3.
TA as communication and participation – the discursive dimension

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Technology assessment as a participatory and argumentative process

1. Concept and purpose of TA; processing TA analyses

The term "technology assessment analyses" has recently been used to describe studies aimed at systematically researching and evaluating the effects of the initial application of new technologies or the increased or modified application of known technologies, with a focus on the unintended secondary and tertiary effects, which often occur after a considerable delay. Technology assessment studies should anticipate and assess the effects of technology application in as many (affected) areas of society and its natural environment as possible.

TA analyses should therefore be systematic and comprehensive and pay particular attention to the side effects of technology applications (without neglecting the intended primary effects). In addition, the "*objectivity*" of TA studies is often claimed or demanded, and they should therefore be conducted by *"neutral" institutes* that *are independent* of certain interest groups and carry out these studies in interdisciplinary teams.

Various analysts have proposed "*methodologies*," "*models*," and "*schemes*" for the approach to TA studies. These schemes usually contain the instruction to

- define and delimit the problem and the assessment task, and describe the technology to be analyzed as well as supporting and alternative technologies,
- develop an information base,
- identify, analyze, and evaluate potential consequences,
- design possible options for action (to reduce or increase the impact of the technologies), and
- draw conclusions and possibly also make recommendations.

These schemes are usually seen as fundamentally *sequential*. The MITRE Corporation[1] has tried to increase the practical benefit of its flowchart for technology

1 *Editors' note*: For further information, see: https://www.mitre.org/ (accessed: 14.04.2025).

assessment studies by drawing up *checklists* for the specific execution of the individual steps.

The declared purpose of such studies is to create a broad and high-quality *information base* for governmental and corporate decisions regarding the development, modification, and application of technologies, and thus the prerequisite for avoiding or reducing the risks associated with the application of technology for humans and their environment. TA is therefore a *decision-making process*. However, the close connection between the TA analysis process and the decision-making process is – rightly – emphasized by most authors: TA can only become effective if it is integrated into the decision-making process.

2. Critical comments on the TA concept

The problem known as "technology assessment" is of course nothing new in principle; there have always been studies on the consequences of the introduction of technical innovations. However, certain consequences have usually been overlooked or deliberately ignored. What is new about technology assessment is above all the demand that the unintended, indirect effects of technology applications, which in the long term can be far more serious than the intended primary effects, should also be taken into account in an appropriate forward-looking manner, and that the analysis should not be limited to effects in the technical and economic areas.

The methods and techniques previously used in TA investigations have also been known for a long time: They are not characteristic elements of TA.

With regard to the claim or demand for "*objectivity*" of TA analyses, it must be said that objectivity in the (scientific) sense cannot exist in such studies. The results of every technology assessment study depend on the assumptions on which the analysis is based, on the delimitation of the study, and on the evaluative decisions made in the course of the technology assessment process. The results are therefore value-laden and subjective. If other assumptions were chosen, if the scope of the examined impact area were defined differently, and if other value judgments were made during the investigation, then the results would be different and equally subjective. This also means that what the research team assesses as "important" or "main" may differ from what critics of the studies assess as such. The frequently heard criticism that the studies are not "comprehensive" can be interest-driven: Only the knock-on effects that strengthen one's own position and those that weaken the position of others are missed.

In this context it should also be noted that – as with other planning and decision-preparatory studies – there is no quasi-logical limit to what must and must not be included in the technology assessment studies, as a result of the problem under investigation. The scope of the study – apart from factors such as the team's work productivity, etc. – is only limited by the client's requirements, the deadline by which the study must be available for decision preparation, and the amount of funding provided.

And a further comment should be made in this context: the *future relevance* of consequences is difficult, if not impossible, to assess given the current state of development of the social sciences. In order to be able to assess an impact that does not (yet?) appear to be relevant by today's standards, the *future value standards* would have to be known. Incidentally, the future value standards must also be known in order to be able to determine the future relevance of impacts that may differ from the current relevance. Without this knowledge of future value standards, technology assessment studies lead to an evaluation of future impacts within the *current* value system and not to an evaluation of future technology impacts within the *future* value system.

As far as the *institutes* that are to carry out the TA analyses are concerned, it will of course generally be desirable for the analysis teams to be formed by institutes that are not dependent on special interest groups. Under certain circumstances, dependent groups will deliberately neglect certain areas of impact and give one-sided priority to certain interests. However, neutrality, expertise, and the ability to organize larger projects seem to contradict one another to a certain extent. Independence and neutrality are probably most likely to be found in university groups. However, we know from American studies, for example, that when awarding TA studies "externally," public authorities give preference to non-university institutions over university institutions, with the probably justified reasoning that the latter do not have the necessary "management know-how" for the development of larger projects, even if their advantages in terms of intellectual capacity and neutrality are recognized.

Perhaps cooperation between university groups and non-university institutions would be a sensible solution. It would also be conceivable to bring together ad-hoc teams of experts from a larger number of institutions of all types for a specific assessment task. In both cases, however, considerable practical difficulties will have to be reckoned with.

The "*schemes*" for the approach to assessment studies proposed by various analysts to date are not particularly helpful for those who are faced with the task of carrying out a concrete technology assessment analysis and developing

a strategy for it. The schemes are – inevitably – relatively crude and actually quite trivial. As far as the *checklists* are concerned, they can of course never be exhaustive – as is sometimes required – if they are to contain more than global categories. They can be a useful "starting aid," for example, in identifying areas of impact and options for action; however, it should not be overlooked that the existence of such prefabricated lists can also have a blocking effect on the imagination.

In recent years, fundamental criticism of the use of process schemes (as in the stage model outlined above) for the analysis of complex issues of a socio-technical nature has been repeatedly formulated within systems research, which tends to operate with very similar models. It is often disputed that the analytical process for such issues actually takes place in the described or a similar step-by-step manner. This criticism and its relevance for the implementation of technology assessment studies cannot be justified in detail here. However, it is clear, for example, that the collection of information cannot be a separate step in the technology assessment process, but takes place during the entire course of this process.

As mentioned above, most authors emphasize that the TA analysis process must be integrated into the policy-making process in order to be effective. However, it is generally not recognized clearly enough that a *mutual learning process* must take place on the part of the analyst and the decision-maker, in the course of which the analyst learns about the meaning and purpose of the study and the decision-maker sharpens his or her insight into the existing alternatives.

I would like to draw the following *general conclusion* from what I have said so far:

The analysis of the consequences resulting from the application of a technology does not constitute a scientific decision on whether a technology should be applied. Which impacts of a technology appear acceptable is not a scientific problem. The question of what impacts are *considered acceptable* and what distribution of these impacts across different groups of people is *considered desirable* is a political decision.

3. Consequences of the criticism presented

In any case, the implementation of technology assessment studies requires the conception of pragmatic strategies that are adequate to the respective issues – including the organization of a fruitful and realistic dialogue between experts,

politicians and stakeholders, and the sensibly coordinated use of suitable instruments.

In my opinion, the attempt to construct a *standardized, generally applicable* scheme for the course of technology assessment processes is not very promising. It seems to me to be more important and urgent to reach a consensus on certain principles or guidelines that should be observed when planning and conducting technology assessment studies. The discussion of such principles forms the content of the following sections.

(a) Transparency of the TA process

Due to the large number of value judgments that are made in the course of the technology assessment process, this process must be made transparent at every step. All those involved in the technology assessment process must disclose the basis of their judgments to one another as clearly and completely as possible.

The main advantage of technology assessment studies over unanalyzed assumptions and fears – as with other methods that are also often referred to as "objective" (such as PPBS, cost-benefit analysis) – is that they *offer the opportunity* to disclose assumptions and value judgments and that the process leading to the result is verifiable and comprehensible. The assessment remains subjective. However, since an interpersonal understanding is reached, one can speak of an "objectified" procedure – to distinguish it from purely intuitive assessments – and thus does not conceal the fact that assessment studies tend to lead to different results with different basic convictions about the problem at hand, even with scientific means.

(b) Information for the public

The public must be informed of interim results and decisions and the reasons for them *during the course of* (important) technology assessment investigations in a form that also allows non-specialists to make an assessment. A more or less generalized final report on the results of the investigations is not sufficient.

(c) Ensuring maximum active, direct participation

Because "objective" technology assessment is not possible, participation in the assessment process must be ensured for those mainly affected by the consequences of the technology application. Participation opportunities should be demanded in particular for those groups of those affected who are not already able to influence

the planning and decision-making process due to their limited economic power or difficulties in forming powerful interest groups.

The lack of genuine participation opportunities for the various interest groups increases the risk of manipulation, and one-sided favoring of certain interests. Without the participation of stakeholders, there is a risk that the analysis of the distribution of positive and negative impacts on the various groups will not be carried out carefully enough, both in terms of the existence, strength, and evaluation of the impacts, and in terms of possible redistributions of advantages and disadvantages (benefits and costs) depending, for example, on modifications to the technology under consideration or its application modalities, and that the results of such analyses, including any divergent views, will not be sufficiently publicized. A form of technology application that is favorable from the point of view of the analyst team and the client with regard to the overall ratio of costs and benefits and their distribution (among those affected) can thus appear to be the only sensible one, and in connection with the claimed "objectivity" or "neutrality" of technology assessment studies, the impression can easily arise that there are no other alternatives with different distributional effects and that those predominantly affected by the disadvantages must bear the burdens from the application of this – overall advantageous – technology "fatefully," as it were. This conceals the fact that the problem of which distribution of costs and benefits *will* result from the application of the technology is primarily solved by the political decision as to which distribution *should* result. A scientific study is no substitute for this political decision.

However, the practical implementation of the direct participation of stakeholders in the technology assessment process is associated with considerable organizational, information, and communication difficulties. Although a whole series of procedures for the direct participation of interest groups in planning processes have already been developed and tested, some of them with television and computer support, it must be expected that a high degree of active participation by those affected could delay important and urgent decisions regarding the application of technologies to a considerable extent. In addition, the costs of technology assessment studies are likely to increase considerably if one is not content with conventional opinion polls or hearings that are often scheduled far too late.

However, this – short-term – cost increase could be small in relation to the costs incurred in the longer term, for example, because a group which is not involved in the assessment, or especially the evaluation process, delays, restricts, or even prevents the use of the technology. Despite these difficulties, for the

reasons discussed above it seems imperative to me that the issue of the direct participation of the main stakeholders in the technology assessment process is seriously addressed and that practicable procedures are sought that allow maximum active participation. The situation-specific knowledge regarding the concrete problems that arise in the context of technology assessment studies is not the monopoly of "experts," but is distributed across all those involved and affected. Citizens' resistance to "planning" by "experts" is rightly becoming ever stronger. Cases are no longer rare in which groups of affected people counter the reports of expert teams with their own analyses based on their specific interests and force their participation in planning processes through the public discussion of these counter-analyses.

As mentioned, there are already a number of approaches for the practical realization of direct participation. The Heidelberger Studiengruppe für Systemforschung (Heidelberg Study Group for Systems Research) has experimented with a planning and decision-making model whose core element is an "organized conflict" between the representatives of affected groups, which is broadcast via radio or television. Interested citizens can comment directly by telephone on controversial issues that arise in the course of the "organized conflict." The information received is immediately evaluated and the results are taken into account by the participants in the "organized conflict" in their arguments. Further elements of the system are: a database that provides the participants in the "organized conflict" with information on request to support their theses or to refute the theses of their "opponents," but from which interventions are also made in the event of false allegations; and a pre-selected representative panel from the population of the broadcasting area, whose members are obliged to participate by telephone and whose main function is to monitor the picture of the wishes and opinions of the population conveyed by the group of voluntary callers.

The reference to "forcing participation" on the part of certain groups of stakeholders refers to a certain basic form of technology assessment, the so-called "*advocacy approach*" ("advocate model" of TA). Here, different groups prepare assessments that reflect only *their own* interests. This approach makes opposing viewpoints on the analyzed technology clear, although the contradictory assessments are not directly comparable. The individual studies propose different measures, which of course cannot be coordinated with each other. By publishing the results and discussing them publicly, it may be possible to force the arguments of certain groups to be taken into account.

(d) Technology assessment as an argumentative process

The issues to be addressed in TA analyses are not purely technical or mathematical problems. Rather, they are complex problems with technical as well as economic, social, political, and ecological aspects. As a rule, these are problems for which no "wrong" or "right" solutions can be found, but only more or less "good" or "bad" ones, and the judgment on the solution to the problem depends on *who* has made it. At the beginning of the analysis, the TA analyst will usually only have a very preliminary understanding of the problem under investigation, about which he hopes to learn more and more as the project progresses.

The nature of the problems to be addressed leads to the insight that technology assessment analyses are to be understood as argumentative processes, i.e., as processes characterized by the fact that:

- new questions constantly arise in the course of their development and can constantly open up further (technological) alternatives and options for action, the consequences of which vary for different groups of those affected;
- every fact, every goal, every alternative, every option for action has its advantages and disadvantages, which are different from different points of view;
- different, more or less plausible arguments for and against different positions on the same issue exist and are put forward and discussed;
- etc.

"Argumentative" is understood here as being in contrast to the models derived from decision theory, which understand decision-making as the optimization of a measure of effectiveness and presuppose clear objectives on the part of the decision-makers, fully developed alternative courses of action, and the existence of that measure of effectiveness. These conditions cannot usually be met in planning processes in the political-social area, at least in the initial phases. The main difficulty for planning in this area is the problem-related formation of opinion, whereby the efforts to understand the problem, the search for possible solutions, and the search for objectives constantly alternate and overlap.

(e) Development of adequate procedures

Procedures must be developed and applied in specific cases that are suitable for organizing the technology assessment process as a transparent, participatory, and argumentative process.

As far as the individual tools used in technology assessment studies are concerned, the well-known methods of operations research, simulation, forecasting,

decision theory, etc. can be of considerable benefit if they are used taking into account their characteristics and limitations. They must be specifically incorporated into the technology assessment process.

All methods and models used should be "open" in the sense that non-tangible, non-conventional, and situation-specific variables can be included.

There is some evidence that, in the current euphoria at the prospect of finally being able to obtain an effective instrument for a comprehensive technology policy that is also geared toward societal and ecological goals, some of the problems and difficulties associated with the planning and implementation of TA studies are being ignored or underestimated. Technology assessment, which in many respects is still in its infancy, thus runs the risk of being overrated in a similar way to other procedures and instruments of planning and decision preparation that have been propagated in recent years – only to be condemned all the more thoroughly afterwards. My comments should help to clarify some of the problems that I consider important in connection with TA studies, and possibly clear up some misunderstandings about the role and possibilities of TA.