzen her besonders nahe liegend erscheint es zum Beispiel, Wissenschaftlerinnen und Wissenschaftler zu begrüssen, die Technikforschung unter der im Bericht etwas eingehender dargestellten Perspektive einer „*social construction*“ bzw. eines „*social shaping of technology*“ betreiben. Dazu gehört u.a. mit Sabine Maasen eine der beiden Verfasserinnen des „Schlussberichts“, deren Aktivitäten zur Wissenschaftsforschung breite Anschlussmöglichkeiten bieten.
- Ebenso vielversprechend (und auch nicht trennscharf vom Vorherigen abzuheben) erscheint das Feld der „*Science and Technology Studies*“, ein Forschungsbereich, dessen Ziel es ist, die sozialen Praktiken bei der Entwicklung, der Verbreitung und beim Umgang mit Technik/Technologie zu erforschen. Als Hinweis möge hier derjenige auf die „European Association for the

Study of Science and Technology“ (http://www.easst.net), dem europäischen Dachverband, genügen, dem zurzeit Sally Wyatt von der Universiteit van Amsterdam vorsitzt.

- Fruchtbare Anschlussmöglichkeiten für eine sozial- und kulturwissenschaftlich orientierte Technikforschung bietet weiter die Akteur-Netzwerk-Theorie. Den Vertreterinnen und Vertretern dieser Sichtweise geht es – wie schon der Name andeutet – um die Analyse von Institutionen, Handlungsmustern und den Verflechtungen von Akteuren und Netzwerken namentlich im (sozio)technischen Bereich. Prominentester Vertreter ist Bruno Latour von der „Ecole des Mines“ in Paris, Brücken zur Kulturwissenschaft schlägt u.a. Stefan Beck vom Institut für Europäische Ethnologie der Humboldt-Universität zu Berlin.
- Schon seit längerem existiert zudem in der Soziologie das Forschungsfeld „Technik im Alltag“. Namhafte Vertreter wie Werner Rammert (TU Berlin), Günter Ropohl (Johann Wolfgang Goethe-Universität Frankfurt) oder Karl Heinz Hörning (RWTH Aachen) sind massgeblich an der Ausweitung des Technikbegriffs und an der Orientierung am Umgang mit Technik beteiligt, Karl Heinz Hörning arbeitet zudem seit einiger Zeit vor allem an der Problematik der Bedeutung unterschiedlicher Wissensbestände im Umgang mit Technik.
- Aus der Technik- und Umweltsoziologie sei zudem speziell auf Ortwin Renn (Universität Stuttgart) verwiesen, der für die im „Schlussbericht“ skizzierte Ausweitung der Ansätze der „Akademie für Technikfolgenabschätzung in Baden-Württemberg“ mitverantwortlich zeichnete.
- Aus dem enger kulturwissenschaftlichen Bereich seien schliesslich Hartmut Böhme (Kulturwissenschaftliche Seminar der Humboldt-Universität zu Berlin) und nicht zuletzt das „Forschungskolleg kulturwissenschaftliche Technikforschung“ genannt (http://www.rrz. uni-hamburg.de/technik-kultur/), das sich unter meiner Leitung seit 2002 der systematischen Erforschung der Erfahrungsdimension der Technik widmet.

Fazit

Um das bereits eingangs gezogene Fazit noch einmal zu wiederholen: Der „Schlussbericht“ zeigt nicht nur geeignete Wege für die Erweiterung der Technikfolgen-Abschätzung, sondern er macht auch deutlich, dass mit der Einbettung sozial- und kulturwissenschaftlicher Ansätze die gesellschaftliche und politische Relevanz des „Projekts Technikfolgenabschätzung“ insgesamt noch einmal gesteigert und der zunehmenden Komplexität des Gegenstandsbereichs Rechnung getragen werden kann.

Hamburg, 19. September 2005

7.2. Expert's Report by Dr. Jan Staman, Rathenau Institute, Den Haag

A real challenge for parliamentary TA

In their paper entitled “Schlussbericht für eine Sozial- und Kulturwissenschaftlich ausgerichtete Technologiefolgenabschätzung”, Professor Maasen and Dr. Merz have produced provocative and challenging material for discussion, not only for TA SWISS but for all members of EPTA (European Parliamentary Technology Assessment Network; the editor). In their paper, the authors make an impressive plea for *Eine Sozial- und Kulturwissenschaftlich Ausgerichtete Technologiefolgenabschatzung*. They analyse how TA SWISS and the selected EPTA members carry out TA with regard to the socio-cultural embedding of their projects and how they involve the social and cultural sciences in their TA. The authors’ judgement is not all that positive, if I may say so. The paper concludes with a number of *desiderata* and an impressive list of detailed recommendations, aimed at making a *Wende* towards a more socio-culturally oriented TA.

The message

Before going into the more general questions that were raised by TA SWISS to stimulate discussion, let me first summarise or rephrase what the authors’ message really is.

- All your TA should be based on the fact that science and technology are deeply embedded in socio-cultural practices. TA should, therefore, be based on the socio-cultural sciences.
- The science and technology concept in your TA practice should be broadened and social technology should also be incorporated in your TA program.
- Your scope should not be constrained to the socio-cultural consequences of a kind of neutral science and technology. The socio-cultural conditions for producing new technology should always be incorporated in your TA, in order to assess not only the acceptation of new technology itself, but also the way in which it can and will be applied.

- You should be aware that this has consequences for the way in which you define your topics and their context, your project or research design, and the methods to be used.
- You should not think that you are home free by just addressing a few points of criticism. No, your approach to TA should thoroughly change, because the perspective should be really different.

In other words, the message that Maasen and Merz want to put across is that if you follow their recommendations, you certainly will make your own *Wende* with respect to TA. (p. 40)

I have no doubt that this paper is well documented and of great interest for TA SWISS, as well as for TA institutes in general. I believe that the EPTA members will be greatly indebted to TA SWISS if this paper is brought to the attention of EPTA in general and I am sure that it will provoke a very stimulating discussion.

As requested by TA SWISS, my contribution is concerned with a number of questions that were raised by TA SWISS.

7.2.1. Questions raised by TA SWISS

The following introductory questions, which I will proceed to answer first, were raised by TA SWISS:

- Does the paper cover the subject of TA adequately by broadening it to socio-technologies and to the socio-cultural context?
- What kind of questions and themes can be added to the issue of the socio-cultural context?
- Are the themes that are being proposed for social technologies assessment (STA), such as New Public Management (NPM), coaching, civil engagement, appropriate starting points and are there other themes that can be added?

In general, I believe that the many aspects of the socio-cultural context are adequately covered in the paper. The authors touch upon an enormous number of themes and questions are stipulated in a compact and coherent way. I believe, though, that there are additional questions that should be asked and additional themes that should be given some attention.

Additional questions

My first additional question is: “Is there a convincing explanation, specifically from the socio-cultural point of view or from the perspective of science studies, for the fact that public ‘neutral’ European TA has, in the past 20 years, focused solely on consequences, while nevertheless successfully contributing to public awareness, to public and political debate, to political agenda-setting and to public articulation of socio-cultural issues at stake? In other words, what kind of success have we really had until now?”

My second additional question is: “If we broaden our TA to the socio-cultural context, what exactly will be the new contribution to success and what will be the added value in terms of awareness, debate, agenda-setting and public articulation, and, if there is no clear prospect of added value, might our TA practice not remain business as usual, so the *Wende* will never be made?”

Additional themes

The first additional theme that I would like to raise for discussion is that of TA for ‘techno-practices in crisis’ or, in modern language, ‘techno-practices in decline and still not in transition’. In the paper, the authors focus on ‘technologies for the future’ and the socio-cultural context in which they emerge. But consider the practice of water management, energy management, mobility, or agriculture. These practices are all in trouble, and there is one place where these problems clearly come to the surface: the generally poorly developed strategic agenda for science and technology. Generally speaking, the strategic agenda for science and technology is an agenda of the past and it is hardly adapted to the rapidly changing circumstances, including

those of a social and cultural nature. Broadening the context of TA might be very helpful in this context, perhaps even more so than in the area of new technologies. That is, at least, our experience in doing TA in the area of water management and agriculture, where it was a *conditio sine qua non* for doing TA.

The second additional theme that I would like to include in the discussion is that of social technology assessment (STA). The authors propose three themes for such social technology assessment (STA). They also emphasize the similarities between material technologies and social technologies and make us aware of the fact that material technologies (ICT) play a role in social technologies. In general, I agree with their notion that STA might well belong to the family of public or parliamentary TA. The historical legitimacy of our TA is related to material new technologies. In the meantime, we have expanded our TA-domain to that of crashing complex techno-systems and, in principle, there is no reason not to expand our activities to the social technologies. However, I am not familiar enough with these themes and I am not sure whether TA focusing on these themes has a reasonable chance of producing successful public and political awareness, articulation, debate, and agenda-setting. In my institute, I think we might start with a quick scan of the idea, in order to make sure that we can be successful in these areas.

A final additional theme that I would like to add to the discussion lies in the world of foresight. It might be related to the proposed theme of citizen engagement and also to the Commission's general view on science and society. Traditionally, foresight is a 'neutral' and evidence or science-based activity, even though it is mostly performed deeply within the world of science and technology itself. In most cases it is directed only towards governmental and other policy-making and funding institutions. We know that in this area, a societal *Wende* is also in progress: a movement towards civil society and towards the societal and cultural embedding of science and technology in general. Quite a few elements of TA will eventually be incorporated into foresight strategies and foresight procedures. In the long run, TA and foresight might even end up going hand in hand. For this reason, I heartily recommend that parliamentary TA institutes each carry out their own STA project on foresight.

7.2.2. Additional questions raised by TA-SWISS

What is the meaning and relevance we can attribute to the broadened socio-cultural concept in relation to innovative TA? New prospects? Objections? The right perspectives?

The black box

As I have made clear by my earlier questions, I believe that the authors did not sufficiently answer this question. In general, I would say that our TA projects are perceived to be related to the socio-cultural context of producing technology, to the acceptation of technology and to the application of technology, even when these projects are formally focused on the consequences of new technologies. I do not even exclude the thought that some of us cherish the idea that *public* neutral TA might, in many cases, be the best tactical starting point for generating *and orchestrating* a broad socio-cultural debate. In that process, I believe, we expect input from the stakeholders, especially concerning the socio-cultural context. My guess is, therefore, that the authors may underestimate the relevance of the process 'after the study'. Of course, TA projects should start carefully and should take time. As most debates recycle the discussions over time, careful consideration is necessary to organise truly new input regarding the socio-cultural dimension.

TA projects certainly relate to different views on good life, as TA is supposedly based on the concept of a liberal, democratic, tolerant and pluralistic society. Nevertheless, the observation was made that the socio-cultural dimension in TA remains too much of a black box. I agree with that observation and I am sure that broadening the scope of TA and its socio-cultural dimensions will contribute to a more sophisticated and fine-tuned TA, to better early warning signals, to more substantial debate, to greater awareness, and to better agenda setting. In this way, TA might also become a more effective eye-opener for the science and technology community itself. Thus, broadening the scope of TA will indeed open up the prospect of TA projects with new designs and methodologies from the socio-cultural sciences, as well as from the media and the arts.

Examples

Examples of projects that are urgently in need of a broadened TA approach concern issues like the relationship between ICT and the emergence of a new screening society. Another ICT-related example is the appearance of the first digital generation. A new, young generation has almost completely internalised ICT. Who are they, at home and in cyberspace, and why have they done this? In the field of bio-medicine, an example is the emergence of possibilities for human enhancement, which gives rise to a new generation of medicines and methods that we do not yet know very well. Another example is the influence of brain sciences on individuals and communities as a whole.

As I have said before, it requires careful consideration to determine where in the TA process the broadened socio-cultural dimensions find their rightful place.

Broadening scope to retain relevance

If TA does not broaden its scope, it will lose its relevance. In the narrow concept, TA will go on exploring issues like the relationship between ICT and human rights, or the relationship between human enhancement and ethical theory. In this concept, TA will, of course, continue to explore the relationship between applied genetics or reproductive technology and concepts of risks and ethics. However, these rather tailor-made explorations need not be repeated over and again by TA institutes. They have already been done, all over the world, year by year, in various specific areas of research.

Balancing acts

It appears to me that the authors look at parliamentary TA primarily as a science-based activity of carrying out studies, and that they urge us to incorporate socio-cultural science in these TA studies. They are aware of the fact that parliamentary TA is a ‘balancing act’, but the general idea is, nevertheless, that TA institutes primarily carry out studies that are science-based. The more science there is in a study, the better TA is considered to be. Possibly, robustness and quality might help convince the policymakers and the politicians, but I have my doubts. In general, scientific studies do not contribute too much to public awareness, debate, or agenda-

setting. The contribution of a scientific paper to a concrete public debate, where opinions clash and arguments are exchanged, is limited in my opinion.

Obviously, TA contributions should be evidence-based, but at the end of the day they are made to serve the public discourse. Parliamentary TA institutes do not produce papers for the scientific community in their expert languages. Their task is not to contribute to the growth of scientific knowledge. Their papers and other productions are not made for scientific journals.
Parliamentary TA institutes produce for citizens, stakeholders, politicians and policy-makers. Of course, experts will scrutinise the texts and, of course, TA institutes have to take account of the opinions of experts and stakeholders. There is no doubt about that. But the primary task of our TA institutes is to provoke debate and raise awareness, to contribute to a well-informed debate, and even to orchestrate debate. But above all, TA institutes function within a socio-cultural arena and not outside of it. Parliamentary TA is not performed by innocent scientific bystanders.

Although I agree with the idea to involve in TA projects socio-cultural scientists, I also want to make a case for the idea of involving writers working in the field of investigative journalism - which is evidence based -, or civil servants who have expertise in writing excellent policy papers - equally evidence based-. But most of all I would like to encourage the involvement of other creative people from the world of the arts and the media. In many cases, artists and media-people are best equipped both to communicate the message and to put the socio-cultural dimension in the proper perspective.

What kind of institutions and persons (professorships) broadened TA is familiar with? Overlap problems? What might be your contribution?
With respect to broadened TA and its relationship with various institutions and persons, it is difficult for me to be specific for the Swiss situation. Let me speak, therefore, about our experiences in the Rathenau Institute with respect to our alliances with scientific institutions and other scientific bodies or persons.

We are currently collaborating with the Dutch institute for social and cultural planning on the digital generation and on the relevance, or lack thereof, of ICT in primary and secondary schools. With the Agricultural Economic Research Institute of the Ministry of Agriculture we have organised two national essay-contests, the first one on the double morality of consumers and citizens and the second one on the socio-cultural aspects of *obesitas*. With quite a few science research centres within universities we collaborate on TA with respect to a variety of new technologies and new developments in science & society. With medical historians in universities we collaborate on topics like psychopharmacology, or everyday medical practices. In general, all kinds of humanities and social sciences chairs in technological and life-science departments of universities are involved in our projects. Of course, philosophers and ethicists are also frequently involved in our work. Quite often we collaborate with chairs in political sciences or policy sciences. General sociology and psychology departments of universities function at a greater distance, but we do sometimes need their specialists. Law institutes at universities are not frequently involved in our activities. Quite frequently, we collaborate with university researchers in the field of communication. Often we also collaborate with all kinds of social scientists in TNO, the Dutch centre for applied research. Within our institute itself we employ a variety of disciplines: an anthropologist, policy-scientists, philosophers, ethicists, a historian, a lawyer, and a sociologist.

Overlap

Of course, there is an overlap between science and TA. Fortunately, I would say. When parliamentary TA is conceptualised solely as the activity of carrying out scientific studies, one might view overlapping institutions and chairs as a danger. In our view of TA, most scientific institutions do not feel legitimized to go public in the arena of science and technology debate. They prefer to work in the shadows and in the discretion provided by science and technology, far from public administration. In most cases, scientists want to stick to their basic competence: scientific studies. Still, they do have a strong preference to collaborate with our institute. This means that, time and again, we need to explain to scientists who do an assignment for us what the purpose of the job is, who the addressee are, and what that means for the way

they carry out their activities and present the results. In order to have the opportunity for close and intense cooperation during a longer period of time, we often provide positions for visiting scholars. This approach also provides the opportunity for coordinating the needs of our institute with the capabilities and approach of the visiting scholar in question.

Our contribution

With regard to the question of our contribution to broadening the scope of TA, I believe that perhaps the best thing to do is to experiment and share the results with our EPTA-partners and the scientific community at large.

Utrecht, September 26, 2005

Studies conducted and commissioned by the Centre for Technology Assessment TA-SWISS are aimed at providing objective, independent, and broad-based information on the advantages and risks of new technologies. To this purpose the studies are conducted in collaboration with groups comprised of experts in the relevant fields. The professional expertise of the supervisory groups covers a broad range of aspects of the issue under study.

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