

The Rational Actor Paradigm in Risk Theories: Analysis and Critique

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Introduction

Coping with risk has captured the attention of elites and laypersons alike to become a pivotal topic for technological elites as well as social thinkers. Technical experts, - engineers, toxicologists, epidemiologists, and social scientists - as well as social theorists have been competing for public attention in the risk arena¹. A model of coexistence juxtaposing the technical understanding of risk and the social science perspective has emerged over the last two decades. Risk in this sense can be summarized as both a potential for harm as well as a social construction of worry². Defining risk as a combination of hazard and outrage, as Peter Sandman suggested, has been the fragile but prevailing compromise in this debate, at least in the United States³. Although the formula of "risk equals hazard and outrage" does not provide answers of how to combine scientific assessments with public perceptions, it seemed to please the professional audience and was accepted as a conceptual guideline for risk management agencies. These agencies were well advised to base their decisions on both, expert assessments and public concerns, and that was a common practice in risk analysis.

This fragile compromise has come under severe attack recently. In his presidential address at the Annual Meeting of the Society for Risk Analysis Europe in Guildford, John Graham complained

¹ For a philosophical review of risk theories see: Shrader-Frechette, K. S. (1991): *Risk and Rationality: Philosophical Foundations for Populist Reforms*, University of California Press, Berkeley, CA., p. 53ff; for a sociological review see Krimsky, S., and Golding, D. (1992): "Social Theories of Risk.", Praeger, Westport, CT., or Short, J. F., and Clarke, L. (1992): "Social Organization and Risk." *Organizations, Uncertainties, and Risk*, J. F. Short and L. Clarke, eds., Westview Press, Boulder, CO, 309-321.

² Review of the implications of a constructivist versus realist concept of risk can be found in: Bradbury, J. A. (1989): "The Policy Implications of Differing Concepts of Risk." *Science, Technology, and Human Values*, 14 (4), 380-399 and Renn, O. (1992): "Concepts of Risk: A Classification." *Social Theories of Risk*, S. Krimsky and D. Golding, eds., Praeger, Westport, CT, 53-79 and Rosa, E.A. (1998), "Metatheoretical Foundations for Post-Normal Risk", *Journal of Risk Research*, 1: 15-44. A pronounced constructivist approach can be found in: Wynne, B. (1982): "Institutional Mythologies and Dual Societies in the Management of Risk." *The Risk Analysis Controversy. An Institutional Perspective*, H. C. Kunreuther and E. V. Levy, eds., Springer-Verlag, Berlin et al.; Luhmann, N. (1993): *Risk: A Sociological Theory*, Aldine de Gruyter, New York.; Adams, J. (1995): *Risk*, UCL Press, London. Or a recent German book by Japp, K. (1996): *Soziologische Risikotheorie*, Juventa, Weinheim München. Realist perspectives in the social sciences can be found in: Catton, W. R. (1980): *Overshoot: The Ecological Basis of Revolutionary Change*, University of Illinois Press, Urbana, III.; Dunlap, R. E. (1980): "Paradigmatic Change in Social Science: From Human Exemptionalism to an Ecological Paradigm." *American Behavioral Scientists*, 24, 5-14.; Dickens, P. (1992): *Society and Nature: Towards a Green Social Theory*, Temple University Press, Philadelphia.

³ Sandman, P. M. (1988): "Hazard versus Outrage. A Conceptual Frame for Describing Public Perception of Risk." *Risk Communication*, H. Jungermann, R. E. Kasperson, and P. M. Wiedemann, eds., Research Center, Jülich, 163-168.

about the tendency of risk management institutions to base risk reduction policies on risk perception rather than risk assessments⁴. He claimed that most public risk perceptions are at odd with the best scientific estimates, are inconsistent with rules of formal logic, and vary considerably among populations and over time. Using perceptions as guidelines for policy would imply that more people than necessary would become victims of risks and that industry and other risk producers would suffer from the capricious tempers of public rage. The same argument was presented at the Probabilistic Safety Assessment and Management Conference in June of 1996 by keynote speaker David Okrent⁵. He questioned the use of public perceptions as guidelines for risk management on the basis that perceptions violate principles of intra- as well as intergenerational justice and equity. Risk aversion among the affluent societies and for the present generation would lead to the imposition of risks onto less developed nations and future generations.

These attacks represents the sudden revitalization of an old debate. Early in its development, the field of risk analysis debated about the role of laypersons and about the significance and function of social science research in risk management. In our view, there are three reasons for the recurrence of these debates. The main reason has been that money for risk reduction has become an even more scarce resource than ever before. As long as risk managers had rather large budgets to spend, it was relatively easy to please all camps, the experts, the public, and the social scientists who studied both. Money was spent on the top risk priorities of experts and the public alike. In times of tighter budgets and less public attention to environmental issues, risk managers found that they could not afford to please both "clients" any more⁶.

The second reason has been that pleasing the public turned out to be more difficult than anticipated on first glance from the psychological studies on risk perception. In the 1970 and 1980, public perception data were often collected at a highly aggregate level⁷. Risk priorities for the public were normally based on the average values of individual risk perceptions that reflected either estimates of small groups of respondents or mean values of larger samples. Most risk

⁴ Graham, J. "The Biases of Public Perception." *SRA-Europe Meeting*, University of Surrey, Guildford.

⁵ Okrent, D. (1996): "Risk Perception Research Program and Applications: Have They Received Enough Peer Review?" *Probabilistic Safety Assessment and Management '96 ESREL '96 - PSAM '96*, C. Cacciabue and I. A. Papazoglu, eds., Springer-Verlag, Berlin et al., 1255-1259.; see also: Sapolsky, H. M. (1991): "The Politics of Risk" *Daedalus* (4), 83-96.

⁶ See for the U.S.: Zeckhauser, R., and Viscusi, K. W. (1996): "The Risk Management Dilemma. "Challenges in Risk Assessment and Risk Management. *Annals of the American Academy of Political and Social Science*, Special Issue, H. Kunreuther and P. Slovic, eds., Sage, Thousand Oaks, 144-155, here p. 148

⁷ See the classic article by: Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., and Combs, B. (1978): "How Safe is Safe Enough? A Psychometric Study of Attitudes Toward Technological Risks and Benefits." *Policy Sciences*, 9, 127-152 or Slovic, P., Fischhoff, B., and Lichtenstein, S. (1980): "Facts and Fears: Understanding Perceived Risk." *Societal Risk Assessment: How Safe is Safe Enough?*, R. Schwing and W. Albers, eds., Plenum Press, New York London.; a critical review at the time was: Otway, H. and Thomas, K. (1982): "Reflections on Risk Perception and Policy." *Risk Analysis*, 2, 69-82.

managers were not aware that mean values tend to obscure the large amount of variance to be found among individuals. More sophisticated research designs revealed a wide array of risk estimates among individuals and social groups and a variety of risk priorities depending on group affiliation, personal values, and social orientations⁸. The gap between experts and the public turned out to be transformed into numerous gaps among experts and among publics⁹. The resultant confusion motivated many risk managers to abandon the idea of public input altogether and to return to the safe haven of technical expertise.

The third reason has been that public opposition to technologies and other risk-inducing activities has been less pronounced than in the past. Many former opponents of technology have become professionals in risk management and adopted at least parts of the risk assessment methodology of their former foes¹⁰. Public concern for risky technologies, though still higher than ever (as measured by surveys), has not translated into widespread public protest or political action. With less public support, the concerns of environmentalists and other public groups are less visible in the political arena and, as a result of this, less important for designing risk policies.

The key question at this juncture is: Will the pendulum swing back to a new era of expert domination in risk policies? The trend seems to point in this direction. In response to this new trend, several social scientists have suggested that social research on risk should be based on theoretical frameworks that risk managers and natural scientists would also find attractive. In particular, they have argued that the postmodern views on risk have been counterproductive and that systems theories in contemporary sociology have only produced the less than helpful insight that risk debates cannot be resolved. Their advice has been hence to use rational actor theories as a basic framework for understanding social responses to risk and to design policies that fit the needs of risk managers.

In the remainder of this paper, we will make the attempt to analyze the potential of rational actor theories to provide an explanatory framework for understanding the social experience of risk in

⁸ Early sociological surveys had suggested such a large variance within the public, but it was hardly acknowledged by risk management agencies. See for example: Gould, L. C., Gardner, G. T., DeLuca, D. R., Tiemann, A. R., Doob, L. W. and Stolwijk, J. A. J. (1988): *Perceptions of Technological Risk and Benefits*, Russell Sage Foundation, New York or Renn, O. (1981): "Man, Technology, and Risk" *Jül-Spez-115*, Research Center Jülich. More sophisticated psychological research designs revealed a variety of different risk perceptions depending on social and cultural orientations. See: Dake, K. (1991): "Orienting Dispositions in the Perceptions of Risk: An Analysis of Contemporary Worldviews and Cultural Biases." *Journal of Cross-Cultural Psychology*, 22, 61-82.; Drottz-Sjöberg, B.-M. (1991): *Perception of Risk. Studies of Risk Attitudes, Perceptions, and Definitions*, Center for Risk Research, Stockholm, pp. 163ff.

⁹ Fischhoff, B. (1996): "Public Values in Risk Research." *Challenges in Risk Assessment and Risk Management*. Annals of the American Academy of Political and Social Science. Special Issue, H. Kunreuther and P. Slovic, eds., Sage, Thousand Oaks, 73-84, here 83.

¹⁰ Dietz, T., Stern, P. C., and Rycroft, R. W. (1989): "Definitions of Conflict and the Legitimation of Resources: The Case of Environmental Risk." *Sociological Forum*, 4, 47-69.

modern societies. Our main thesis will be that rational actor theories may be well-suited to describe individual actions under uncertainties but fail to provide satisfactory explanations for collective risk actions or decisions. Furthermore, we claim that rejecting rational actor theories at the collective level does not necessarily lead to the hyper-relativism of post-modernism or to the pessimism of social systems theory¹¹.

The foundation of rational action theories

The notion that rational action form the philosophical basis for explaining risk comes in three levels of abstraction. In its broadest form (as a worldview) it presupposes that human beings are capable of acting in a strategic fashion by linking decisions with outcomes¹². Humans are purposive agents, they are goal-oriented, have options for action available and select options that they consider appropriate to reach their goals. In this broadest form, most people would take this worldview for granted. With the exception of post-modern theories, there is hardly any disagreement among the different schools in the social sciences that rational action is not only possible but also a "touchstone" of human action. If the post-modernists were correct, social science based risk studies would make little sense except as socially constructed knowledge systems amendable to rhetorical criticism or deconstruction.

The second, more refined version of rational action can be called the *Rational Actor Paradigm (RAP)*. It is a general theory of human action that makes a whole set of further claims that are more specific. Many special theories on risk and uncertainty rely on this second level RAP and its assumptions. These assumptions refer to human actions based on individual decisions. Among the most important are:

- Atomistic view of rationality (all actions can be reduced to individual choices);
- analytical separability of means and ends (people as well as institutions can in principle distinguish between ends and means to achieve these ends);
- goal-attainment motivation (individuals are motivated to pursue self chosen goals when selecting decision options);
- maximization or optimization of individual utility (human actors select the course of action that promises to lead to more personal satisfaction than any other available competing course of action);

¹¹ The content of this paper summarizes a recent effort by the four authors to publish a book on this subject: Jaeger, C. C., Renn, O., Rosa, E. A., and Webler, T. (in preparation). *Risk, Uncertainty and Rational Action*.

¹² Dawes, R. M. (1988): *Rational Choice in an Uncertain World*, Harcourt Brach Jovanovich, New York.

- existence of knowledge about potential outcomes (people who face a decision can make judgments about the potential consequences of their choices and their likelihood);
- existence of human preferences (People have preferences about decision outcomes based on values and expected benefits);
- predictability of human actions if preferences and subjective knowledge is known (rational actor theory is not only a normative model of how people should decide but also a descriptive model of how people select options and justify their actions).

This set of fundamental assumptions linked to individual behavior is also extrapolated to situations of collective decision making or collective impacts of individual decisions. These situations refer to three classes of phenomena: (i) to human actions that reduce or enlarge the potential for actions of others (external effects); (ii) to a multitude of rational (individual) actions that create social structures such as markets or political institutions, in which the aggregate effect of many rational actions provide predictability and consistency even in absence of a "self-conscious" collective will (in the language of Durkheim the so called "social facts") and (iii) to actions that are designed and/or implemented by more than one actor or other forms of actions that lead to or stem from interactive effects among different individual actions (structural effects such as class biases).

Specifically designed to explain collective behavior, there is a third level of interpretation of RAP. In this interpretation, humans maximize their utility by choosing among different options the one option that promises maximum payoff. In its collective version, such rational behavior leads to a social and economic equilibrium within a web of rational actions as long as humans have equal access to resources and information and are allowed to compete with each other. The third interpretation of RAP is closely linked to economic theory and its basic understanding of rationality as a process of the efficient selection of means to reach a predefined goal. The main thrust of the third level is the transference of factors that govern individual action to the realm of collective action and the implication of the transference on institutions and social structures. In addition to the above mentioned assertions of individual actions, the realm of collective actions within the third level of RAP comprises a whole set of additional claims:

- *Methodological Individualism* (all aggregate social actions can be interpreted as a complex net of individual actions).
- *Treatment of organizations or social groups as 'virtual' individuals* (organizations act like individuals, they select the most efficient means to reach pre-determined goals).
- *Possibility of extending individual preferences to aggregate preference structures* (institutions that aggregate individual preferences such as markets or political decision

making bodies resemble not only the sum of individual preferences but also their combined collective interest).

- *Availability and effectiveness of organizational principles and practices* (markets, democracy, negotiations, and others) that provide a systematic link between individual utility maximization and social welfare (in particular the so called invisible hand of markets).
- *Reasonable knowledge of individual actors about the effect of social inferences* (actions of others that interfere with the actions of oneself) on one's own probability to attain goals (handling of complexity).
- *Indifference to the genesis and promulgation of values and preferences* (values are seen as pre-existent or exogenous, RAP can only make predictions on the premise that preferences are given, not created in the decision process).
- *Independence between allocation of resources and distributional effects* (it is rational for societies to assign priority to the most efficient allocation of resources regardless of distributional effects before re-distributing the wealth among the members according to preconceived principles of social justice). In some laissez-faire versions of RAP, a Darwinistic selection rule for distributing wealth is assumed as most appropriate since the most successful entrepreneur should also reap most of the benefits. Modern versions inspired economists of the neoliberal (Hayek) school emphasize the distinction between allocation of resources and equitable distribution. RAP models are appropriate for ensuring the most effective and efficient production and exchange of goods and services, but need auxiliary ethical norms or moral principles to distribute equitably the added value among society's members.

The optimization principle

Underlying the individual as well as the collective interpretation of RAP is the basic assumption that all human actions can be described as problems of maximization or, in more contemporary versions of RAP, optimization. The social world is divided into countless of decision problems each of which require the generation of options for future actions and some kind of an algorithm (decision rule) to choose one among the available options. This algorithm is meant to guide an individual or collective strategy to the optimization of its own benefits. The algorithm may be well founded in many social arenas such as markets and political debates. It may, however, be unfounded for other social structures; such as those creating mutual trust among actors, building individual and social identity, gaining ontological security or constructing solidarity among people with similar interests. Although these latter social activities are certainly goal-oriented and thus fit the first level of rational actors (worldview), they do not lend themselves to a process of

optimization. Thus, neither the assumptions of the second, nor of the third level of RAP are met under circumstances where optimization is not the primary goal of action.

It makes no sense to think of trust, identity, or solidarity as resources to be maximized or optimized as is understood in the RAP tradition. These social phenomena are products of communication and mutual understanding, elements of social life itself that require pre-existing cultural meaning and constant feedback in order to reach stability. They are always endangered by the perceptions of strategic or disruptive social actions and need to be fueled by reciprocal actions and exchange of symbols that emphasize shared values and convictions. Such a process of offering, sustaining and symbolic reinforcement cannot be adequately described by an optimization process although some of the contemporary rational actor theorists have made some attempts to phrase these phenomena in the language of RAP¹³. These attempts include many additional ad hoc assumptions and qualifying conditions beyond the RAP framework. As Thomas Kuhn has pointed out in his classic study of scientific paradigms¹⁴, a scientific theory becomes weak when it needs too many ad hoc explanations to subsume phenomena that do not fit the original predictions. Such was the case with the Ptolomean view of the solar system with its ad hoc epicycles.

Our main point here is that the realm of the monarch RAP has been extended beyond its scope to areas that cannot and should not be regarded as maximization or optimization problems. RAP assumes that individuals pursue the three requisite steps of decision making: option generation, evaluation of consequences, and selection of the most beneficial option. Without a doubt there are many social situations that can be described or at least simulated in such a fashion. There are many other situations, however, in which the model of decision making as an act of optimizing outcomes appears to be a weak descriptor for what actually happens, let alone for what the actors perceive to happen. Social reality becomes impoverished if all actions have only one common goal: to maximize or optimize one's own utility. Balancing social relations, finding meaning within a culture, showing sympathy and empathy to others as well as being accepted or even loved by other individuals belong to a class of social phenomena that do not fit neatly into the iron rule of RAP theory. Individuals may conscientiously or unconscientiously behave in accordance with the means-ends optimization process of RAP some of the time, but certainly not all of the time. A major task of post-RAP theories is therefore to identify and define additional schemata of social actions that are based on intentionality but use routes other than optimizing outcomes.

¹³ cf Opp, K.-D. (1989): *The Rationality of Political Protest. A Comparative Analysis of Rational Choice Theory*, Westview Press, Boulder, CO.; Opp, K.-D. (1983): *Die Entstehung sozialer Normen. Ein Integrationsversuch soziologischer, sozialpsychologischer und ökonomischer Erklärungen*, Mohr, Tübingen.

¹⁴ Kuhn, T. (1962): *The Structure of Scientific Revolutions*, University of Chicago Press, Chicago.

This criticism is not directed towards RAP on the first level of analysis, and only partially to its application for understanding individual action as exercised on the second level. Rather the criticism refers to the imperialistic extension of RAP to social phenomena that are not suitable for the assumptions of RAP at both the individual and the collective levels. To our knowledge no RAP theoretician or practitioner has taken up this suitability issue. Rather they continue to defend their claim that RAP offers a universal perspective for understanding human risk (and other) social behavior. Empirically proven deviations from the assumptions of RAP are treated as anomalies or noise. The major question of whether optimizing strategies underly all classes of human and social actions has not been adequately addressed by the defenders of the monarch.

The problem of optimization alone requires a critical discussion about the limits of RAP as a general theory of human action. But there are numerous additional targets for criticism with respect to the major assumptions. Many have been raised by critics of RAP, which in turn have been partially addressed by adherents of RAP. These criticisms can be classified into two classes: criticisms of RAP as a theory of individual choice and action, and criticism of RAP as a theory for collective choices and social action.

RAP and individual choice

The most prominent debate surrounding RAP stems from the empirical evidence that humans more often violate rather than conform to the rules of rational action. RAP seems plausible as a normative standard for judging individual action if it can be framed as a decision problem. But, as descriptive tool for predicting people's actions it has only limited validity. This is true even if the analyst has access to the preferences and subjective knowledge of the individual decision maker. Most psychological experiments demonstrate only modest correlations between rationally predicted and intuitively chosen options¹⁵. Furthermore, by asking people in "thinking-out-loud-experiments" how they arrive at their decision, all kinds of rationales are being articulated of which only few have any resemblance with the prescribed procedures of rational actors¹⁶.

The cumulation of observed deviations from RAP-based decisions led two leading cognitive scientists to conclude: "... the logic of choice does not provide an adequate foundation for a descriptive theory of decision making. We argue that the deviations of actual behavior from the

¹⁵ Tversky, A., and Kahneman, D. (1974): "Judgement Under Uncertainty: Heuristics and Biases." *Science*, 185, 1124-1131; von Winterfeldt, D.; Ward, E. (1986): *Decision Analysis in Behavioral Research*, Cambridge University Press, New York; Dawes, R. M. (1988): *Rational Choice in an Uncertain World*, Harcourt Brach Jovanovich, New York.

¹⁶ Jungermann, H. (1982): "Zur Wahrnehmung und Akzeptanz des Risikos von Grosstechnologien." *Psychologische Rundschau*, 23, 217ff.

normative model are too widespread to be ignored, too systematic to be dismissed as random error, and too fundamental to be accommodated by relaxing the normative system. We conclude from these findings that the normative and descriptive analysis cannot be reconciled¹⁷. In response to this empirical challenge, proponents of the rational actor paradigm in psychology and economics have proposed five modifications that would bring the theory more in line with the actual observations of behavior.

First, they claim that the procedures prescribed by RAP-theory serve only as analytical reconstructions of the intuitive choice process in humans. Whether humans follow these prescriptions consciously or not, does not matter as long as the outcome of the decision process is close to what rational theories would predict¹⁸. Second, people use simplified models of rationality such as the lexicographic approach (choose the option that performs best on the most important attribute), elimination by aspects (choose the option that meets most of the aspects deemed important) or the satisficing strategy (choose the option that reaches a satisfactory standard on most decision criteria); all of these are strategies of bounded rationality with suboptimal outcomes¹⁹. These suboptimal outcomes are either sufficient for the person (the additional increase in utility is less than the cost of such a decision) or the time saved to come to a satisficing solution is more valuable than the additional benefits derived from an optimal decision. Recent experiments have shown that people use more complex and elaborate models of optimization when the decision stakes are high (large potential payoffs), while they prefer the simplified models when the decision stakes are low²⁰. Introducing simplified models for suboptimal decision making increased the validity for making predictions of chosen decision options substantially.

Third, most applications of RAP theory equate utility with an increase in material welfare. However, people may feel an increase in satisfaction when they act altruistically or when they enhance their reservoir of symbolic gratifications. Although experiments are usually designed to exclude these factors (or to keep them constant), it is not clear whether symbolic connotations (such as accepting money for a trivial task) may play a role in the decision making process²¹. Some of the aforementioned "thinking-out-loud experiments" revealed that some subjects felt that

¹⁷ Tversky, A. and Kahneman, D. (1987), Rational Choice and the Framing of Decisions." *Rational Choice: The Contrast between Economics and Psychology*. R.M. Hogarth and M.W. Reder, ed., University of Chicago Press, Chicago, pp. 67-84

¹⁸ Edwards, W. (1977): "How to Use Multiattribute Utility Measurement for Social Decision Making." *SMC-7, IEEE*.

¹⁹ Simon, H. A. (1976): *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organizations*, Basic Books, New York; Tversky, A. (1972): "Elimination by Aspects: A Theory of Choice." *Psychological Review*, 79, 281-299.

²⁰ Dawes, R. M. (1988) *Rational Choice in an Uncertain World*, Harcourt Brach Jovanovich, New York.

²¹ Weinmann, J. (1991): *Umweltökonomik: Eine theorieorientierte Einführung*, Springer-Verlag, Berlin et al.

they should opt for the most cumbersome decision option because that way they felt they deserved the promised payoff.

Fourth, people in such experiments often assume a strategic posture. They assume that their choices will depend on actions and reactions of others even in experimental settings that focus on individual actions without any interference from other actors. By deliberating over how others could influence their preferred choices, they may select the suboptimal solution because such a solution avoids the strategic response of the assumed others. Game theoretical models, though normatively inappropriate for these conditions, may actually offer better predictions than those based on expected utility.

Fifth, some analysts claim that the artificial situation of a laboratory as well as the "playful nature" of the subjects (normally undergraduate students) are the main reasons for many observed deviations from the rational actor model²². In real life situations with real stakes people would be more inclined to use rational or at least bounded rational models to select their preferred decision options. Yet, comparative studies among students, laypersons, and experts show that while there are intergroup differences, all have perceptions that deviate from expectation²³.

This is not the place to review all these arguments in detail. However, two implementations emerge from them. First, if utility encompasses all aspects that matter to people then the model becomes tautological and is non-falsifiable. That humans act intentionally has not been challenged in this text. If altruism, feelings of solidarity, struggling for meaning are all manifestations of utility, the concept of utility itself becomes meaningless and trivial. Second, if closeness to real life situations and the inclusion of bounded rationality indeed improves the predictability of decision choices, as many experiments suggest at this point, then the conclusion is justified that many individual decisions can be explained by a modified rational actor approach. The modification to include simplified models is not tautological (they exclude many potential options from the selection) and the utility measurements are still defined in terms of actual payoffs. Third, even granted that rational choice occurs at the individual level in many instances, many other human actions do not follow the optimization processes of RAP.

Laboratory experiments narrowly frame the situation as a decision making context. Left out of this context are many of the social forces that define humanness. Many human actions are motivated by cultural imperatives, most notably habituation, for example imitation, conditional learning, emotional responses, and subconscious reactions. These actions are not perceived as

²² Heimer, C. (1988): "Social Structure, Psychology, and the Estimation of Risk." *Annual Review of Sociology*, 14, 491-519.

²³ Lichtenstein, S., Slovic, P. and Fischhoff, B., ???

decision situations and hence rational strategies are not even taken into conscious consideration. In addition, anecdotal evidence tells us that many actions are functions of both, cognitive balancing and emotional attractiveness. The fragmentation of the psychological profession into communities of clinical, cognitive, analytical psychologists has blinded researchers from testing the relative importance of these factors in motivating human actions. Nevertheless, it seems quite appropriate to conclude that rational actor theories can provide a normative algorithm for decision making. RAP can also describe some important aspects of human actions that center around decisions - in particular those decisions involving measurable outcomes. The real issue seems to be what happens to other aspects of social life and to what degree actions are closely or loosely coupled to decision making in the RAP sense.

RAP and collective choice: a critical view from systems theory

These problems of finding the limitations and boundaries of RAP are especially relevant for two applications of RAP that extend its realm beyond the individual level: to collective decision making and to the impacts of individual choices on other individuals. There are considerable conceptual problems for the rational actor paradigm when applied to collective decision making. On the most fundamental level, all rational actor theories imply that individuals have sufficient knowledge about the consequences of their potential courses of actions. This assumption has been strongly contested by sociologists belonging to the systems theory camp, such as Luhmann. System theorists claim that prediction of outcomes may already be difficult to accomplish in a complex world even if there are no other actors. But with the presence of a multitude of other actors, who are likewise making strategic choices and thus able to affect the outcomes of one's own action in a myriad of different directions, it is almost impossible to predict the consequences of one's own action. The individual decision maker is, thus, trapped in a web of contingencies and uncertainties. In such instances, RAP does not provide a very meaningful orientation. The belief that rational action is possible and normatively required turns out to be an "ideological" element of those social systems (or subcultures) that would like its members to believe that the world is governed by rational decisions²⁴.

Furthermore, there are clearly social contexts where RAP seems out of place. It is not uncommon for someone to have no idea of what the impacts of various decision options (such as accepting one of several job offers) might be. Furthermore, information seeking strategies may turn out to be insufficient or too time consuming as to produce sufficient clarity about options and potential outcomes. In this case, RAP would suggest guessing or a conservative "better safe than sorry"

²⁴ Rayner, S. (1987): "Risk and Relativism in Science for Policy." *The Social and Cultural Construction of Risk*, B. B.Johnson and V.T. Covello, ed., Reidel, Dordrecht, 5-23.

strategy. Social theory and systems theory in particular would suggest, however, that social systems need more coherence and predictability of individual actions than this seemingly random strategy would provide. If human actions were random occurrences, as in the case of insufficient knowledge, social integration would be jeopardized. In response to this problem, systems theorists claim that conformity and predictability are accomplished through a variety of functionally equivalent procedures of which rational choice is only one among others. In particular, orientation through reference group judgments and secondary socialization by organizations and subcultures provide selection rules for options independent of the expected outcome for the individual²⁵. In addition, these selection rules include other motivational factors such as emotions or social bonds that play no or only a minor role in RAP. Again option selection does not result from an optimization process but from social or cultural orientations. Individual choices are made on a social basis such as judging the social desirability of or proximity to the aspired lifestyle of one's reference group.

The conflict between expected and experienced outcomes is likely to increase with the degree of social and cultural complexity. This leads, on the one hand, to an increased variability of human action and thus to a growing number of potential choices that are open to each individual. Increased complexity, on the other hand, necessitates an increased effort for coordinated actions. This dilemma has been resolved in modern societies with the evolution of semi-autonomous systems that provide a network of orientations within each distinct social grouping²⁶. Such systems organize and coordinate the necessary exchange of information and services through specialized exchange agents. Depending on the cultural rules and images of these social groupings, rational expectations may play a larger or smaller role in shaping these orientations. That is why appealing to rational decision making is only attractive to some groups (e.g. bankers), but repulsive to others (e.g. evangelists). Absolute rationality - the strongest form of RAP - has lost its integrative power over the diverse system rationalities that each group has accepted as binding reference points for action and legitimation²⁷. Complex, modern societies are characterized by the coexistence of multiple rationalities - RAP being just one of them - that compete with each other for social attention and influence.

This trend towards multiple rationalities is reinforced by the disintegration of collectively approved and confirmed social knowledge. Each group produces its own rules for making knowledge claims. These rules determine which claims are justified as factual evidence compared

²⁵ Giddens, A. (1994), "Living in a Post-Traditional Society." *Reflexive Modernization*, U. Beck, A. Giddens and S. Lash, ed., Stanford University Press, Stanford, 56-109

²⁶ Bailey, K. (1994): *Sociology and the New Systems Theory*, State University of New York Press, New York, 243ff

²⁷ Luhmann, N. (1986): *Ökologische Kommunikation*, Westdeutscher Verlag, Opladen.

to which claims are seen as mere constructions, ideology, or myths. Furthermore, they govern the process of selecting those elements of an abundant reservoir of knowledge claims that seem relevant to the group members and match the body of previously acknowledged and accepted claims.

Under these circumstances it is difficult to predict the factual consequences of different decision options. How can individuals make prudent judgments about options if the relevant knowledge is not only uncertain but also contested by the relevant stakeholder groups? The result of this growing uncertainty and indecisiveness of potential outcomes leads, on one hand, to a larger share of non-rational incentives to ensure conformity and, on the other hand, to a concerted effort to create certainty often in the form of RAP-based strategies such as quantitative risk assessments. This polarization fuels an ongoing conflict among the subsystems, which continue to develop their own mechanisms of internal integration and development, while threatening external coherence (the well-known autopoiesis theory of Luhmann)²⁸

The State and its political agents have become more and more powerless in developing and allocating resources for regulating the exchange of materials and communication as well as relations between social groups. They seem to be engaging in a losing battle. It is increasingly difficult for them to provide a commonly accepted and legitimate system of meta-rationality that encompasses the plural rationalities of each subsystem. However, it is unclear whether the battle is being lost in principle or whether the RAP approach is merely insufficient to provide such a meta-rational framework. In either case, institutional trust is eroded and political legitimacy is seriously jeopardized. Because of these ramifications (and other equally grave problems) and because RAP does not provide the requisite meta-rules demanded for ensuring coordination among competing rationalities, we later conclude the need for an alternative or at least modified framework.

RAP claims in the light of competing social theories

The struggle for a comprehensive and overarching framework of rationality has been the focus of many new social theories because of the theoretical challenge outlined above. It also represents one of the most pressing problems of contemporary societies. Although one can observe a renaissance of RAP-models to provide a common base for a meta-rational integration of competing subsystem claims, it is very doubtful that this rejuvenation will be effective for a variety of reasons. The growing uncertainty and complexity of modern societies obscures the

²⁸ Luhmann, N. (1986): "The Autopoiesis of Social Systems." *Sociocybernetic Paradoxes: Observation, Control and Evolution of Self-Steering Systems*, R.F. Geyer and J. van der Zouwen, ed. Sage, London, pp. 172-192

relationship between rationally derived expectations and actual outcomes. Too many social system variables intervene between the rational axiom of expected utility and the experienced cause-effect-relationships in everyday life. These discrepancies make the application of rational actor theories less convincing for members of the various self-governing subsystems and thus weaken its potential power as a meaningful interpreter of and predictor for social responses. High-risk technologies are the most prominent examples of this. The weakness of the RAP approach to offer a commonly accepted rationale for designing and legitimizing public policies for managing these risks grows in recognition. As this weakness has become clearer in the eyes of most observers, it has challenged RAP's hegemony over risk knowledge claims. It has also challenged its legitimacy as a policy and management tool.

Thus, RAP is threatened by two key assaults to its foundations. First is the inability of an individual in a complex society to foresee the consequences of one's action, and, second is the need for functional equivalents that create conformity and commonly accepted selection rules without reference to expected outcomes. These problems are further aggravated by the contemporary trend towards emphasizing personal development and self-realization of individuals. The experience of incoherence that individuals desire to accomplish one goal but achieve another, conflicts with the expectation of self-realization. One social mechanism to cope with this conflict is to re-interpret the actual outcomes as a variant of the desired outcome (Isn't what I got what I really wanted or needed?). Religions frequently use this re-interpretation when they try to explain why bad things happen to good people. Either the allegedly good people had sinned after all, or the bad fate turned out to be a blessing when seen in a different light. Another mechanism is to offer a system of symbolic gratifications and incentives that compensate for the experience of conflict. However, all these post hoc methods of resolving this conflict perform poorly in creating social conformity and individual happiness at the same time.

RAP's failure to produce the requisite conformity attracts a key theoretical alternative: critical theory. Critical theory suggests that, with the decline of a universal rationality proposition, new social norms and values need to be generated that provide collective orientations, but do not conflict with personal aspirations²⁹. Similar suggestions have been recently proposed by the new Communitarians³⁰. In contrast to systems theory in which such new norms are part of an evolutionary process remote from any individual voluntaristic influence, critical theory believes in the integrative potential through a free and open discourse. Such discourse is not an arena for

²⁹ Habermas, J. (1969): *Strukturwandel der Öffentlichkeit. Untersuchungen zu einer Kategorie der bürgerlichen Gesellschaft*, Luchterhand, Neuwied et al.; McCarthy, M. (1971): *The Group*, Penguin Books, Harmondsworth.

³⁰ Etzioni, A. (1991): *A responsive society. Collected essays on guiding deliberate social change*, Jossey-Bass Publishers, San Francisco et al.

resolving conflicts about competing claims (as is practiced in conflict resolution models based on RAP), but as an arena for the establishment of commonly agreeable social norms or values. All participants voluntarily agree to accept the quest for common principles of evaluating validity claims and to comply with these principles via discourse because they perceive them to be intuitively valid and socially rewarding. Systems theorists are extremely skeptical about this approach. They claim that each system has developed its own language, reference system of knowledge, and norms, all of which cannot be amalgamated under the umbrella of procedural or substantive meta-norms. Normative agreements need to be based on some commonalities. If these are missing or if participants in a discourse are unable to understand, let alone accept the arguments of other (language) camps, a discourse becomes an arena of window dressing; everybody talks but nobody understands. Under these circumstances, agreements remain elusive acts of chance, strategy or power. Regardless of whether systems theory or critical theory is correct in this debate³¹, RAP based theories cannot offer any solution. This is because normative discourse (not aimed at optimizing utilities but at ensuring social cohesion) is outside of its conceptual universe. Norm evolution (other than serving higher norms) and the genesis of values are explicitly excluded from the body of knowledge within RAP. For RAP - they are simply "given" or "out there" - exogeneous to any particular context of choice. One of the major drawbacks of RAP is, therefore, its inability to explain one of the most eminent conflicts in modern societies: how to accomplish normative coherence, and how to provide solutions for coping with plural claims for collectively binding moral principles.

Structural pressures on individual behavior

RAP also faces major problems when it comes to structural influences on individual behavior. The problem is conceptualized in two ways. First, many individual actions occur in a restricted social context in which the variety and quantity of decision options are limited or are perceived as limited by individual actors. Such a limitation is not a serious challenge to RAP. The well-known RREEMM model (resourceful, restricted, evaluating, expecting, maximizing man) accounts for the restrictions and barriers that people face when making rational decisions³². Problems arise if the decision maker feels guided by context variables - norms, obligations, values, habits etc. - and does not perceive the situation as one of individual choice. This not only applies to habitual behavior in the form of personal routines that are performed in everyday life quasi unconsciously but also to cultural routines that are based upon complex stimulus-response mechanisms. The

³¹ Habermas, J., and Luhmann, N. (1971): *Theorie der Gesellschaft oder Sozialtechnologie: Was leistet die Systemforschung?*, Suhrkamp, Frankfurt/Main.

³² Esser, H. (1991): *Alltagshandeln und Verstehen. Zum Verhältnis von erklärender und verstehender Soziologie am Beispiel von Alfred Schuetz und "rational choice"*, Mohr, Tübingen.

enactment of culturally shaped behavior is mainly below conscious awareness and does not imply any type of internal cost-benefit-analysis - certainly not conscious calculation.

Second, the outcomes of individual actions produce external effects for other individuals; the so called interferences. These non-intended and very often unpredictable side effects do not only limit the ability of actors to anticipate or predict the consequences of their own actions (as discussed above), they also form the structural conditions for collective actions in the future. A major reason for the necessity of having transpersonal institutions in society is to assure predictability and social orientation even in the presence of unpredictable side effects of individual actions. RAP based theories do not deny the existence or the relevance of these structural elements. Rather, they regard them either as constraints on rational choice (these constraints can be traced back to individual actions of the past) or as a social learning process that teaches individuals to cope with interferences by predicting interactive effects more accurately. In addition, if collective action is rather homogeneous, RAP treats social aggregates as if they were rational individuals. Organizations are seen as *persona ficta*. They are entities that have goals, that evaluate their options, and that pursue an optimization strategy. They select the most efficient means for reaching predefined goals similar to individual decision makers. The transfer of individual choice to collective action characterizes the RAP approach and is accomplished via the route of methodological individualism. All aggregate phenomena are interpreted as if they were reducible to the decisions or an individual actor.

Methodological individualism has often been criticized on the ground that social actions cannot be reduced to individual actions alone. Simmel already claimed that in sociology the house is more than the sum of its stones. Accordingly, the appropriate theoretical organization is not methodological individualism but methodological holism. But, RAP theorists eschew holism. They emphasize that complex social actions can indeed be explained by referring to the same terms of reference that have explained individual actions. The claim for the universal applicability of RAP is not justified by postulating that individual and social behavior exhibit an identical or isomorphic internal structure. If so, the two action categories would necessitate identical or interchangeable terms and theories, which is clearly not the case. Rap does postulate, however, that complex social actions can be decomposed analytically to a variety of individual actions that in turn provide the data base for explaining and predicting actions of aggregates. RAP theorists would, in one sense then, agree with the statement that the house is more than the sum of its stones. The additional quality, however, can be derived from studying the sum of stones and the mortar holding them together rather than from investigating the house as entity sui generis.

Examples

Here are two illustrations that may help to demonstrate the RAP understanding of complex social systems. The first comes from economic behavior. In the field of economics, a rational actor must accept the rules of the market, the present price structure and the availability of resources as external constraints although these constraints are a product of all the actions of other rational actors. Learning in this context is a function of (intelligent) trial and error in which individual actors learn to cope with the effect of interferences and to improve their ability to predict future outcomes more accurately.

The second illustration is in the political arena. In politics, rational actors must accept the norms, laws and rules of decision making as external constraints. Again these constraints were presumably generated by rational actors in the first place. Learning takes place, for example, through the process of elections where the individual candidates can learn how their expectations of popularity are measured in votes. After a defeat, he or she may learn to rearrange the political program or communication method to incorporate the possible effects of the message on voters' behavior. In general, observing the individual actor provides enough insights to understand the structural effects of all the collective actions relevant in the respective social or political arena.

The structural theorists in sociology do not deny the possibility of looking at structural phenomena from an individualistic perspective. However, they prefer the alternative orientation of methodological holism. Treating social structures and institutions as entities sui generis supposedly provides more adequate insights and more explanatory power for understanding collective actions than the atomistic view of methodological individualism³³. Social scientists, adhering to RAP theories, are convinced that treating aggregate phenomena as manifestations of individual actions may indeed help to get us closer to a "unified social theory". Other social scientists believe that such an approach is bound to fail. It will either produce trivial results or will be applicable only to a limited range of social phenomena. Structural theories claim instead that they have found similarities and regularities in the behavior of aggregate structures that are difficult or impossible to explain by individual actions (although they clearly impact individual actions). Seminal studies on institutions, economic or regulatory styles, class structure and others have identified many of these structural phenomena that apparently influence individual behavior without entering into the rational calculations of each actor and that were never "invented" by actors through rational choices.

³³ Parsons, T. E. (1951): *The Social System*, the Free Press, Glencoe.

One attempt to combine the individual focus of RAP and the structural focus of many macrosociological theories has been the structuration theory by A. Giddens³⁴. Giddens describes this approach as one of duality - a synergy between the actor agent and social structure. Giddens rejects the idea that individuals calculate the expected utilities of the various consequences of behavioral options. Instead, they orient themselves within a complex arrangement of traditions, individual routines and socio-cultural expectations. Each individual actor is part of the forces that shape the future context of actions for others. At the same time each individual is bound to structural constraints that are the outcome of past actions and choices of others. Such an open system would tend to be chaotic if society would not develop consistent patterns of behavior; for they act as invisible guidelines for individuals in choice situations. These patterns are not simply an aggregation of individual actions but instead develop a structural logic of their own. For example, traditional norms do not promise maximum payoff or even an improvement of individual satisfaction but assure system continuity and stability. Likewise, power structures are often cherished even by those who lack power because it provides ontological security to society. The main argument that Giddens proposes is that individuals do have agency³⁵. They have choices to orient themselves within different social frames (such as traditions, special institutions, system rationalities). But the frames constitute developments of structural forces that go beyond individual actions and their effects on others.

External effects: Deviations from normality?

A final concern for RAP is the treatment of external effects. Although discussed frequently in the RAP literature, their treatment points to a major weakness in the assumptions of RAP theories. RAP presumes that, under certain conditions, the pursuit of individual rational actions would lead almost automatically to collectively rational outcomes. But the opposite often occurs in reality; i.e. that individually rational actions frequently lead to socially undesirable outcomes. This has always been discussed within RAP as a deficiency of the conditions. Perhaps the most well-known example of such failures is the free-rider-problem. The common RAP response to the problem of individual versus collective rationality and hence the potential conflict between the pursuit of individual rationality and the common good has been twofold: On one hand, RAP theorists believe in the "invisible hand" in the sense that under the condition that external effects can be internalized as costs to the individual actor, the outcome of individual actions would be equivalent to the overall social good. On the other hand, corrective actions are mandated if the

³⁴ Giddens, A. (1979): *Central Problems in Social Theory: Action, Structure and Contradiction in Social Analysis*, ???

³⁵ Giddens, A. (1984): *The Constitution of Society. Outline of the Theory of Structuration*, University of California Press, Berkeley, CA.

market fails to allocate social costs to those who cause them. In such a case market-compatible instruments are readily available to impose external costs on the guilty party. Among those compatible instruments are the extension of property rights to all affected parties or simulating market prices to include social costs (Pigou taxes or Coase property rights).

The same argument can be made for the political sector. Individual rationality is sufficient to provide a framework of laws and regulations that will automatically enhance the common good under the premise that each individual has the same right to influence political outcome. In both cases, economics and politics, collective action enhances the common good if the conditions of rationality and perfect market structure are met. But the real world is devoid of such perfections. Thus, the conditions are not ripe for collective welfare. The strategy of "blaming" the conditions for impeding the congruence of individual and collective rationality effectively builds a wall of immunization around RAP theories. Since all conditions for a perfect market or a truly rational political system are never met, deviations from theoretically derived predictions can always be explained by imperfect conditions. Relying on perfect conditions also reduces the explanatory power of RAP since it does not explain how markets or political structures arise in the first place and how people behave in an imperfect world.

The main argument against the RAP treatment of deviations from rationality as a consequence of imperfect economic or political conditions, however, is the fiction of a hidden social tendency towards an equilibrium stage of perfect market conditions and political structure³⁶. If this were true, social systems would tend to orient themselves in line with the guiding principles of rationality in their pursuit to reach the goal of perfect conditions. In reality, however, many systems and institutions profit from imperfection. Even if we assume that they behave like rational actors, their particularistic interest is and has been to make sure that conditions in the economic or the political market do not change. Imperfection creates losers and winners. It is not clear if and why social systems would tend to enforce a movement towards more "perfection". There may be even some good normative reasoning to allow for some imperfection in society if such a system could enhance social stability, solidarity or cohesion.

Finally, many structural barriers such as market segmentation, incomplete knowledge, possibilities of manipulation, market scale effects and many others make it unlikely if not impossible to accomplish a situation that ever comes close to perfect market conditions. Political will, even if available, is not sufficient to assure a transition to a more perfect world. There are structural barriers that are impossible to overcome without sacrificing other highly esteemed

³⁶ Bailey, K. (1994): *Sociology and the New Systems Theory*, State University of New York Press, New York, 88ff

social goods. The real world will always consist of economic and social structures that do not resemble the vision of perfection that RAP theorists share. One may even raise the question whether perfect conditions in economy and politics would constitute a desideratum for societies. Rather than a vision for the future, the RAP equilibrium may turn out to be a nightmare. We might find a creature that looks like a utility maximizing robot who has perfect knowledge, pre-programmed preferences, and all equal opportunities, but who knows nothing of habit, culture, commitment, and sociability.

Conclusions

Our discussion leads to following conclusion. The most eminent problem for RAP is the assumption that all human behavior can be modelled as variants of optimization procedures. There is sufficient doubt that such a structure superimposed on all human actions can offer a satisfactory perspective for studying and explaining such phenomena as trust, solidarity, identity, affection, - and of course risk. Furthermore, major problems for RAP lie in the fact that more and more areas of social life demonstrate specific patterns of behavior that neither make sense in the light of RAP's own assumptions, nor with respect to actual human choices. Outcomes have become less predictable so that orientations for future behavior can be based only partially on expected consequences. Interferences between social actions have increased over time so that distributional impacts of one party's action on the resources of another party have become politically and socially more important. Under such conditions social processes for optimal allocation of resources take a back seat.

In essence, RAP presumes a world that does not exist - at least not to the extent that RAP theorists would like to see it. Social development has created a complex world in which the conditions for applying RAP are seldom met and hence there is a growing discrepancy between model and reality. As a result, many RAP theorists have become ardent proponents of changing the world in the direction of the model rather than adjusting the model in the direction of the world.

This practice is common for any good theory in the sciences. Theories must always live with anomalies. Good theories are not proven wrong over time but proven either irrelevant in face of new developments or only applicable to special cases. The kingdom of the monarch RAP may not collapse because of its weaknesses, but it may be swallowed up by a new empire. Then, the kingdom will be one important but only a fractional part of the entire empire.

What does this mean for the recent debate on the role of social science for risk policies? Explanations based on RAP may help risk managers to understand why individuals behave in a

certain ways when they face uncertain outcomes of their action. Such an explanation, however, can only yield valid results if the individual perceives the risk problem as a problem of optimizing outcomes and if the conditions of choice meet RAP assumptions. If risk behavior is grounded in solidarity with others or motivated by reference group judgments, RAP does not make much sense. If the focus of social research is on collective risk behavior, theories based on RAP are still less convincing. They may even serve the function of disenfranchising individual from political actions or restricting freedom since the actions are deemed "irrational". The main problem here is that RAP presupposes stable preferences and knowledge about outcomes beyond the individual aspiration level. Furthermore, there is the assumption that the sum of individual actions would tend to form an equilibrium. The evidence for all of this is extremely weak.

It is our judgement, therefore, that social science research on risk needs to include more than the RAP perspective when analyzing risk behavior. All challengers to RAP, most notably systems theory, critical theory, and postmodernism, face other theoretical and practical problems when they deal with risk. They do provide, however, the missing links in the gaps that RAP cannot bridge. Until we have a unified social theory for risk, we are forced to live with a patchwork of different concepts. This is not a plea for eclecticism but a cautious argument for matching theories with the corresponding type of problems. In the end, social theory will be judged according to its potential to explain social responses to risk not by its ability to please risk managers. Regardless of whether risk managers prefer to set risk policies according to the numerical results of risk assessment studies or not, they are and will be faced with social reactions to their policies. Some will challenge or even counteract the basis of their policies. It is the task of social scientist to provide meaningful explanations for these responses and to promote a critical reflection on risk policies in the light of the research results. RAP based research will play a role in this endeavor but we would like to caution the ardent proponents of this approach to neither overstress its explanatory nor policy power. In particular at a time where social research is under attack, one should not put all the eggs in the same basket.