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Special Issue: Neuroscience in Information Systems Research

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Special Issue: Neuroscience in Information Systems Research

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COGNITIVE NEUROSCIENCE PROVIDES A NEW LENS through which to study issues related to the design, use, and impact of information systems (IS). This new line of research, called *NeuroIS,* allows some behavioral constructs in IS to be investigated at the brain's functional and subconscious levels. Apart from brain imaging, other neurobiological measurements applied in NeuroIS include galvanic skin response, heart rate, eye and facial movement, and hormone release. A major value of NeuroIS is that certain latent variables may be observed directly from body signals to validate and challenge findings

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from previous behavior studies and to improve information technology artifact design in design-oriented studies.

However, designing NeuroIS research and interpreting the findings require neurobiological knowledge, and NeuroIS research is also confined by the capability of neuroscience instruments. Because of its significant difference from existing methodologies in IS, the value and the research quality of NeuroIS papers are sometimes difficult to measure, and additional research is needed to capitalize on the field's potential. Given the potential and the constraints of this new line of research, the main purpose of this Special Issue is to demonstrate the state of the art in NeuroIS research and to provide a platform for communication among authors, reviewers, and readers of NeuroIS papers in the IS community.

The papers published in this Special Issue have gone through three rounds of rigorous review. Initially, the Special Issue received 30 submissions, some of which the authors presented at the 2012 Gmunden Retreat on NeuroIS in order to receive feedback. After an initial screening, 21 papers were sent out for full review by at least one IS scholar, who assessed the relevance of the research issue, and one cognitive neuroscience scholar, who evaluated the rigor of the methodology. In some cases, additional reviewers were consulted to ensure the quality of the papers.

Five guidelines, presented further in this Special Issue by vom Brocke and Liang, were used to evaluate the papers' topical relevance and methodological rigor—that is, their ability to (1) advance IS research, (2) apply the research to standards of neuroscience, (3) justify the choice of a neuroscience strategy of inquiry, (4) map IS concepts to bio-data, and (5) relate the experimental setting to authentic IS situations. In the end, we chose seven papers for this Special Issue, each of which demonstrates the state of the art in NeuroIS research and serves as a keystone for future development of the area. Table 1 shows the IS and neuroscience relevance of the papers.

Shirley Gregor, Aleck C.H. Lin, Tom Gedeon, Amir Riaz, and Dingyun Zhu investigate the role of emotions in IS research and propose and test a 3-emotion system nomological network. The experimental task was online travel service Web sites, which are highly relevant to electronic commerce. Both self-reported and electroencephalography (EEG) data were measured to evaluate the proposed theoretical framework.

Randall K. Minas, Robert F. Potter, Alan R. Dennis, Valerie Bartelt, and Soyoung Bae study information-processing biases in virtual teams—that is, how individual team members process information in virtual settings compared to face-to-face settings. The authors use a combination of three neuroscience instruments—EEG, electrodermal activity (EDA), and facial electromyography (EMG)—to evaluate their hypotheses. Their results show neurological evidence for the confirmation bias in information processing in online team discussions.

René Riedl, Peter N.C. Mohr, Peter H. Kenning, Fred D. Davis, and Hauke R. Heekeren use functional magnetic resonance imaging (fMRI) to study the neurological differences between interacting with humans versus computerized avatars. They find that people are better at predicting the trustworthiness of humans than the trustworthiness of avatars, but that the learning rate concerning trustworthiness is similar whether the interaction is with humans or avatars.

Table 1. Papers in this Special Issue with Reference to Information Systems and Neuroscience

Authors	IS topic	IS constructs/ theories	NS method
Gregor et al.	E-loyalty	Emotion theory	EEG
Minas et al.	Virtual teamwork	Information processing	EEG, EMG, EDA
Riedl et al.	Avatar in human–computer interaction	Trust	fMRI
Li et al.	Mobile commerce	User engagement	EEG
Kuan et al.	Social commerce	Social influence	EEG
Ortiz de Guinea et al.	IS adoption	Behavior beliefs, PU, PEOU	EEG
Vom Brocke and Liang	IS research	NeuroIS, research guidelines	Method analysis

Mengxiang Li, Qiqi Jiang, Chuan-Hoo Tan, and Kwok-Kee Wei study the issue of user-software engagement in mobile gaming using two constructs, game complexity and game familiarity, in their theoretical framework. To test their hypotheses, the authors conduct two studies, one that uses self-reported and EEG data and one that uses qualitative interviews. The experiment that uses self-reported and EEG data reveals that complexity and familiarity both have a significant effect on engagement, contributing to improving game design, a field of growing importance in information systems research.

Kevin K.Y. Kuan, Yingqin Zhong, and Patrick Y.K. Chau investigate the social influence of two types of recommendation information on attitude and purchase intention: the number of people who have bought a deal ("buy" information) and Facebook "like" information. An EEG experiment reveals that positive and negative "buy" information has an asymmetric influence on attitude and intention, whereas "like" information has a positive influence on intention. The presence of "buy" information tends to generate negative emotion, while the presence of "like" information tends to generate positive emotion.

Ana Ortiz de Guinea, Ryad Titah, and Pierre-Majorique Léger investigate the determinants of perceived usefulness (PU) and perceived ease of use (PEOU) and report neurophysiological data to show their nonlinear effects on behavioral beliefs. Two implicit constructs, memory load and distraction, and two explicit constructs, engagement and frustration, are hypothesized as potential determinants. The study's EEG experimental findings indicate that these determinants interact (i.e., have interaction effects). For example, when engagement is high, distraction does not affect PU, but when engagement is low, neurophysiological distraction has a significant negative effect on PU.

Vom Brocke and Liang provide a methodological paper for conducting NeuroIS research. This paper is the result of the collective intelligence of all papers submitted

to this Special Issue and the reviewers who provided comments during the review process. It outlines six phases and five guidelines for conducting a sound NeuroIS study and assessing the quality of NeuroIS research. The paper provides an IS view on NeuroIS studies, assisting researchers, editors, and readers to capitalize on the potential of neuroscience as a strategy of inquiry in IS research.

It was both challenging and rewarding to have the opportunity to access many top-quality research papers and to interact with a group of top-tier scholars in our capacity as guest editors of this Special Issue in NeuroIS. Unfortunately, due to space and time limitations, we had to reject many papers with very good potential. We hope that the publication of this Special Issue will motivate more research in the important field of NeuroIS and that it will help to bring the scope of IS research to a new level.

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