

# Neural Evidence of Uncertainty and Risk Processing Networks in Information System Research: A Multilevel-Mediation Approach

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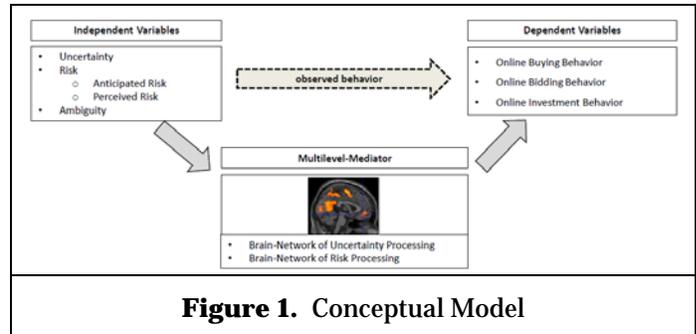
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Many decisions in our everyday life such as decisions in an economic or social context are made under uncertainty. In uncertain situations people often have to make decisions under risk, where the probability of specific outcomes is known. Sometimes they even face ambiguous situations, where the outcome is not clearly predictable. Furthermore decisions under uncertainty in economic contexts, i.e. buying or investment decisions are framed by different determinants, i.e. perceived risk or anticipated risk, personality or situational factors. These determinants suggest that the role of uncertainty is particularly important for decisions in online settings.

One major focus of information systems (IS) research, are decision-making processes and consumer behavior in online settings, where the importance of investigating risk and uncertainty is enhanced (i.e. Pavlou et al. 2007). To understand consumer behavior in online settings, recent studies show for example the necessity to analyze specific decisions under uncertainty (Dimoka et al., 2012) or to investigate the interplay of risk and trust (Gefen and Pavlou, 2010).

In this context a newly emerged scientific field – NeuroIS integrates neuroscientific methods and theories in IS research to better understand how the brain interacts with an IS relevant context (Riedl et al. 2010). Experimental studies within this field currently focus on trust-related processes by integrating decision-making under uncertainty as external factor. In a next step, the analysis of uncertain and – more specifically – the analysis of risky decisions as well as the integration of results and theories from social neuroscience regarding uncertainty and risk processing networks could be of importance for (Neuro)IS. Furthermore the investigation of the brain as a complex network structure is now spotlighted by IS research by the means of integrating advanced neuroscientific methods in NeuroIS research (Hubert et al., 2012).

Therefore we suggest a conceptual model of analyzing decisions under uncertainty and risk in online settings by using an advanced neuroscientific method of multi-level mediation. This methodological approach takes into account the different brain networks that are associated with the processing of uncertainty and risk (see figure 1).



First, starting point of the multi-level mediation is the relevant and evident causal dependence of various levels of uncertainty as well as risk (independent variable) on various outcomes in online settings (dependent variable), i.e. bidding and purchase behavior or investment behavior.

Second, studies of social neuroscience provide evidence of the existence of networks of brain regions for risk and uncertainty processing which determine decision making (multilevel-mediator), i.e. in economic exchange or cooperation games (Mohr et. al, 2010). Those results could build a powerful theoretical basis that may be transferred to IS-related contexts.

Third, the possibility of neuroscientific multilevel-mediation analysis (i.e. described by Wager et al. 2008) allows us to integrate results and theories regarding risk or uncertainty processing networks into existing models and theories of observed behavior (see e.g., Berkman and Falk 2013) to broaden the understanding of decision-making under uncertainty in online settings.

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