

NeuroIS: Status, Rewarding Research Questions, and Future Directions

Practice Development Workshop

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Abstract

NeuroIS is a field in Information Systems (IS) which makes use of neuroscience and physiological tools and knowledge to better understand the development, adoption, and impact of information and communication technologies. Since its genesis in 2007, NeuroIS has turned out to be among the cutting-edge topics in IS research. Based on an interactive workshop format, participants are provided with an opportunity to exchange their perspectives on the status of the field and discuss rewarding research questions, thereby outlining possible avenues for future research. Thus, this workshop contributes to a discussion and synthesis of what has been achieved so far, and also offers a forum to deliberate on the future.

Keywords: NeuroIS, brain, fMRI, EEG, autonomic nervous system, heart rate, genetics

Introduction and Motivation

Based on a review of N=200 NeuroIS papers, a recent article concluded that “today NeuroIS can be considered an established research field in the IS discipline. However, our review also indicates that further efforts are necessary to advance the field, both from a theoretical and methodological perspective” (Riedl et al., 2020, p. 13). As a direct response to this call that further efforts are critical, this highly interactive Practice Development Workshop (PDW) provides participants with an opportunity to discuss the status of the field and to reflect on rewarding research questions that could, or should, be addressed in future research. Because discussion of a field’s historical research achievements, along with a deliberate reflection on possible avenues for future research, contributes to the formation and stabilization of that field’s identity (Klein & Hirschheim, 2008), this PDW has the goal to promote the prosperous development of NeuroIS. Because NeuroIS has attracted much attention in the IS discipline (see the numerous articles in top journals such as MISQ, ISR, JMIS, and JAIS; for details, please refer to Riedl et al. 2020), but also in other disciplines such as psychology and cognitive neuroscience (as evidence for this statement, see, for example, the interdisciplinary composition of the board and founding members of the *NeuroIS Society*, NeuroIS.org 2018), a workshop on NeuroIS likely draws a strong audience. Importantly, as it has turned out since the genesis of the field, both the more established scholars as well as the younger generations such as PhD students show significant interest in research at the nexus of digital technologies and neurophysiology. Moreover, methodological discussions on neuroscience tools have gained significant relevance in the IS discipline (e.g., Riedl et al., 2014).

Objectives

The objectives of this PDW are twofold. First, we provide a synopsis of NeuroIS research. This synopsis summarizes the major achievements in the field. We describe the research status both from a thematic and a methodological perspective. This synopsis covers both brain research and studies related to autonomic nervous system activity, and also addresses genetics research. Intriguingly, the most recent NeuroIS research found that variation in a specific gene is related to both search duration and the amount of information searched. Thus, as stated by the authors, “the amount of information that people gather and the temporal cost of gathering that information have a strong genetic component, which has implications for internet search strategies, information use, and information systems design” (Browne & Walden, 2020, p. 747). Based on this foundation, second, we offer a forum to reflect on possible future developments of the field.

These two objectives, along with an interactive workshop format, will not only provide a high-level tutorial on NeuroIS for newcomers in the field, but also provides an opportunity for participants to actively contribute to the development of the field.

We discuss the following five major questions:

- (1) Which important IS themes, or IS constructs, have been investigated?
- (2) Which methods and tools have been used?
- (3) Has the extant NeuroIS literature fulfilled the expectations which are documented in early “NeuroIS potential” papers such as Dimoka et al.’s (2007, 2011, 2012) or Riedl et al.’s (2010) articles, as well as Riedl and Léger’s NeuroIS textbook (Riedl & Léger, 2016)?
- (4) What are the critical success factors when establishing a NeuroIS lab?
- (5) What are promising future research areas and methods?

PDW Structure

The PDW is based on three sessions.

Session I: Introduction and input by the workshop organizers

The workshop begins with a brief introduction by the organizers, providing an overview of the workshop goals, the format, and the agenda.

The first speaker, Dr. René Riedl, provides a summary and synthesis of the extant NeuroIS literature and his perceptions on its impact on the IS discipline. This part includes a description of the status regarding the investigated topics and constructs and the used tools. Thus, the first speaker addresses questions (1) and (2). The second speaker, Dr. Fred D. Davis, continues with his perceptions on whether the NeuroIS literature has fulfilled its potential so far. A benchmark for this assessment, among others, are “NeuroIS potential” papers, several of which were published approximately 10 years ago. Thus, the second speaker addresses question (3). The third speaker, Dr. Pierre-Majorique Léger, provides his perspective on the institutionalization of NeuroIS research at a business school. Specifically, he serves as co-director of Tech3Lab at HEC Montréal, one of the worldwide largest NeuroIS labs. His experiences are of particular value as the prosperous future development of the field strongly depends on the development and long-term establishment of neurophysiological measurement infrastructure. The fourth speaker, Dr. Gernot R. Müller-Putz, provides an “outside perspective” on the NeuroIS field. He is among the worldwide leading experts in brain-computer interfacing (BCI) with a focus on electroencephalography (EEG); he has not only passively observed the development of the field, but also actively contributed to it since the field’s genesis in the late 2000s. Yet, he is not an IS scholar and hence is in a good position to provide an “outside perspective”. The third and fourth speaker will address question (4). The four organizers of this workshop form the current board of the NeuroIS Society, the premier academic organization for scientists and professionals working at the nexus of IS and neuroscience research and development. The NeuroIS Society is a non-profit organization and was founded in Vienna (Austria) in 2018. The group of founding members consists of top researchers from various scientific disciplines, including IS and computer science, neuroscience and brain research, and psychology (for further details, please see NeuroIS.org

2018). This first session lays the foundation for the following two sessions, and it addresses questions (1) to (4) as outlined above.

We emphasize that this workshop is not only relevant to established NeuroIS scholars; rather this PDW also provides a forum for a “newcomer audience”. Against this background, NeuroIS methods and tools, among the other topics in the workshop, will be described in a way that is understandable without previous neuroscience knowledge. Moreover, illustrative examples will be provided throughout the workshop.

Session II: Research (idea) presentations and discussion

In this part of the workshop, participants present their research ideas and hence contribute to a discussion of question (5). What follows is that we actively seek to involve the research community to share their thoughts on possible future developments in the NeuroIS field, both thematically and methodologically.

Ahead of the workshop, participants will submit an abstract of their most powerful research (idea) in the area of NeuroIS. These research (idea) documents may not exceed 2 pages of text and should include author name(s) and contact information, as well as a description of: (1) problem statement, (2) research question(s) and/or hypotheses, (3) intended methods/tools, (4) expected contribution, and (5) key references. The organizers of this PDW will select the five most visionary papers for presentation in this session. Both the organizers, as well as the general audience, will provide their perspectives and feedback on the research (ideas). Please note that it is possible to participate in the PDW without submitting a research (idea) document. Rather, all participants are invited to actively comment on the presented papers, thus promoting a lively discussion.

Each contributor whose paper is accepted will have the opportunity to present and discuss his or her research (idea). In preparation, all PDW participants will receive a copy of the five abstracts before the PDW. The organizers will encourage participants to ask questions to the presenter and provide feedback. Based on the presentations in Session I, even participants without any pre-existing NeuroIS knowledge will be able to engage in constructive discussion about current and future research opportunities.

Session III: Summary of the workshop

In this last session, the organizers will sum up the insights gained during the workshop. The organizers will then lead a joint conversation reflecting on the key takeaways from the PDW. Given that this workshop will be held in a virtual format, we will follow the common guidelines for hosting virtual events. All presenters will test the system and their connection before the workshop, and we will upload presentations in advance for participants.

Agenda

The following table outlines the detailed agenda of the PDW on December 13, 2020 (Central European Time).

Time Duration	Presenters	Activity/Topic
12:00–12:05	René Riedl, Fred D. Davis, Pierre-Majorique Léger, Gernot R. Müller-Putz	Welcome and introduction by the organizers (5 min)
12:05–12:45	René Riedl, Fred D. Davis, Pierre-Majorique Léger, Gernot R. Müller-Putz	Session I input (4 x 10 min)
12:45–13:10	All Participants (moderated by organizers)	Discussion of Session I input
13:10–13:50	Presenter 1, Presenter 2, Presenter 3, Presenter 4, Presenter 5 (selected by the organizers before the workshop based on evaluation of abstracts)	Session II input (5 x 8 min)

13:50–14:30	All Participants (moderated by organizers)	Discussion of Session II input (approximately 8 min discussion for each paper)
14:30–15:00	All Participants (moderated by organizers)	Session III reflection on key takeaways, summary and farewell by the organizers

Bios of Organizers

Fred D. Davis is Professor and Stevenson Chair in Information Technology at Texas Tech University Rawls College of Business. He received his Ph.D. from MIT, and his research interests include user acceptance of information technology, technology supported decision making, skill acquisition, and NeuroIS. He has been a co-organizer of the NeuroIS Retreat since 2009. His research has been published in *MIS Quarterly*, *Information Systems Research*, *Management Science*, *Journal of Applied Psychology*, *Journal of MIS*, *Journal of the Association for Information Systems*, *Information Systems Journal*, *Computers in Human Behavior*, and others. Dr. Davis is a board member of the NeuroIS Society and co-conference chair of the NeuroIS Retreat.

Pierre-Majorique Léger is a Full Professor of Information Systems at HEC Montréal. He holds a PhD in industrial engineering from École Polytechnique de Montréal and has done post-doctoral studies in information technologies at HEC Montréal and NYU Stern. He is also invited professor at Henry B. Tippie College of Business (University of Iowa) and Tuck School of Business (Dartmouth University). He is the director of the ERPsim Lab and co-director of Tech3Lab. He has published articles in the *Journal of the Association for Information Systems*, *Journal of Management of Information Systems*, *Information & Management*, *Journal of Neural Engineering*, *Frontiers in Human Neuroscience*, *Computers in Human Behavior*, *PLoS ONE*, and others. Moreover, he is a co-author of the book “Fundamentals of NeuroIS: Information Systems and the Brain”. Dr. Léger is a board member of the NeuroIS Society and program co-chair of the NeuroIS Retreat.

Gernot R. Müller-Putz is a Full Professor of Semantic Data Analysis and head of the Institute of Neural Engineering at the Graz BCI-Lab at Graz University of Technology. He received his PhD in electrical engineering and his habilitation in Medical Informatics. He has published articles in the *Journal of Neuroscience*, *NeuroImage*, *Journal of Neural Engineering*, *IEEE Transactions on Biomedical Engineering*, *Scientific Data*, *Scientific Reports*, *PLoS ONE* and many more. He is Speciality Editor in Chief of *Frontiers in Human Neuroscience: Brain-Computer Interfaces*. He is in the Board of Directors of the International BCI Society. Dr. Gernot Müller-Putz is co-director of the NeuroIS Society.

René Riedl is a Professor for Digital Business and Innovation at the University of Applied Sciences Upper Austria and an Associate Professor for Business Informatics at the University of Linz. He worked as guest researcher and guest professor in the USA, Canada, and Germany. He has published in various academic journals, including *BMC Neurology*, *Business & Information Systems Engineering*, *Journal of Information Technology*, *Journal of Management Information Systems*, *Journal of Neuroscience*, *Psychology*, and *Economics*, *Journal of the Association for Information Systems*, *MIS Quarterly*, and *PLoS ONE*. Moreover, he is a co-author of the book “Fundamentals of NeuroIS: Information Systems and the Brain”. Dr. Riedl is the scientific director of the NeuroIS Society and co-conference chair of the NeuroIS Retreat.

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