

## INTERVIEW



# Cognitive neuroscience and risk

Leonardo da Vinci once claimed that all our knowledge has its origin in our perceptions. Thus, our (presumed) knowledge of risks also depends hugely on our very subjective and therefore highly differentiated perception and is ultimately a process and the result of highly complex stimulus processing. The material from which risks are constructed is supplied by our sensory organs. A sophisticated biological system converts the tiny electrical pulses emitted by our nerve cells into images and tricks us into believing our reality, even though it is ultimately only one of an infinite number. This hugely subjective risk perception plays a key role in determining the importance and our perception of the human factor as a cause of risk.

The sensory perception organs (sight, hearing, touch, taste and smell) allow us to perceive risk physically and neuro-physiologically. We call this subjective construct risk. We spoke to Prof. Bernd Weber (Centre for Economics and Neuroscience, University of Bonn) and Axel Esser (HGS Concept) about ways to achieve intelligent risk management using findings from neuroscience.

**FIRM Editorial:** First of all, we ought to clarify the areas of research that neuroscience actually covers. Is it a cooperation between medicine, psychologists and biologists?

**Bernd Weber:** Neuroscience deals with the functioning of the brain in the broadest sense. Cognitive neuroscience is most important for understanding human decision making. Various disciplines from the worlds of biology, medicine, psychology and other related areas such as economics are currently working closely together.

**FIRM Editorial:** We often read articles about new findings in brain research in the media. Why do you think that neuroscience seems to be "in vogue" at the moment?

**Axel Esser:** Particularly in decision making research, neuroscience provides methods that help us to understand the processes better rather than simply describing behavioural phenomena. Questions about the quality of decisions have never been so relevant as during the financial crisis. Answers to them have never been so urgently needed. As imaging methods develop, we are now in a position to provide answers at a whole new level. This is reflected in the media.

**FIRM Editorial:** A look at the practice of risk management shows us that there is a great deal of discussion about a so-called "risk culture" – but the element of human complexity is often forgotten. Is it not true that those of us involved in risk management need to pay much more attention to the person as a highly complex decision making entity?

**Axel Esser:** We believe that is absolutely the case. Particularly in the financial sector, but also in industry, where important decisions about risks are taken. It is essential to understand what is happening in the brain of a decision maker. As studies have demonstrated, we are subject to systematic distortions in our decisions, which can cost a lot of money in the real world.

**FIRM Editorial:** In risk management we often cannot see the wood for the trees. At its core this simply means a failure to perceive certain things – due to the limited processing capacity of the human brain. Psychologists call this phenomenon "inattentional blindness". Can neuroscience deliver more in-depth findings on selective perception of risks?

**Bernd Weber:** Yes. The core issue when it comes to selective perception is focus – just as our field of vision is limited at a physical level, the same applies in the mental sphere. We only consciously record what we pay attention to and that is all that makes it into our memory, which we then rely on when we come to make decisions. Daniel Kahneman calls this WYSIATI (what you see is all there is). However, at the same time we are exposed to phenomena such as subliminal priming, where unconscious stimuli have an impact on our decisions, and an inclination towards coherence in the brain, which creates links that are not actually there.

**FIRM Editorial:** Just as in psychological research, in risk management there is an almost dogmatic dispute between the use of analytical methods and quantitative risk models, and reliance on intuitive assessment of risks by experts. The Director of the Harding Centre for Risk Competence, Gern Gigerenzer, has criticised logical/rational models that view making judgements and decisions as the result of complex unconscious algorithms. Instead, he is convinced that decisions are predominantly made intuitively based on rules of thumb. Can neuroscience settle this debate or provide new findings?

**Bernd Weber:** That's actually a very interesting question. On the one hand, brain researchers have concluded that analytical and logical methods are useful for simple decisions, while intuition is better for more complex decisions. This may well be true for everyday decisions we have to make. But things are different when it comes to commercial or financial decisions in the face of risk. Here, we would be better not to rely on heuristics or intuition. Intuition is based on the capability to identify patterns in the brain, in other words automatic consideration of "learned probabilities". This requires an environment that is sufficiently regular to be predictable, with numerous opportunities to confirm this regularity by years of experience. Heuristics are a special form of this kind of intuition, based on automatic rules of thumb. These are fast, mainly unconscious and can lead to errors. This is particularly true if the environment changes, which for today's commercial decisions tends to be the rule rather than the exception.

When we have to deal with complex risk decisions, it is therefore essential to utilise appropriate analytical and quantitative risk models. Even then, according to one of the American researchers (Brian Knudson), it is possible that the emotional or intuitive decision will be given priority.

**FIRM Editorial: What added value can modern brain research provide for managing risks in companies, or indeed for all decisions involving risk?**

**Axel Esser:** The deeper we get into this issue, the more one factor emerges as being critical, namely "emotional regulation". Studies in neuro-economics have delivered ample confirmation that emotions influence decisions involving risk or uncertainty, and that decision makers need to learn to regulate these emotions. We use a model in this area that was initially developed in the USA and is known as the Anticipatory Affect Model. The model states that when particular areas of the brain are strongly stimulated – i.e. by increased anticipation caused by emotion – incorrect decisions are made. This either entails taking excessive risks or avoiding risks. In terms of a balanced risk/opportunity analysis, these are both problematic.

**FIRM Editorial: Big data is one of the themes of the moment, including in the context of risk management. Data volumes are getting into terabytes, petabytes and exabytes. How does our brain actually deal with this surfeit of data and information?**

**Bernd Weber:** Our brain has a very limited capacity to process information, particularly in terms of what we refer to as our working memory. It is a real bottleneck situation. For this reason, quality is the key criterion, not quantity. How information has to be prepared to make it accessible and easy to process is a very exciting and important question. There is still an urgent need for research in this area.

**FIRM Editorial: What makes the brain (risk) intelligent?**

**Axel Esser:** Intelligence in this context involves having access to the cognitive and decision making capabilities of the prefrontal cortex. This is only possible when you have control of your emotions. A risk intelligent culture can develop in a company on this basis. It means employees being familiar with the mechanisms to be considered and controlled when making decisions involving risk or uncertainty and consistently utilising this knowledge.

**FIRM Editorial: What do you think would be valuable and exciting research fields in the area of "risk intelligence" and neuro-risk management?**

**Bernd Weber:** One such area – as we discussed already – is the issue of information processing. A second area is the issue of emotional regulation, which is central to qualitatively better decision making, especially, when making decisions involving risk or uncertainty. Methods such as self-control, mindfulness and neuro-feedback are also being selectively studied and there is increasing evidence that they can have a regulating effect.

However, there is still a lack of clear and solid proof for how these emotion regulating interventions impact on risk behaviour. To provide this scientific stringency we in neuroscientific research need to do what has been done for many years in medicine, and conduct randomised and controlled studies on the effectiveness of particular measures. This would provide companies with greater reliability in terms of measures to improve their risk decisions in this area.



**Prof. Dr. Bernd Weber** is one of the directors of the Centre for Economics and Neuroscience at the University of Bonn and has spent many years researching the biological principles of human decision making. He is also the head of the Neuro-economics division at Life&Brain GmbH, which aims to turn scientific findings into usable solutions for companies and policy-makers.



**Axel Esser**, Director of HGS-Concept has been a consultant, trainer and coach in business and elite sport for more than 20 years. He is a director of HGS Concept, an international consultant working with major companies. With academic degrees in business and psychology, he has spent the last five years working with researchers, academics and other experts to develop practical methods for applying findings from neuroscience in companies.