

Complexity and Information Systems Research in the Emerging Digital World

Special Issue Editors

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Motivation and Overview

Global digital infrastructures, social media, the Internet of Things, digital business platforms, and other digitally enabled networks and ecosystems foster hyper-connections and mutual dependencies among human actors, organizations, processes, and things. Social and technical components become intertwined into complex sociotechnical ecosystems that affect human agencies and experiences in all dimensions including market and economic behaviors, political processes, entertainment, and environmental sustainability. Complex sociotechnical ecosystems operate far from equilibrium and exhibit nonlinearity, self-organization, emergence, and coevolution. Individuals and organizations within such complex sociotechnical ecosystems turn to digital technology to manage problems resulting from nonequilibrium dynamics. Although intelligent computational algorithms powered by big data and analytics have great potential to augment human agencies, predicting the surprising outcomes of complex ecosystems could be infeasible unless the tools could accommodate nonlinear, dynamically changing interactions in the complex ecosystem. This is because every attempt a stakeholder makes to address a wicked problem triggers intelligent responses from other stakeholders in the ecosystem. These dynamics present fundamental uncertainties that do not lend themselves to the traditional, reductionist information-processing paradigm. Thus, in digital worlds, complexity and solutions based on digital technology present new phenomena that offer new opportunities and challenges for information systems (IS) researchers and practitioners. Furthermore, methodological developments such as agent-based simulation, high-dimensional statistical techniques, visualization tools, data-mining tools, and large-scale dynamic network modeling, together with the increasing availability of user- and machine-generated trace data enable scholars to explore how sociotechnical, complex ecosystems emerge and evolve in digital worlds.

The purpose of this special issue is to foster the development of new IS theories on the causes, dynamics, and consequences of complexity in sociotechnical systems in the digital age. Research on complexity has spanned a broad range of disciplines and led to the emergence of a *complexity science* that provides new concepts and frameworks for examining order creation in complex adaptive systems. We encourage submissions that go beyond the application and replication of received principles of complexity science in the context of the digital world. We also invite submissions to learn from the unique characteristics of the emerging digital world to develop new IS theories and make new contributions to complexity science.

Scope and Focus of the Special Issue

We are interested in a broad set of complex, digitally enabled social, technical, economic, and psychological phenomena. There are many different definitions of complexity and complexity science.¹ While we recognize that people might have different interpretations on what complex science is, we believe that some combinations of complexity concepts are necessary in defining complex science. Interested authors must refer to at least some complexity concepts² and previous studies both in management and IS that have used complexity. We ask authors clearly articulate how their work includes one or more of these ingredients in their study. At the same time, we are open to new concepts and novel forms of complex sciences. In such cases, the authors must rigorously discuss the their use of *complexity* in their study.

We welcome submissions from all forms of IS research, including organizational and behavioral IS, economics of IS, qualitative and critical studies of IS and design science. The special issue is open to all types of papers: philosophical, theoretical, methodological, empirical, etc. We welcome any IS research that generates new knowledge on causes, dynamics, and consequences of complex sociotechnical systems and enables individuals, organizations, and societies to better address the challenges and opportunities posed by complexity. Possible topics include, but are not limited to the following:

- Explaining how the digitization of products, processes, relationships, etc., induces complexity
- Explaining how increasing complexity changes behavioral dynamics in complex ecosystems, and how information and IS can be used to cope with the new managerial challenges posed by increasing digital complexity
- Empirically examining the role human agents, data, devices, infrastructure, and relationships and their interactions in fast-changing, complex sociotechnical systems (e.g., emergence, self-organization, skew distributions, and coevolution behaviors in crises situations; surprising system glitches and crashes; system vulnerabilities and risks; hypercompetitive dynamics in digital ecosystems; and social movements)
- Exploring the relationship between innovations and the complexity level of digitally enabled products and platforms, and their performance
- Building evolutionary ontology, theories, and methods that allow investigation of emergence dynamics from a multi-level perspective
- Analyzing temporal and spatial nonlinear dynamics where digital technologies can radically affect the creation and re-creation of order, formation of fractals, and build-up of tension, and lead to phase transitions and dissipation of structures, or where digital technologies could be used as control points and circuit breakers to prevent socio-technical and economic systems from approaching the edge of discontinuities
- Investigating the changing nature of human agency and extending the existing discussion on sociomateriality, emphasizing the hybrid and distributed nature of human agency as human actors constantly interact with intelligent materials, facing computational and algorithmic sociotechnical worlds
- Examining how the increasing complexity of a digitally enabled, sociotechnical system affects traditional institutions, regulations, and social and cultural norms
- Applying complexity science to big, digitally traced data to generate novel empirical discoveries
- Developing new methods that are more appropriate for the study of IS phenomena in complex adaptive systems

Review Process

The guest editors will screen submissions for fit. The review process will aim for a 3-month review cycle and will require authors to adhere to a 3-month revision cycle. Papers that miss the required revision cycle or that are not deemed acceptable after two revisions will be removed from consideration. The guest editors and some members of the Special Issue Editorial Board will be attending two complexity and IS themed events in the summer of 2015. Prospective authors are encouraged to meet them at these events to discuss ideas and receive early reactions:

- Third Annual Research Symposium on Complexity & IT, July 6–7, 2015, Montpellier Business School, Montpellier, France.

¹See a graph of [complexity science](#) on Wikipedia.

²For a list of key complexity concepts and short definitions, [click here](#).

- Professional Development Workshop on “Complexity in Information Systems Research & Digital Business” at the Annual Meeting of the Academy of Management, August 7–11, 2015 in Vancouver, British Columbia, Canada.

In addition, a workshop for prospective authors will be held on Saturday, December 12, or Sunday, December 13, at the International Conference on Information Systems (Fort Worth, TX). Check the *MIS Quarterly* website for additional information on this workshop.

Deadlines

Submission due date:	June 16, 2016
First round reviews due:	September 15, 2016
Workshop:	For authors who are invited to submit a revision – January 15, 2017
Revisions due:	March 15, 2017
Second round decisions:	June 15, 2017
Revisions due:	September 15, 2017
Final editorial decision:	December 15, 2017

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