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**Neuroscientific models of decision-making
in complex interaction systems:
applications for consumer neuroscience,
organizations, and tool development**

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Abstract

Decision-making has a longstanding tradition of streamlined models, built on statistical approaches, that aim to derive a universal theory of decision via controlled experiments. However, the maximization of experimental control is intrinsically bound to the minimization of environmental complexity. Since human cognition has evolved within naturalistic environments, highly complex by nature, these models face challenges in terms of low generalizability. We propose emotions and social behavior are key aspects of the environmental complexity that formal models have long failed to acknowledge, contributing to propel unrealistic accounts of decision. Building on these premises, the present research aims to deepen the understanding of real-world decision-making and its interplay with contextual factors by investigating the neural correlates of decisions within ecological contexts. A multimethod approach, encompassing neurophysiological (neuroimaging, electrophysiology, and autonomic indexes), behavioral, and psychometric measures, is employed to target multiple levels of analysis, with a view to integrate insights on complexity from diverse perspectives. Three studies are carried out that increasingly try to incorporate environmental complexity. The first study investigated the effect of emotional advertising contents on consumer decision by adopting a basic research experimental protocol where ecologically valid stimuli were introduced. Based on the neurovascular, implicit behavioral, and psychometric measures collected, we found evidence suggesting that emotional appeals may influence consumers' emotional and attentive processes, potentially affecting implicit behavioral tendencies, while leaving purchase decisions unaffected. Building on the evidence that implicit responses may be more sensitive to heightened emotional processing than verbal explicit measures of purchase decision, we concluded that the modulatory interplay between cognition and emotion should caution us from assuming linear relationships between neural markers of emotional processing and verbal measures of decision-making. The second study, qualified as applied research conducted within a more naturalistic environment in the organizational context, investigated the effect of social interaction on creative decision-making by assessing differences in the neurophysiological correlates of the creative decisional process resulting from an individual effort compared to cooperation among team members. The comparison between electroencephalographic,

autonomic, and psychometric measures of a managerial and a non-managerial control sample, suggested that the acquired expertise of the managerial population may have promoted their capacity to take advantage of joint attention, empathy, and mentalization to build a more extensive range of creative options in the decision task, while also handling more effectively emotions and stress evoked by the decisional space. Finally, the third study addressed the evaluation of a newly developed digital tool for the assessment of decision-making abilities in professionals. The tool is meant to fully embrace the complexity of decision-making processes involved in organizational contexts and aims at providing a neuroscience-based measure of decisional efficacy intended to be particularly mindful of ecological validity. Our findings provide initial evidence in favour of the suitability of the investigated tool for applications in organizational environments. Lastly, we discuss how cognitive neuroscience can find a way forward to build more realistic models of decision-making that are rooted in real complex environments and grounded within the biological reality of the decision-maker.

Keywords: naturalistic decision-making; complex environments; neuroeconomics; rationality; emotion; social decision-making.