

# Chapter 9

## The Contribution of Neurobiology to Human Decision-Making Processes and Motivation

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### Risk and Uncertainty as a Part of Human Existence

Practically all human decisions and reactions have to be made on the basis of incomplete and usually non-verifiable knowledge and information in a limited time frame. On one hand, this is due to the prospective character of the decisions, and on the other, to the very high number of unknown or variably evolving covariates. Also, decisions are rarely taken by one individual in isolation without a social context. Relevant bidirectional influences on decision making exist between the individual and the reference collective. Findings from neurobiological research over the last 20 years on individual and collective decision-making processes can provide the foundation for the modulation of the behavioral changes necessary for a sensible and appropriate reaction to changes in the environment and in society.

In short, the following statements are possible on neurobiological grounds.

### Individual Decision-Making Processes

1. The assumption of the primacy of ratio/reason is false. In actual fact, decisions are made on the basis of subconscious tacit values and emotional associations that draw on past experience. Only when a clear-cut decision does not succeed on these grounds is it in fact taken by the so-called ratio. Otherwise, reason only supplies the rational explanation for a decision that has already been taken.
2. Every decision relies on intrinsic motivation, which results essentially from inter-individual interaction through social resonance with recognition, atten-

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tiveness and trust. The morphological prerequisite for mutual awareness and its influence on individual behavior are the cerebral mirror neurons.

## **Collective Decision-Making Processes**

Human behavior is geared toward cooperation and social resonance due to the evolutionary advantages of aligned collective behavior. Here, the strength of collectively held convictions is more essential than the supposedly rational benefit-risk structure of the behavior.

The willingness to cooperate in a group occurs in the interplay of, essentially, the following factors:

- The individual assessment that a situation is advantageous in itself or in conjunction with the collective
- The importance accorded to instant or delayed gratification, respectively
- The number of persons involved: the collective effect increases only in proportion to the size of the group if the individual advantage is preserved, irrespective of group size

It has been successfully demonstrated that groups able to depart from the majority principle for decision-making processes achieve greater decision effectiveness and accuracy. For an individual's positioning in a collective decision process, it is decisive in how, by whom and at which point in time information is conveyed. Hence, there is dynamic adaptation in the course of a collective decision algorithm.

## **Impacts, for Example, on the Option of Consciously Managing Large-Scale Risks Using Behavioral Change**

As comprehension of the factors mentioned above and their effectiveness grows, substantial efforts are being made to translate these findings into statistical models (evolutionary computation employing multistate regression modelling) for the predictive assessment of probable individual and collective behavior as a reaction to measures targeting behavioral change. These developments are being pursued to serve scientific, economic and political interests. The statistical model calculations represent the chance to determine probability ranges for behavioral patterns. They will replace the currently valid concepts that are frequently based on socio-ideological convictions, theoretical assumptions or models that are simply associated with a renowned name. This development is advancing very swiftly thanks to the growing availability of large amounts of data (big data) about

individual assessments and collective decisions, making the statistical models increasingly robust regarding their predictive reliability.

When planning measures for inducing individual and collective behavioral change, an understanding of the processes mentioned above increases the chances of successful implementation. Only if the individuals and the collective are addressed in a concerted manner and synergistically motivated, and if both the provision of the material conditions and the psychodynamic components of cooperation are actively promoted, can the measure achieve an optimal result.

The outline for planning a future measure, i.e. for changing individual and collective attitudes towards common resources could assume the following form:

1. Analysis of subconscious and emotional factors when the resource is accessed
2. Analysis of subconscious and emotional factors when the resource is created
3. Understanding the intra- and inter-individual hierarchy and interconnections between these factors
4. Identification of factors of social resonance, reinforcing and steering collective development
5. Development of specific measures for the targeted addressing of intra- and inter-individual mechanisms that act in favor of the project, by stimulating the intrinsic motivation to implement it
6. Verification of the concept, using statistical methods including the development of a predictive model with which variations in the influence and potency of different factors can be modelled and the corresponding impact simulated
7. Development of psychosocial parameters that can be collected in the field, that serve to monitor project progress and that can be compared with expected values from model simulations.

For actual implementation, efficient means are either available or can be created on the basis of widespread, globally accessible web-based and mobile network communication technologies that make the inclusion of all involved parties possible. On one hand, these technologies allow substantial amounts of information about behavior and opinions to be generated, while on the other, they facilitate the targeted influencing of individual and collective behavior by using adapted information strategies to create material and intrinsic incentives, possibly even independently of dominating local socio-collective structures.

Irrespective of cultural socialization, opinion leadership will continue to be founded on the evolutionarily established pillars “presence, charisma, credibility and trust”. In the past, this was inextricably linked to the physical experience ability of opinion leaders, whilst nowadays substantial intrinsic motivation to join aligned collective behavior can be generated by replacing the physical with the multimedia experience. As a result, collectives anywhere on earth are within reach that were previously not accessible in this way. The competence and willingness to use these new possibilities will, in the future, essentially dictate the success of economic and political measures.