

## **EDITORIAL**

# **INTERDISCIPLINARILY ON DECISION MAKING**

Decision making as a cognitive process has recently become a hot topic of various scientific fields from neurology to economics. As different disciplines are developing their specific research methods, hypotheses and vocabularies, an emergent need for a synthesis is becoming increasingly apparent. This special issue of INDECS is dedicated to cover the state-of-the-art in the major fields of cognitive science: philosophy, psychology, artificial intelligence and neuroscience, and, by doing so, search for the possibility of an interdisciplinary and interactive dialogue between these fields.

### **DECISION MAKING – A FAMILY OF PHENOMENA**

Decision making is one of the central if not the very central cognitive process and activity expressing human capability for conscious (rational) coping with lived situations, and by that, for facing oneself. Decision making expresses all human mental, psychological and social skills. In our lives we have to make decisions in one way or another on daily bases, whether we are aware of it or not, whether we make it rationally or not, and whether we make it spontaneously and creatively or not. Successful decision making is the key to creative processing of problematic situations from stressful conflicts to positive challenges.

Psychology, neuroscience, social sciences and computer sciences usually consider decision making to be a special cognitive process which runs somewhat autonomously and is separated from other components of the human being. This might prove to be a useful abstraction in certain situations, e.g. when we are interested in decision making as a process that can be formally handled as a kind of calculation or computation. But such a view also brings us to untenable simplifications which are not in accordance with the actual forms and ways of human decision making. People make decisions with their whole selves, with “body and soul”, with the aid of emotions and reason, as members of social units and not merely as individuals and even less so as some kind of automata or computers. The context is what gives this process its character and content of decision making. When observing and explaining cognitive processes as dependent on man’s bodily existence in the world modern cognitive science tends to talk about “embodied cognition“, but when observing and explaining cognitive processes as dependent on the actions of an individual in one’s natural and social environment it rather mentions “situated cognition” [1-2].

The phenomena and processes various fields of research relating to the notion of decision making are extremely diverse. On the one hand, one could talk about decision making even when considering the most basic reactions of living beings (and

machines) to external stimuli. As soon as there is the possibility of more than one reaction, one could already talk about decision making. Such decision making is usually carried out extremely fast and on reflex basis. Usually it is unconscious or partly conscious at best. Today it is mostly the different areas of neuroscience which research such decision making. On the other hand, we find “big“ and “complex“ strategic problems in decision making, like for example the decision about the social system of a country or the strategy of economic development of a large organisation. Such decisions can have important and long-term consequence. Usually they are carried out slowly and thoughtfully, with the cooperation of several agents. Here the emphasis is on communication, collaborative formation and evaluation of alternatives and the argumentation of suggested solutions, as well as on the solving of conflicts emerging from diverse interests and power relations among different agents.

Decision making can be understood either in the narrow or the broad sense of the word. In the narrow sense, we are interested in the decision itself as it is, i.e. as the choice of one of several options. In the broad sense, decision making can be seen as a process in which the choice of one alternative is only one of the steps. Prior to the choice itself, there are other activities taking place, e.g. gathering and checking information, formation of alternatives and foreseeing their consequences. Once the choice has been made, such an alternative can either be carried out or not. Each of these steps can itself become the object of special scientific research. Thus we can be interested in what way the decision maker formed the group of alternatives from which he tried to select the best one. What was the procedure he/she used to create these alternatives; did he/she rationally reflect on them at all; which ones were eliminated and why; were all the relevant alternatives considered or were there some left out etc. Usually it turns out that this encompasses a succession of smaller decision making problems which need to be solved prior to selecting the final alternative, i.e. prior to the actual decision in the narrow sense of the word. Another point of interest for the research is the phase of realization of the decision. The decision in the narrow sense does not mean that the selected alternative will actually be carried out. In order to make a decision, let alone to carry it into practice, we need „energy“, that is a motive, an intention, an emotional impulse or some other source, such as time, for example.

## **PATCHWORK OF PERSPECTIVES**

There are many different angles from which the decision making process can be observed. The articles in the present issue reflect this diversity. Some of the approaches to the research of the decision making process differ one from another merely in their research perspective, while others are virtually mutually exclusive. As with other cognitive phenomena, there are still several fundamental questions left unanswered concerning decision making. One of them is undoubtedly the question about the possibility of unconscious decision making. The field of computer learning and decision making is an important part of artificial intelligence. It is therefore obvious that the research of the area of machine (i.e. unconscious) decision making deserves serious consideration, regardless of our intuition that decision making has to be conscious. In his article, Marko Bohanec classifies and concisely describes the basics of the computer analysis of decision making, computer systems supporting decision making and computer decision making systems. Bohanec also analyses the most important phases in computer decision making – the most important one perhaps being the analysis of the decision situation. The author hints at the possibilities and reach of computer decision making and concludes that the most perspective area is

still the area of computer systems supporting human decision making, which can simplify the analysis of decision situations, while cannot make decisions instead of us.

An interesting point is that not only the artificial intelligence experts allow the possibility of unconscious decision making. Neuroscientists Zvezdan Pirtošek, Dejan Georgijev, and Milica Gregorič-Kramberger in their article introduce a division into three types of decision making: unconscious, half-conscious and conscious decision making, and two types of processes competing for the control of final decisions and actions: the simple, fast, perception-motor processes which appeared earlier in the evolution, and the complex, slow, more reflected cognitive-social processes with the elements of self-awareness which appeared later in the evolution and are characteristic of human beings. The first processes are related mostly to sensory-motor areas of the cerebellum, while the second ones are located in the frontal lobes. Basing on this division and proceeding from the experimental results of Libet's (and similar) research, the authors present a neuroscientific analysis of the experience of free will. In this they take sides with the relatively widespread view that the experience of free will as well as the experience of oneself as being the author of the decision mostly just accompany the experiencing of certain neurophysiological processes rather than being their causes (or the causes of our actions, to put it more accurately). The experience of free will is therefore a kind of illusion, or an explanatory means helping us to maintain a coherent world-view.

Such arguments are analysed also in the article written by Olga Markič. She is a bit more sceptical and careful in bringing conclusions about the illusoriness of our experience of free will. She points out the ambiguity of researches which form the basis of such thinking. Markič also points out the other extreme position often taken by researchers of decision making processes - the reduction of decision making to computation. Such a view improperly neglects unconscious processes and emotions, just like negating free will neglects the power of rational judgement and the role of personal responsibility for one's actions. In her paper, Markič presents Damasio's theory of the necessary role of feelings and emotions in decision making. Damasio develops the theory of "somatic markers". These are a kind of traces of emotional responses to situations, which have been formed in previous, similar situations. This way our emotional signals help us evaluate the possibilities and potential outcomes of decisions and thus help us decide about actions which are in accordance with our past experience.

The next article instead of finding general external (third-person) definition of the phenomenon of decision making, focuses on experience. From the phenomenological point of view, i.e. the perspective of the research of direct lived experience, the only expert able to answer the question whether a given process is decision making or not is the person who experiences this process. In the first part of his article, Urban Kordeš describes the emerging subdiscipline of cognitive science, phenomenological research, which concerns the studying of experiential processes. In the second part, he presents some results of the pilot study of the phenomenology of decision making. It appears that many experiential processes which subjects define as decision making are composed of two phases: rational weighing and analysing different options, and then waiting for an "impulse" or a kind of energization which ultimately tips the scales in favour of one of the options.

This phenomenological article is followed by the psychologist's report which focuses mainly on the problems of decision making in real-life situations. Marko Polič points out the phenomenon of intuitive decision making as the central feature of naturalistic

decision making. He presents different models of decision making in a natural environment, specially emphasizing Klein's (basing on subject recognizing critical signs which mark the type of circumstances and causal factors of the goings-on). He also presents Rasmussen's model of decision making on the bases of skills, acquired rules and knowledge. The author is in favour of a sensible integration of diverse models of naturalistic decision making. He points out six features, significant for such integration: diversity of forms, evaluation of circumstances, use of mental images, environment dependence, dynamic processing and description based on prescriptions.

The mosaic of diverse angles continues with the article by Andrej Ule, who makes a step forward from considering decision making as an individual process to researching decision making in groups. The notion of collective decision making is presented in a mathematical form, as a process of actualisation of decision potentials. Ule takes into account also the context which ultimately brings to a simplified matrix of the attractiveness of the outcomes, which corresponds to collective decision making about one of the given alternatives. Collective decision making is thus presented as a process of gradual crystallization of dominant alternatives under the influence of diverse contexts of decision making from the primary potential represented by the starting matrix of the attractiveness of combined outcomes.

The special issue is rounded up by Simona Tancig's paper about the problems and advantages of collaborative expert decision making and problem solving. Many of her findings have already been personally tested by the collaborative efforts of the group of authors of the present issue, which makes this article a perfect conclusion. The author builds on the so-called naturalistic perspective (introduced in the paper by M. Polič), which puts the expert in the focus of research and sees the expertise as the core of decision-making research in natural situations. An expert team is more than a group of experts. It is defined as a group of interdependent team members with a high level of task related expertise and the mastering of team processes. Tancig discusses the characteristics of expert teams during their optimal functioning. These characteristics are discussed in terms of input, process and output factors. Cognitive, social-affective, and motivational characteristics are presented and correlated with individual and team learning, problem solving and decision making strategies. Author explains deeper structures of dialogue and discussion, and the phenomena of collaboration, alignment, and distributed cognition that emerge from them.

To a group of researchers, trying to understand decision making from a broader perspective, the questions that Tancig is tackling seem essential, because it would appear that truly interesting insights into the nature of this phenomenon (or families of phenomena) can only be gained by a synthesis of all individual disciplinary findings. Such collaboration is obviously not a simple task, especially when trying to overcome the epistemological barrier between natural and social sciences. Apart from that, as mentioned above, in attempting interdisciplinary research of decision making and processes related to it we have to face the first major problem in the very beginning, i.e. when trying to define what decision making actually is and thus what exactly is the subject of our research. In specialised fields researchers might even not be aware of this problem as their view of the phenomenon is determined by the area or by their specialisation which usually does not require broader understanding. But once we try to tackle decision making research collaboratively, in interdisciplinary meetings, it turns out that a psychologist, a neuroscientist, an A. I. expert, and a phenomenological researcher use the same terms to describe quite diverse processes (phenomena). Is it possible that the notion of "decision making" actually describes different processes?

Could it be that we are not even dealing with the same problem? The answer to these questions is definitely the first (and maybe foremost) task for an interdisciplinary team trying to grasp any cognitive process in a more holistic perspective.

Regardless of these problems, it seems that the truly interesting findings are lurking somewhere “in between“ the disciplinary views, precisely on the edge of each individual research paradigm’s perspective. How to enter these intermediate spaces? How to find the synergy between essentially different disciplines? And first and foremost – how to handle research in an interdisciplinary way?

The present issue of INDECS probably cannot answer any of the above questions. But it is at least not afraid to ask them. All the authors are aware that the synthesis and acknowledging of different perspectives is merely a first step on the long road to a broader, more high-level understanding of decision making – the phenomenon so familiar to us that we know virtually nothing about it.

## THANKS

This introductory text is in parts based on Andrej Ule’s introduction to the monograph “The Contexts of Decision Making“, and on a text I am writing in collaboration with Marko Bohanec, in which we intend to present a kind of a map representing different modalities of decision making. Both papers are still works in progress. I would like to thank Olga Markič for invaluable help in preparing and editing this issue, and the entire team of the “Methodological aspects in researching cognitive processes – learning and decision making“ project for numerous fruitful discussions which planted the first seeds of a truly collaborative research process.

I would also like to thank Jaka Andrej Vojevec for help with translation and Karolina Radovanovič for double-checking the manuscripts.

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Ljubljana, 14 December 2009

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