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Risk as a key category of social theory[1]

1. Preliminary remarks

The workshops of social theorists are once again bustling with activity. After having spent the last decade clearing out their classical concepts, safely depositing old theoretical burdens or simply retreating into the labyrinthine building of the history of dogma, they have *discovered risk as a social-theoretical issue* (Beck 1986, 1989; Halfmann/Japp 1990).

As a special type of theory formation, social theory reflects on the defining structural features of existing society, which determine its forms of communication, its self-interpretation (ideology), and its conflicts. Social theory also constitutes itself as an analysis of the present. It asks about the present conditions of action, the evolutionary/revolutionary possibilities, and the self-interpretations and visions of the future of the members of society, which are expressed in communicative relationships. The double reference in its reflection on the functional structures and the possible development conditions of society forces it to search for the representation of the general in the particular and brings it close to metaphysics, as whose heir it presents itself – of course under different conditions and with different means – for both opponents and proponents (Heidegger 1972; Habermas 1988).

Social theory concepts are not only scientific constructs, they are also an expression of a factual awareness of problems in and of society. They are forms of reflection and embody recognized solutions to problems that have found their institutional expression in society (Luhmann 1971).

In the 17th and 18th centuries, it was the contract, subjective law and the category of the individual that inspired the theory of Hobbes, Locke, or Smith in order to make comprehensible the transition from a medieval hierarchy of laws to a simple commodity and market economy, and to reflect this development in its totality. In the 19th century, Marx, Durkheim and Weber focused on the concepts of labor, capital, class, division of labor, integration, and rationalization in order to be able to comprehensively analyze the emergence of a capitalist social

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formation and its subsequent problems such as class struggle, bureaucratization and the differentiation of society. The classical concepts such as labor/capital, contract/action or state/society are still traded, but have lost both their connection to a stringent social theory for modernity and their explanatory power for the interpretation of current social reality (Offe 1982; Luhmann 1984).

Today, the *concept of risk* seems to be embarking on a career in social theory. It crystallizes the basic experiences and problems of a highly industrialized and, in many areas, scientified society. It has become the symbol of the present per se. For some, risk is directly associated with the *dangers of modern technologies* that threaten planetary civilization (Beck 1986, p. 254ff; Meyer-Abich 1990). They see risk as a danger that could escalate into an all-encompassing catastrophe. This is certainly not wrong, but it is one-sided. Even if some technologies were banned, the riskiness of life in a technical civilization would not disappear. Others associate the term risk with the *chance of extended control over nature* and celebrate the achievements of modern technology for this very reason (Heilmann 1986). From their point of view, the destructive forces thus released disappear or shrink to residual risks that can be tolerated as socially acceptable due to the immense benefits. A third group place the *emphasis on security* and see risk as a challenge to prove that security is feasible and producible (Krüger 1986), without, however, accepting that complete security has been unattainable since the Fall of Man at the latest, as since then it has at least been possible to choose between good and evil, apart from the difficulties of recognizing what is right in each case.

Our society seems to be paradoxically constituted. It can rightly be described as a society of danger and catastrophe, as Ulrich Beck does with emphatic pathos and good evidence. It is just as true when Francois Ewald speaks of the same society as an insurance company that has elevated security to a central value (Ewald 1989; Kaufmann 1973). Modern societies apparently increase security and insecurity at the same time. The concept of risk gives expression to this contradictory development and thus gains its significance for social theory.

Risk thus initially means nothing more than the *relationship between opportunities and losses in relation to a decision,* with the help of which one wants to make an unknown future predictable. The fact that this type of action has become an essential element of modernity must be understood in terms of social theory. My thesis, which I would like to make somewhat plausible, is that modern societies visualize their future as a risk and have thus found their own specific way of dealing with uncertainty, which distinguishes them from all previous societies.

2. Risk as a socio-theoretical concept

But what is risk? In recent decades, the literature on risk has exploded. Until then, the concept of risk had essentially only been of interest to a mathematically inspired decision theory, which had found its field of application in the insurance industry, but now economists, engineers, lawyers and psychologists are increasingly turning their attention to the subject. Even sociologists discovered it – albeit relatively late – as an attractive subject for their research. This intense preoccupation with risk across the various scientific disciplines suggests that an important problem of society has been addressed here. Nevertheless, *these studies lack a uniform concept of risk*. Although we now know something about how risks are perceived, how they are selected, how they can or cannot be calculated, compared or not compared, there is a lack of conceptual clarification of the underlying social problem.

Risk is often equated with danger, and risk is defined as a measure of danger. Risk is then the product of the extent of the expected damage and the presumed probability of occurrence, in short R = S x W. This formula has also been adopted by lawyers and has led them into extreme definitional and decision-making problems, as they only see a quantitative transition in probability in the distinction between danger and risk, and are unable to make the exact transition from danger to risk plausible on the basis of this conceptual construction (Kloepfer 1988). To switch from risk to social adequacy or to invoke practical reason, which then reveals itself as the reason of technical experts, indicates more of a failure to work through the problem situation than a satisfactory solution to the problem thus indicated.

The failure of "risk assessment" also shows that the risk problem must be about more than just solving a conventional measurement question (Krüger 1986). Here too, it has not been possible to develop a uniform standard. When calculating risks with a high hazard potential but a low probability of occurrence, it has been found that there is neither a binding measure for the dimension of damage nor a generally valid determination of the degree of probability (Binswanger 1990). Neither can be determined without social negotiation processes. The examples of Harrisburg[2] and Chernobyl[3] have made it emphatically clear

2 *Editors' note*: On 28 March 1979, the so-called Three Mile Island accident happened in Harrisburg (Pennsylvania, US), a partial nuclear meltdown of the Unit 2 reactor (TMI-2) of the Harrisburg nuclear power plant.

3 *Editors' note*: On 26 April 1986, during a routine power outage test, the No. 4 reactor of the Chernobyl Nuclear Power Plant, located near Pripyat in the Soviet Union (now

that the residual risk, calculated by experts to be almost zero, has become the actual social reality. Here, too, attempts were made to redefine the mathematically uncontrollable reality as a social problem. They switched from risk to acceptance and saw the real difficulty in the experts' loss of confidence (Wynne 1983).

If risk is not just a quantification of danger and at the same time risk has become a dominant topic of public discussion in society, then what is the meaning of risk?

The historical origin of the word risk provides a first clue (Priddat 1990). Uncertainty and risk appeared [in Europe] in the Middle Ages in connection with the [Christian] doctrine of usury. Interest no longer always meant [the sin of] usury, and interest taken as compensation for the risk of not recovering the money lent was seen as justified (LeGoff 1988). Nevertheless, interest takers still ran the risk of ending up in purgatory if they took unjustified interest. However, this would only become apparent in the future. Pascal's well-known [17th century] calculation of faith was also still based on religious considerations (Pascal 1980). The doubts about the existence of God that arose as a result of the confessional war[4] were to be transformed into subjective certainty of faith through rational reasoning. The risk of unbelief was simply too high, as the entire salvation of the future was at stake. Toward the end of the 16th century, the concept of risk was removed from its religious context and subjected to economic considerations. Seafaring and long-distance trade were the social contexts in which risk calculations became established. Risk (Italian riscare = to dare) here refers to a way of dealing with a future perceived as uncertain and dangerous (Bonß 1990). By insuring valuable goods, the aim was to make it possible to calculate the possible loss that could arise from lengthy transportation and the many unforeseeable dangers on the roads or sea. And not in the sense of creating security by combating or eliminating the dangers – that would have cost too much time and money and would probably not have been possible – but by taking a risk, and at the same time insuring against the possible loss, at least in part, so that if the loss event occurred, the loss itself remained limited and bearable.

If risk initially means opening up an unknown future for decisions, then riskiness from a quality of actions becomes the unavoidable form of existence

Ukraine) exploded. The Chernobyl accident is considered to be one of the most severe nuclear disasters so far.

4 *Editors' note*: Confessional wars are related to the European Wars of Religion that began after the Protestant Reformation in 1517. They were fought during the 16th, 17th, and 18th centuries. One of the most destructive conflicts in European history was the Thirty Years' War, which took place from 1618 to 1648.

of action per se. The greater the uncertainty with regard to the temporal connections between events, actions and decisions, the more it becomes possible and necessary to bring risk into play. Avoiding risky actions with the help of precautionary strategies is also perceived as risky, because it involves incurring costs and sacrifices that may prove to be unnecessary.

With the *universalization of risk awareness*, the issue of security also becomes relevant in society. In this context, risk is used as a complementary term to security. To an extent, risk is the soft form of uncertainty. Where there is uncertainty, security should be created through risk calculations. Evers/Nowotny even see this as the core of the concept of risk (Evers/Nowotny 1987). Elsewhere, Evers writes in deliberate contrast to Beck:

> Risk is a certain form of the practice of dealing with dangers, namely that which attempts to make dangers definable, calculable or even attributable by means of action techniques, methods and institutions (Evers 1989, p. 34).

This may be correct, but it does not capture the entire meaning (complexity) of the concept of risk. Any security gained in this way is, on the one hand, second-hand security: it is no longer the security of a world without alternatives; on the other hand, it is the security of a calculation that could have been calculated differently and that may prove to be correct in the future, but may also prove to be wrong. This contingency of the decision cannot be eliminated. Precisely because safety becomes conscious of being produced by decision, it loses its innocence and objectivity. In the language of safety engineers, this means that there is no absolute safety; from the decision-maker's point of view, this means: When you decide, you cannot decide without risk.

In the *term pair safety/risk*, risk is only a measure of the uncertainty that can be tolerated or of the safety that can reasonably be achieved. In addition, the concept of risk has a warning function in relation to the idea of uncertainty. It signals that more can be done about the danger: more information can be obtained, more money should be invested, more laws could be enacted. On the basis of strict calculation, the concept of risk offers a gateway for social, political and legal claims. The question that "risk assessment" has just elevated to a leading research question: "How safe is safe enough?" (Fischhoff et al. 1981), cannot be answered by this research, because then we would have to know the future.

If the concept of risk in relation to the concept of security has its function in the rationalization and regulation of claims, then in relation to the concept of danger it reflects society's historical approach to uncertainty. Luhmann has proposed an instructive distinction between danger and risk that illustrates this:

> Dangers, like risks, are about possible future damage whose occurrence is currently uncertain and more or less unlikely. In the case of hazards, the occurrence of damage is attributed to the environment; in the case of risks, it is seen as a consequence of one's own actions or omissions. The difference therefore boils down to a question of attribution. The assumption of risk is therefore based on a realization of danger. It is always possible if there are technologies that provide alternatives so that the possible damage can be attributed to the choice of action or omission. Then, however, decisions can and must also be made in uncertainty (Luhmann 1988, p. 269).

The first thing that is noticeable about this distinction is how closely the *concept of risk* is *associated with decision.* Risk presupposes a decision-making situation. The possibility of a natural disaster does not yet result in a risk, at most a threat. Risk only comes into play when you decide whether you want to do something about it.

However, the *concept of attribution* is decisive. It expresses the historical and social relationship between risk and danger. Depending on the degree of plausibility, risk and danger can be attributed to uncertain damages. If these damages are accounted for as dangers, they are externalized by society, regarded as coincidences; if they are classified as risks, they are generated by decisions and are accordingly responsible and also possible differently. If we now speak of the risk society, this term takes on a different meaning. Beck essentially used it to distinguish our society of high-risk technology from other societies. He defined the difference in terms of the new and qualitatively different hazard potential created by modern technologies (Beck 1986, 1989, 1990). In our context, we can say that modern society is a risk society insofar as it interprets all dangers as risks and thus produces an immense need and compulsion to make decisions. We no longer need to speculate as to whether the dangers of the scientific and technological age are greater or lesser than the dangers of the Middle Ages. One thing is certain: today, dangers are attributed to actions and decisions and are thus given the form of risks. Two to three centuries ago, much could still be attributed to nature, its willfulness, or even just fate, but with a few exceptions – in this case meteorite impacts or an invasion from an alien star – there is a consensus in our society that all dangers that threaten us are in principle based on decisions.

Even these brief considerations contain the essential elements of the concept of risk, which make it a fundamental concept of modernity, *in nuce.*

- First of all, it is about *uncertainty and the future,* about decision and attitude. We are uncertain about the consequences associated with a decision. It can have good or bad consequences. In any case, profit and loss lie in the future, a future that is unknown and harbors dangers, but which also opens up

opportunities and promises profits. No one can take the decision to influence the future away from you. In this sense, the future is truly bleak and hopeless. Risk as a decision leads to an inconsistent attitude in time. By calculating risk, two things are attempted simultaneously: to take advantage of what the future offers and to limit the damage that may result from this action. Risk is therefore a form of decision that becomes self-reflective. It wants to be able to correct itself (Baecker 1989; Japp 1990b).

- A second moment stands out. By making risky decisions, one wants to tie up time and *make* the *future controllable from the present,* a future that one does not know, but which nevertheless determines the horizon of the action. Here we can already see that risk is a legitimate child of modern rationality, which has its credo in the feasibility of things and has found its form of action in the means-ends relationship (Weber 1971).
- A third characteristic of risky decisions is their *dependence on knowledge*. Although decisions can be made with intuition, the form of calculation forces us to collect data and information about possible events, to check their repeatability, in other words, to make them calculable.
- The fourth striking aspect is that this introduces a *subjectivization of danger*. Dangers are events that occur independently of human action. If you are aware of them, you can try to avoid them: leave the earthquake zone, don't build your house near a river, or avoid getting married. Threats can only be accepted as fate, as they come from outside and may create and uncertainties that can hardly be influenced. Risks, on the other hand, are consciously taken, their consequences must be accounted for and can be attributed to the individual as a decision that could have turned out one way or another. In the case of danger, causality prevails, albeit sometimes the causality of fate; in the case of risk, the experience of contingency dominates.
- Fifth, it becomes apparent that risky decisions are *self-referential and paradoxical at the same time*. The difference between risk and non-risk disappears, since a non-decision is also a decision. Risks are paradoxical; insofar as the option is realized, uncertainty increases with regard to the consequences that arise; if it is not realized, uncertainty arises about the associated consequences (loss of possible benefits). If you have not built a nuclear power plant, then you cannot talk about its benefits and dangers.

What is actually new, as we can now see, is not so much the feasibility of things and the ability to shape social conditions according to plan (Evers/Nowotny 1987), but rather that the concept of risk heralds a *change in human understanding of nature and itself*, which can be seen in the immense increase in human

decision-making potential and in the primacy of the future over the past in society. It is obvious that all this is linked to structural changes in society itself.

3. Functional differentiation of society, future orientation and scientification

Modern societies, whereby the beginning of modernity is estimated to be in the middle of the 18th century, are incomparably more complex than previous societies. The increase in complexity not only concerns the increase in the possibilities for human action – a popular topic in the philosophy of technology – but the overall structure of society as a whole has changed. This will be outlined in a few points.

3.1 Differentiation into functional subsystems

Modern society is developing from a primarily stratified differentiation to a differentiation into functional subsystems. The division of labor as a prominent example of functional differentiation in industrial societies is not even the decisive feature. Far more important are the *differentiation and constitution of subsystems* such as science, politics, economics, etc., which become autonomous in a particular sense by reproducing themselves according to their own orientation patterns and no longer following a development logic of society as a whole.

3.2 Follow-up problems

The switch to functional differentiation is associated with decisive consequential problems. The integration of society is no longer achieved through the successful coexistence of people, but rather through the *interplay of the individual perspectives of the functional subsystems*. Values or actions no longer form the ultimate reference points of society. The human being as the center of society is losing its fascination and significance. Functional differentiation results in an "increase in the ability to dissolve" (Luhmann) all social facts, i.e., there is no longer anything outside of society. Even nature is only significant as the environment of society; it has no quality of its own that is distinct from society. "The grove became a grove." This sentence by Hegel outlines in a nutshell the process of rationalization and disenchantment that began with industrialization and is still ongoing today. Everything is socially mediated insofar as it only gains meaning if society communicates about it (Luhmann 1986). There are no longer any "natural facts," only relations and relational structures. This may also be the deeper social reason

why the categories of traditional metaphysics, such as substance and movement, have lost their persuasive power as grounding concepts (on the context of this discussion, see Habermas 1988).

3.3 Loss of overall social representation (of the general interest)

Functional differentiation leads to an a-centric society. In the social transformation from segmentary differentiation to functional differentiation, hierarchical relationships are replaced by circular and counter-circular relationships. No subsystem of society can any longer claim to represent society as a whole or even to speak for it as a whole. What began in the 18th century with the splitting up of state and society has intensified into an evolutionary process in the following period. *Modern societies no longer have a central authority for self-reflection and control.* Neither the state nor capital, and certainly not the proletariat, represent the place where the general interest of society is anchored, because such a general interest no longer exists. Luhmann rightly points out the associated consequences:

> This makes it difficult and actually impossible to reach a consensus on what is and what is valid for society as a whole; what is used as a consensus function in the form of a recognized provisional arrangement. In addition, there are the actually productive function-specific syntheses of reality at the complexity levels of the individual functional systems, which these can each achieve for themselves, but which can no longer be added up to the overall view of a world in the sense of a *congregatio corporum*, a *universitas rerum* (Luhmann 1980, p. 33).

3.4 Shifting the time horizon

The time horizon of modern society has shifted from the past to the future (Koselleck 1979, p. 17ff.). Not only has society's range of possibilities increased immensely, but the fact that the past no longer forms the standard of orientation for action, but rather an uncertain future, is probably of equal importance for modernity. More and more decisions in the life of the individual are taking the form of a risk calculation. In other words, decisions where it will only become clear in the future whether they were right or wrong. *Social contingency is becoming the dominant life experience* of modern humans. Every action can also be carried out differently. Every social situation is constituted by a decision and is therefore, in principle, also conceivable in a different way. The pressure to make decisions has therefore increased immensely in modern society. Even living conservatively is based on a decision, and preservation (*conservare*) becomes a selection process.

3.5 Orientation toward curiosity

Modern societies are characterized by the prevalence of cognitive, adaptive and adaptive expectation structures, whereas normative, moral expectations are on the retreat. The subsystems of business, science and, more recently, technology have become the leading systems in society, from which the most important innovations come. Science, with its *early orientation toward curiositas*, has provided the decisive breakthrough here. *Curiositas* not only means curiosity, but also that everything in the world can also be researched with the help of scientific means and methods (Blumenberg 1971). More precisely, this means: Science operates in an infinite world that can only be limited by itself, namely by the limitations of scientific tools, theories and methods. It is only in the face of this new situation that the sentence that you can't do everything you can gains meaning – and exposes itself as a helpless triviality. Although research can be prohibited, the potential to research what is prohibited cannot be prohibited.

If these broad characteristics roughly apply to important structural features of modern societies, this essentially means two things for our analysis:

- Functional differentiation leads to a structurally induced overproduction of opportunities in society as a whole. This results, for example, in an increase in opportunities, but also in the compulsion to select, higher improbabilities and riskiness in every type of decision, in every type of determination and a generally open future.
- As science becomes a leading subsystem of society, a risk awareness develops that is based precisely on the uncertainty of scientific knowledge. Knowledge generated by research increases knowledge and ignorance at the same time. The modern risk society is not only the result of the perception of the consequences of technical realization. It is already inherent in the expansion of research possibilities and knowledge itself.

4. On the structure of risk in the modern age

Whether life in a scientific and technological world is more dangerous – this may or may not be the case – one thing is certain however; that it is likely to be riskier in any case, if only because it has become both richer in possibilities and more selective. This can be deduced from the structural framework conditions that have become the constituents of modernity. It is no longer possible to return to these, unless one wants to reverse the evolution of the social system as a whole.

In this respect, Adorno was ironically right when he defined freedom, with critical intent, as "only those who do not have to submit to alternatives would be free." There is indeed no alternative to the modern scientific and technical world in the process of self-realization, but only alternatives in society. At the same time, however, these also form the horizon in which today's society creates, perceives and processes dangers.

An essential experience of the present is the self-endangerment of society through the consequences of its developing structural principles: functional differentiation, future orientation, and scientification. In this context, technical-ecological risks play a prominent role.

The concept of technical-ecological risks has created a problem formula with which society alerts itself. They represent a type of risky decision that has become the focus of public attention and discussion.

Technological-ecological risks can be distinguished from other risks, such as the risk of unemployment, career decline or the risk of finding oneself in hell after a laudably spent life, on the basis of their form, their time structure and their social effects (Lau 1989).

4.1 Form and type of technical-ecological risks

A distinction can be made between sudden disasters in the form of major accidents (Lagadec 1987) and "creeping disasters" such as irreversible changes in ecology (Gottweis 1988). Japp and Perrow see their differences, but also their comparability, in the principle of coupling (Japp 1990b; Perrow 1987).

- Modern *technologies with a high disaster potential* are systems whose components are closely coupled and have a high density of action. These are usually technologies that release toxic substances during their operation, such as nuclear power plants, genetic engineering laboratory tests, and chemical production plants. The risk rationale for this type of systems is to prevent the release of toxic substances, or more precisely, the uncontrolled release of toxic substances. The system must therefore be as causally determined as possible in its functional sequences, and the technical manufacturing process must be strictly separated from its environment during normal operation. It may only correspond with its environment on the basis of predetermined relationships. Perrow has now shown that this principle of fixed coupling is susceptible to unpredictable incidents due to unpredictable interactions in the case of high internal complexity, which can escalate into catastrophes in a short space of time. In view of the fact that incidents can always occur

that nobody can foresee, and have already occurred in many cases, Perrow calls them "normal accidents," and concludes that "high risk technologies" are uncontrollable in principle due to their existence. Not every "normal accident" immediately triggers a catastrophe, but it has the potential to do so. One wrong move, one piece of misinformation, or one misinterpretation of the display of a measuring device – and an emergency can occur, the extent of which is ultimately unknown.

- "*Creeping disasters*," on the other hand, usually take place in ecosystems. Here, the principle of loose coupling predominates, with diverse and complex interactions. In contrast to technical systems, ecosystems control themselves through the principle of "order through fluctuation." This self-controlling and self-organizing process is so complex that it defies any causal technical access. However, external intervention can disrupt the processual structure of the ecosystem, causing it to lose its internal flexibility and trigger a gradual catastrophe that can lead to the entire system toppling over. Soil karstification due to over-fertilization, forest dieback due to high levels of pollutants, and river pollution, are examples of this developing type of danger.

What interests us here, however, are not the associated horror scenarios, which are immediately aired when another of these disasters becomes public, but rather the peculiar relationship between risk and rationality.

> Under the conditions described, causal-technological rationality produces technical and/or ecological risk potentials which, due to the uncontrollability of complex interacting and tightly coupled systems, elude almost any causal-technological rationality. To an extent, these risk potentials are formed behind the back of the technologies and their rationality thus becomes paradoxical. They are rational (with regard to their causally intended purpose), and at the same time they are not (with regard to their "built-in" risk potentials) (Japp 1990b, p. 45).

Pointing out the paradoxical nature of technical rationality is a well-known game of any progressive and conservative critique of technology (instead of many: Horkheimer 1974). But is there an alternative? Or can the paradox be de-paradoxed so that we can live with it?

4.2 Time dimension and technical-ecological risks

Technical and ecological risks also create a time problem. For structural reasons, there is a lack of time to analyze and regulate them. Anyone who has dealt even superficially with the assessment of the consequences of technology knows that it is difficult to capture the full complexity of the effects within a fixed time frame.

In order to consider all possible consequences in the analysis, one would in principle need to have infinite time (Bechmann 1989). The prognosis of possible damage and benefits of a technology causes the researcher to swarm into the future, from which they can only be brought back with the help of the bureaucratic time machine of the deadline constraint. Any technology assessment can only be a selection of relevant consequences or, as the lawyer would say, consequences selected by practical reason. The time limit for the research process is both a structure and a relief.

There is a second restriction. Every investigation takes time, some more, some less. Nevertheless, the development of technology and its integration into the social fabric of society continues and raises new problems. During this time, both the questions and the data change. If you still want to conclude the research and decision-making process, you have to ignore new data from a particular point onwards. The decision is then partly made on the basis of fictitious facts and outdated observations. Marquart sees this as a general feature of our technical-scientific culture: the increase of the fictitious (Marquart 1986). According to Marquart, where everything is in a state of flux, every action or decision forces us to flee into fiction. The boundary between reality and dream dissolves on the horizon of declining rationality of purpose.

The selectivity in determining technical and ecological risks*, which* in principle *cannot be eliminated in terms of time,* leads directly to the thesis of the observer dependency of knowledge, and to Popper's theorem on the indeterminability of the future. Observer dependence means that the phenomenon to be analyzed can only ever be perceived in perspective. At best, one can in turn observe how an observer observes, how an observer observes the observer, etc.

The "Popper theorem" (Lübbe) states that whatever we may know in detail about the future of our world – one thing we cannot know is what we will know in the future, otherwise we would already know it. This indicates a *fundamental limit to the predictability* of scientific and technological development. Since knowledge and science have been transformed into the form of research, there is no longer any comprehensive, ultimate knowledge (Henrich 1982; Heidegger 1972): this is also a consequence of the self-actualizing modern age, which extends to the problem of risk.

4.3 Technological-ecological risks and the social dimension

Technological-ecological crises trigger severe social crises – this is the new experience in highly industrialized countries over the last twenty years. The protest

against technology has become a protest against society per se (Touraine 1982). It can be seen as an expression of a general awareness of values and culture (Inglehart 1989), or interpreted as the struggle between two paradigms – the idea of life and the idea of progress (Raschke 1985). These may all be important and accurate insights, but they do not make it plausible why the conflict is primarily ignited by "high-risk technologies" and articulated in the form of fear.

It seems more plausible to assume that with the development and implementation of new technologies and an increasing number of irreversible interventions in the environment, a *new line of conflict* is emerging that runs between decision-makers and those affected, and symbolizes the issue in dispute with the distinction between risk and danger.

Although all threats of a technical or ecological nature today are caused by actions and decisions – the thesis that society is endangered by itself says nothing else – technological and ecological threats are perceived as risks by some and as dangers by others, and action is taken accordingly. There are several reasons for this:

- In the case of technical-ecological risks, costs and benefits fall apart or are not related to one person, so that a cost/benefit calculation is no longer instructive for the decision. Many people who are particularly at risk from new technologies, such as residents living near nuclear power plants, inhabitants of certain industrialized regions, or neighbors of large chemical plants, have to endure disproportionately high disadvantages, while the benefits are spread across everyone.
- Secondly, risk originators, or more precisely risk decision-makers, are now fundamentally different from those affected by risk. On the one hand, this is certainly a consequence of the differentiation of society with its functional systems: decisions and the consequences of decisions no longer coincide spatially, temporally and socially, as the chains of action and effects have been extended enormously. On the other hand, they can hardly be perceived without scientific measuring instruments and are difficult to attribute to the originators due to their complexity (Lau 1989).
- Thirdly, technological and ecological hazards are social risks. They are imposed on us, we do not take them voluntarily. Whether ecological risks are caused by the actions of many (forest dieback), or technical risks arise from the decisions of a few, one thing is certain: the individual neither wanted them, nor were they able to decide on the conditions under which they were taken. To an extent, they are brought into the world without their knowledge,

will or participation. In view of this situation, the individual's only option is to evade the dangers, to accept them – or to protest.

In other words, as soon as risky decisions are made in the field of ecology or technology, the *difference between the decision-maker and the person affected* arises. The decisive factor is that this difference no longer separates people, no longer discriminates on the basis of class or makes social distinctions. The separation of decision-maker/affected party is aimed at the division of functions and power. Who is allowed to decide and who is affected is thus a social question of attribution of self and others, which is decided on an individual, organizational and social level. The difference is institutionalized with the functions of the subsystems. Incidentally, this is also one reason why ecological protest is so difficult to organize in the long term: It runs into the pitfalls of functional differentiation.

The perspectives are correspondingly different. *From the decision-making perspective, the threat presents itself as a risk; from the perspective of those affected, it presents itself as a danger.* The decision-maker tries to rationalize the decision with the help of calculations, estimates, scenarios etc.. They even go so far as to take the perspective of the person affected into account by factoring in the question of acceptance and even providing information about the risk. No matter how complex and presuppositional the decision about possible risks may be, there is one thing it cannot do: see the risk as a danger and thus switch to concern.

Conversely, the person concerned perceives the consequences of the risky decision as dangers. The person concerned sees themselves exposed to a danger that they had no say in creating, that they cannot control, that they are at the mercy of, and of which they only know that it represents a risk from the perspective of the person who caused it – they are left with uncertainty and fear.

"Communication of fear" now also has its own specific social rationality (Luhmann 1986; Delumeau 1990). It creates solidarity and causes alarm in society. In dangerous situations, common ground is established, mutual help is organized and social differences are smoothed out. At the same time, blame is apportioned externally and those responsible for the impending catastrophe are sought. In short, *communication is moralized and ideologized*. In the face of danger, it is a question of humanity's chances of survival, or at least the preservation or destruction of the "natural" foundations of the species. Those who think in this way must dispense with rational decision-making, but focus on the "risk of rationality" (Japp 1986). From the decision-maker's point of view, the aim is to eliminate the potential for catastrophe through risk calculations, risk strategies and safety measures: This is precisely what is declared by the affected person as

a failure of the decision-maker and made the crystallization point of fear and warning attention. Both perspectives thus reveal themselves as selections that deal with the uncertainty generated in society in different ways. One is the blind spot in the eye of the other. Thus, a dual perspective on the technical-ecological hazards in society is institutionalized: Some act in a risky way, others warn. But who is in the right will be decided in the future, which is unknown but is already being put up for discussion today, both in terms of risk and danger, and which contains both.

Technological-ecological hazards generate dissent, namely dissent in relation to a future that is expected to be a risk or a danger. Every decision, every action in this context can be dichotomized according to the risk/danger difference, and this because of the "contingency factor" implicit in it. Precisely because uncertainty has become the secret common denominator, and the future the point of reference, there is no overarching rationality criterion for resolving this conflict. In view of the technical and ecological problems, it is not a question of right or wrong calculations, but of the *limits of decision-making rationality.* On the other hand, renouncing risk also means renouncing rationality and the limited control of uncertainty.

If we consider this mutual exclusivity of the danger standpoint and the risk standpoint, we can see – as second-order observers – that a conflict has arisen here that is related to the constitutive structural features of modernity (functional differentiation, scientification and future orientation), and for which there are no satisfactory solutions in society to date. All attempts to rationalize this difference have so far failed due to their own preconditions. In the following, the three main approaches will be discussed: acceptable risk, expert decision, and risk communication.

- From the very beginning, the declared aim of risk assessment was to determine and set limits for the risk to be tolerated (Starr 1969). The history of these efforts can be described as a history of failure. Instead of finding a generally accepted measure of risk, the result was the realization that there is no such thing *as an* acceptable risk, but rather different perceptions and evaluations of risk that cannot be aggregated into a common value. In the course of the discussion, the optimization problem became a *problem of social acceptance* (Ueberhorst/de Man 1990; Otway/Thomas 1982). The result of this research can be briefly summarized: Acceptance and acceptability of risks are not fixed values and cannot be determined and defined independently of the preferences of those affected. They are always social constructions, processes of attribution and definition, which involve different ideas about the

sensible shaping of society's future and which have to be negotiated through consensus/conflict processes in society. The conflicts surrounding the new technologies convey to the contemporary observer that the irreconcilability of the contrast between danger and risk is more likely to generate more dissent than to open up opportunities for consensus.

- A similar impression is gained when one sees *the shake-up of expert status* that has taken place in the field of science and technology in connection with this conflict. An expert is someone who has specialized knowledge and is trusted to make the right decisions for others (Bechmann 1990). In view of the undeniable catastrophic nature of modern technology, trust in experts is dwindling. It is ruined by the harshness of the contrast between risk perception and hazard perception, to the extent that the danger is no longer due to natural events but results from the decisions of others. When error, misconduct – and even worse, new knowledge – can no longer be ruled out, trust in the self-confidence of others dwindles, especially in the case of potential damage that simply eludes precautionary measures and insurance.
- The demand for more *communication with those affected* was derived from the experts' loss of trust (Weber 1986, p. 184). In science, a term was immediately coined for this, which can be used to apply for funding, hold conferences and fill positions (Jungermann et al. 1990). "Risk communication" is intended to help where trust has been destroyed (Plough/Krimsky 1987). Leaving aside the fact that in many cases communication is only intended to generate a willingness to accept by having the affected party take on the perspective of the decision-maker, the question arises as to whether dialogue in this context can achieve what is expected of it. Communication initially generates a multiplication of topics, an increase in the amount of information and an expansion of possibilities. Not only solar energy as an alternative to nuclear energy, but also saving energy or changing the entire energy industry can be considered as possible decision alternatives. However, the threat of catastrophe is also increasing the pressure to act; not everything can be discussed. Both the expansion of decision alternatives and the potential dangers force selectivity. Communication aimed at making decisions must be interrupted at some point. Making risky decisions always means acting without knowing exactly what to do. Risk communication must also be terminated by virtue of authority, as there are no limits within it. The only question is, by virtue of which authority, that of the decision-maker or that of the person affected? But there is another. In view of today's knowledge about the side effects of risky decisions, the decision-maker reveals that they cannot

control the consequences. Despite all the discussion, we end up back at the problem of decision-making under uncertainty and the difference between risk and danger.

These three examples should only illustrate the structure of the conflict that has arisen with the distinction between decision-makers and those affected. The risk and hazard perspectives are irreconcilably opposed both in terms of the control (tolerable risk) of knowledge (experts), and in terms of understanding (risk communication).

5. Ethics and rationality

In the conflict over high-risk technologies, hope has been placed in an "ethics of responsibility" (Jonas 1979) and in comprehensive rationality after politics was unable to reach a consensus and the law was unable to create peace. The only question is whether the control of risks with ethics as a control criterion and non-halved rationality is not an escape into the 19th century.

5.1 Ethics and risk

Following Luhmann, one can differentiate between morality and ethics and understand ethics as the reflection or theory of morality. Morality, on the other hand, has to do with rules of mutual respect and disregard that are communicated and institutionalized (Luhmann 1978, p. 43f, 1990, p. 17f; also Tugendhat 1990). Morality distinguishes between good and bad, whereas ethics specifies when this distinction should be applied, in which cases it applies and how it can be generalized and universalized. If we take this distinction seriously, we can see three things.

(a) Many treatises that are traded on the public engagement market today under the "headline" of technology and ethics reveal themselves on closer reading as *moral treatises* dealing with the good or bad sides of technology. Their preferred form of reflection is the formula "indeed ... but," or, "on the one hand ... on the other hand" (Kluxen 1987; Lenk/Ropohl 1987; Zimmerli 1991; and many others). Only a few deal with an ethics of technology (Lern 1990) and they come to a skeptical conclusion about the efficiency of ethical principles in determining the regulation of technology. Today, ethics in the field of technology seems to have become a moral enterprise.

(b) *Overall social morality and functional differentiation are mutually exclusive.* The evolutionary novelty that prevailed with functional differentiation and on which it is ultimately based was that the individual functional areas with their fundamental orientations detached themselves from the contexts of morality and religion and specialized in various codes. The neutrality of politics toward questions of religion and morality, symbolized by the rule of law, the independence of science from social constraints, symbolized by the principle of freedom of value, and the freedom of love, symbolized by the value of passion, testify to the process of the increasing indifference and autonomy of these areas toward regulatory guidelines other than their own codes. Scientific truth, political decisions or dealing with money can no longer be made dependent on a generally binding morality. Modern society can no longer be integrated via morality (Luhmann 1990a, p. 25).

(c) Anyone who speaks of ethics or morality also means responsibility. The *concept of responsibility* presupposes two things: precise knowledge of the secondary consequences, and an agent to whom these secondary consequences can be causally attributed as an action. Both have become problematic in the field of technology development. We no longer live in a guild society; modern technologies are not produced according to the craftsman model. They are characterized by incompleteness and uncertainty about their side effects. Only in the future will it become clear whether the predicted advantages and disadvantages will materialize, and the future can be distant, as we know from the field of "small-dose effects." Often, however, unexpected consequences occur that no one has taken into account. But how can we take responsibility for this, when at least the recognizability of the consequences of our actions is a prerequisite for responsibility? Whatever we know about major technical innovations and their consequences, one thing is certain: the more planned a person's actions are, the more effectively they are affected by chance (Dürrenmatt). Even recourse to ethics of conviction cannot resolve the dilemma. Dealing with technology in particular has taught us that good intentions can have bad consequences and vice versa. Who wants to trust their own conscience – only to be condemned afterwards? The uncertainty of the future and the limitations of consequence analysis have blunted the weapons of ethics. In functionally differentiated societies, the consequences of scientific and technological progress are no longer in the hands of one person; neither in the hands of the scientist, nor in the hands of the politician, and certainly not in the hands of those affected. At no point in society can

> these effects be overlooked or controlled as a whole. Unless God is restored to his former rights.

As we remember, risk is the form of a decision that attempts to bind the future and in doing so creates decision-makers and those affected who treat the consequences of this decision according to the risk/danger scheme. If this is the case, the dilemma of the morality of risk quickly becomes apparent. Morality, but also ethical reflection, presupposes that one knows the actions and their consequences that are attributed to one, and according to which one is sorted into good and bad. We must at least be able to assume that they are foreseeable. If this is not the case, morality comes to nothing. This uncertainty about the possible consequences of actions also explains a contradictory experience in dealing with risk. As empirical risk research has determined, there is a "*double standard*" *in risk behavior.* Risks that I expect myself to take are assessed as incomparably lower, accepted more readily and, above all, taken far more frequently (even risks of death) than risks that others expect me to take. Riding a motorcycle is hardly controversial, while emissions from coal-fired power plants are a matter for the Bundestag. People do not die from food chemistry, but from poor nutrition, not from industrial exhaust fumes, but from tobacco smoke (Luhmann 1986).

These few empirical examples already show that there is no consensus and no reciprocity of action maxims in the area of risk assessment and risk perception. Familiar risks receive a higher level of approval than unfamiliar risks, even though statistically the probability of damage is the same or equally low. Risks where the damage only occurs after a delay are more likely to be accepted than risks with immediate damage. Accordingly, nicotine and alcohol are perceived as less risky than road traffic (Bechmann 1986).

This empirical research can be summarized as follows: *There is no uniform assessment of risks* in society *and no chance of consensus for a uniform risk policy.* A morality based on reciprocity and an ethics based on universalizability will fail precisely because of this connection between social conflict and expectations for the future. Risk-taking and responsibility for consequences are seen from different perspectives – as a danger or as a risk. And because we are talking about the future, which can also be different, there can be no reciprocity. With an unknown future and uncertain consequences, who wants to be loved by their neighbor as much as they love themselves? Dealing with one's own future leads to the burdening of others, and even then, or rather especially then, when one wants to rationalize the future as a risk.

5.2 Rationality and risk

The idea is obvious – if technical rationality leads to paradoxical results and decisions that cannot be legitimized, then an attempt can be made to expand its basis in order to change the "constraints" of a pure means-ends relationship or cost-benefit calculation, thereby transforming the "halved rationality" (Habermas) into a comprehensive one. Under the title of "*social compatibility*," this attempt has been made to expand the limited decision-making rationality of technology policy (Wiesenthal 1989; Tschiedel 1989). Although the term itself remains unanalyzed – in its use it oscillates between a normative guiding idea (Meyer-Abich/Schefold 1986), an empirical decision-making method (Renn/Häfele 1985), and a procedural proposal (v. Aleman/Schatz 1986) – it has inspired entire research programs and attracted funding for social science research. Meyer-Abich/Schefold advocate an optimization strategy for technological decisions. In addition to the economic costs, the legal, political and social consequences of modern technologies should also be included in the decision-making process in order to arrive at an optimal decision by comparing all possible advantages and disadvantages.

In contrast, Renn/Häfele (1985) start from an empirical problem: the attempt to rationalize the pluralistic and divergent value preferences in society and, if possible, to make them representable in a decision tree. Their aim is to increase the value consideration potential of the decision, in the sense that more people see themselves represented in the respective technology policy decision.

The third attempt to determine "social compatibility" aims to institutionalize a new procedure for making decisions. The aim is to achieve comprehensive participation of all those affected by innovations (v. Aleman/Schatz 1986). The new procedure should be anticipatory, offensive and general. Anticipatory means that all possible consequences of the respective technology should be recorded and taken into account in their ramified effects. Offensive refers to the way in which the participants become active. They should gather information independently and, if possible, also research the anticipated consequences. The procedure is general when the entire development and innovation process of a technology is included and a comprehensive awareness of the consequences is created among those involved (Wiesenthal 1989, pp. 136–137).

Increasing options, increasing the potential for value consideration and participation are the strategic guiding principles of the "social compatibility concept," to which its protagonists are oriented and through which it has gained its sociopolitical relevance. When it comes to risk decisions, its solution capacity fails due to the novel combination of the time dimension and the social dimension.

The idea of increasing options is still rooted in optimization thinking. Meyer-Abich/Schefold only want to exchange and increase the criteria. There is nothing wrong with that. Only the selectivity of the decision with all its temporal and social consequences remains. This is aggravated by the fact that objectives are not the final fixed points for a decision, but are themselves subject to change. What is considered acceptable today is not necessarily acceptable tomorrow. Both technological development and social structures are subject to evolutionary – and sometimes revolutionary – change. In the hands of the decision-maker, "social acceptability" can change from a catalog of criteria to a relational concept that slips from a firm grasp and only becomes tangible again through social consensus. However, as we know, social consensus is difficult to achieve in risk decisions and cannot be assumed as a basic consensus in a plural and contingent world.

Value preferences can be surveyed. The first question that arises here is which ones and to what extent? The problem of aggregating value preferences is crucial, but also more difficult to solve. Renn/Häfele (1985) see this as a task for science. Experts create a value tree, determine average values and homogenize differences (critically Bechmann/Gloede 1986). Only through the authority of science can unity be created where there is dissent – a unity that is based on the contingency of knowledge and is ruined by the divergence of experts.

The most far-reaching proposal is to define "social compatibility" through participation. Participation in decisions increases the number of decisions (Luhmann 1987). Additional decisions must now be made about the procedure, the voting mode and the right to participate. If you really want to get involved in what those affected think and want, you are under time pressure. This can be countered by scheduling consultation times, breaking down problems, and forming subcommittees whose results are summarized by a senior committee. To gain time, you no longer look for optimal decisions, but only useful ones. And if these are not achievable, decisions are taken. At the end of participation there is not half a rationality, but a fragmented rationality (see Lindner 1990). Wiesenthal's verdict on this variant of "social compatibility" is correspondingly apt and devastating at the same time:

> Situationality and past reference of preferences show political concepts to be undercomplex, which are aimed solely at overcoming the obstacles that stand in the way of the wishes of those negatively affected. In a society whose fragmentation into self-referential subsystems has led to existence problems in the natural environment, it is not merely a matter of making different choices in the "feasible set" of particular action alternatives, but of modifying the "constraints" of the set if overall systemic decisions are to be made possible (Wiesenthal 1989, p. 152).

On closer inspection, we are back to the non-rational preconditions of rationality, and are once again confronted with the "risk of rationality," which was supposed to be defeated by the concept of "social compatibility."

6. Outlook: Living in a hypothetical society

The thesis that risks are social constructs (Douglas/Wildavsky 1982) is still too closely tied to the psychological approach to perception to be able to grasp the broader significance of the concept of risk. It is true that there are no "objective risks." They are always perceived, interpreted, dependent on the respective context and determined by a specific culture. Accordingly, the perception, description and assessment of risks also differs within the population. Nevertheless, this does not explain why the question of risk has become a secular problem for all industrially developed countries. Today, it is no longer the class issue that concerns the public, but the management of the ecological crisis and the associated risks that divide society into new conflicting parties. In contrast, it has been argued here that the significance of the risk issue must be understood in the context of social transformation processes, which have led to a new, paradoxical type of action and a new social conflict. As society becomes more functionally differentiated, a uniform meta-social order is lost. Today, neither religion nor science can offer people a uniform world view in which the most important orientations are anchored. Instead, more and more system-specific perspectives are gaining ground, each of which has its own rationality and can no longer be standardized or even universalized. At the same time, or in connection with this, the time structure of society is changing, the past no longer has any orientation value, the future is becoming the goal of action, and this can be seen most clearly in the acceleration of scientific work. Scientific work is per se future work (Nowotny 1989, p. 77ff.).

The loss of a uniform culture and the opening up of the present to an indefinite future creates enormous pressure to make decisions and a high degree of social contingency within society. This can be seen as the new aspect of the risk society, namely that in the course of the functional differentiation that has become established, the possibilities for decisions have expanded enormously and at the same time the social wealth of alternatives has increased. This process has also had the effect that former dangers have been transformed into risks in such a way that soon there are only risks and no dangers. However, the difference between risk/danger now emerges as a social difference. For the decision-maker, the control of an uncertain future is transformed into a risk that can be calculated

either way; for the person affected by a decision, if they cannot influence it, a danger arises, but this danger is socially generated – and this gives the risk issue its explosive power.

If we understand risk as a "decision-related, calculable uncertainty" (Beck), then a paradox quickly becomes apparent. Every decision that relates to an uncertain future is exposed to a double problem. It has to calculate costs and benefits – and at the same time determine the risk of not making the decision. Decisions that are not made can also have bad and good consequences; in any case, they are not neutral with regard to the future. The "two-sided nature of risk" (Rapoport 1988) points to the self-reference of risk. If deciding or not deciding in relation to the future is equally uncertain, then any striving for security that does not want to risk anything falls into the black hole of risk rationality (Baecker 1989).

If we consider the paradox of risk and its social anchoring in the evolutionary development pattern of functional differentiation, we can see that many of the ways out of the risk society that are offered lead directly back to it.

In a society that generates new risks on a daily basis, Ulrich Beck's proposal to rely on the self-destructive forces of large-scale technology is reminiscent of the recipes from the arsenal of an objective philosophy of history that still believed in the teleological meaning of history. Even an extension of the selection criteria to include ethics, democratic co-determination and veto institutions, breaking the "grip of the economy" on the use of technology (Beck 1991), does not lead out of the fundamental dilemma of risk policy, since only the number of decisions would increase, but not the possibility of clearly discriminating between good and bad consequences. Apart from the fact that the invocation of danger and the radical countermeasures derived from it completely forget that the production structure, which is cited as the source of all dangers, is the basis of all life that needs to be saved.

Similarly, the suggestion of placing *our hopes in the zero option* does not seem to work (Offe 1986). In view of the ever-increasing acceleration of scientific and technological progress and the resulting unforeseeable side-effects, the idea of moving into the time dimension is initially captivating. Today, the real utopia is no longer the increase of options, but clever and rational self-restraint (Offe 1986, p. 113). Only those decisions should be made that are manageable and reversible in the near future.

> Such a criterion of rational decision-making, disciplined in the time dimension, would also correspond if decisions were not made methodically under the time pressure exerted by competing decision-makers, but instead – for example by introducing moratoria or iterations – the time necessary to make possible effects of the decision more assessable and to avoid hastiness (Offe 1986, p. 115).

But the option for the zero option is also an optimization calculation in which the "renunciation of an increase in options is extrapolated against a gain in controllability" (p. 116). The risk of the decision remains. Quite apart from the fact that, of course, the preference for reversibilities can only be based on irreversibilities, which must be determined one way or another over time. Every attempt, as Luhmann puts it, to keep the future open only determines the irreversibilities in a different way: by omission or by unintended actions (Luhmann 1990b, p. 166).

Considering the new situation created by the risks of modernity, it is important not to prematurely advocate solutions that make their uselessness visible in the very terminology used. The intention of this work is to raise awareness of the *social dimension of risk*. With the advancing scientification and mechanization of society, but also with the increasing differentiation of the social sphere, the problem of risk takes on the same importance as the question of poverty in the 19th century, and the question of insurance in the 20th century.

Similar to this, the question of risk forces a revision of the basic concept of social theory. Risk makes us aware of the contingency of social life – everything could also be possible differently, and at the same time refers to the future in the present – every decision can have both good and bad consequences.

Aware of these facts, approaches in science that make *uncertainty the starting point of* their considerations are gaining importance. Rorty, for example, makes contingency the starting point of a new philosophy of freedom when he writes:

> It is not any great, necessary truths about human nature and its relations to truth and justice that will determine the nature of our future leaders, but only a set of small contingent facts (Rorty 1989, p. 304).

Only by accepting the risk can we avoid failing because of it.

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