

ENERGY INFORMATICS: DESIGNING A DISCIPLINE (AND POSSIBLE LESSONS FOR THE IS COMMUNITY)

Panel Statement

Jan vom Brocke

Universität Liechtenstein
Institute of Information Systems
Fürst-Franz-Josef-Strasse
9490 Vaduz
Liechtenstein
jan.vom.brocke@uni.li

Gilbert Fridgen

University of Bayreuth
FIM Research Center
Faculty of Law, Business
Administration and Economics
D-95447 Bayreuth
Germany
gilbert.fridgen@uni-bayreuth.de

Helen Hasan

University of Wollongong
Faculty of Commerce
School of Economics
Wollongong NSW 2522
Australia
hasan@uow.edu.au

Wolfgang Ketter

Erasmus University Rotterdam
Rotterdam School of Management
Burgemeester Oudlaan 50
Rotterdam 3062 PA
Netherlands
wketter@rsm.nl

Richard T. Watson

University of Georgia
Department of MIS
Terry College of Business
Athens, GA 30602-6273
USA
rwatson@terry.uga.edu

Abstract

If we were to design a new scientific field with a clean slate perspective, what might be the outcome? The panelists have been working in various ways for the last few years on establishing a new domain of inquiry, Energy Informatics. The panel will address key questions that they think should be considered by those designing a new discipline. Specifically, they will address the following critical questions: (1) How do you enhance research community effectiveness? (2) How do you enhance research community efficiency? (3) What are the central activities and key resources? (4) How do you assess an effective contribution? These questions follow directly from the panel's contention that a new field should make every endeavor to avoid accepting legacy systems as an appropriate infrastructure for conducting research in today's world.

Keywords: Research effectiveness, research efficiency, Energy Informatics

Introduction

New science and new structures

New ventures are an opportunity to rethink established practices and apply new infrastructures and information systems to achieve more effectively the goals of the enterprise. While new businesses might take a green field approach as their starting point, new scientific endeavors seem to accept established practices and proceed to reapply the old structures (e.g., journals and conferences) to solve a new set of problems. If we were to design a new scientific field with a clean slate perspective, what might be the outcome? In particular, how might we use Information Systems to make this new field more effective and efficient?

For those operating at the interstices of information systems and sustainability, legacy systems are usually inadequate for addressing current problems. Legacy systems are based on the canons and conditions of a bygone era, and their fit to current problems typically decays with time. This erosion of relevance is often most evident in periods of technology turbulence and shifting dominant logics, such as the move from service to sustainability (Watson, Lind, & Haraldson, 2012). The IS research infrastructure, for example, has essentially remained unchanged over the last several decades. While many IS journals appear in electronic format, they can be viewed as conversions of print thinking because the knowledge within an article is not encoded (e.g., tagging propositions). Furthermore, journal cycle times are still measured in years and might even be lengthening. Most importantly, the IS academic focus on theory building does not recognize that climate change is a problem that needs current solutions. The IS legacy infrastructure appears ill suited to contributing to solving the most pressing issue of our time. Thus, there is a danger that those who rely on an existing academic infrastructure to address a distinctively different class of problems will be less effective and efficient.

The panelists have been working in various ways for the last few years on establishing a new domain of inquiry, Energy Informatics, which was initially defined as "... analyzing, designing, and implementing systems to increase the efficiency of energy demand and supply systems" (Watson, Boudreau, & Chen, 2010). Bioinformatics, a parallel to consider, is defined in the Oxford English Dictionary as, "The branch of science concerned with information and information flow in biological systems, esp. the use of computational methods in genetics and genomics." Following this framing, we have recast Energy Informatics as, *the branch of science concerned with information and information flows in energy systems, especially the use of computational methods to increase the efficiency of energy demand and supply systems*. Taking this approach can set Energy Informatics on a path to develop in a green field mode without being constrained by being labeled as a subfield of an existing, broader domain, such as Information Systems.

Critical questions

The panel will address a series of key questions that must be considered in the process of designing a new discipline. The major questions to be addressed by the panelists are:

1. How do you enhance research community effectiveness?

Starting with the assumption that a science must ultimately serve humanity, we need to decide what social value a science should create as this is how you can assess its effectiveness. For example, medical science produces value by diagnosing diseases, establishing their causes, and developing treatments (e.g., the search for a malaria vaccine). Thus, measures of the success of a country's medical system are life expectancy and infant mortality rate. At the global level, these are measures of the value of medical science.

What societal value should Energy Informatics create and what are possible measurable societal outcomes?

Reiterating the societal value creation perspective, a research community is effective when it answers questions that vex society. There is often, however, little connection between what matters to society and what some academics investigate. Given that Energy Informatics is intrinsically an applied science

focused on a well-defined problem, the pursuit of research effectiveness (i.e., solving the right problems) requires deployment of mechanisms that motivate researchers to address relevant societal problems.

What are potential mechanisms to increase Energy Informatics community effectiveness and how can we design information systems to support them?

2. How do you enhance research community efficiency?

Research is a cumulative process, and scholars need efficient mechanisms for discovering what is known or has been created to build upon prior knowledge when tackling new problems. The issue is that much of what we know is buried within the text of journal articles rather than codified for machine searching. Turning print into pdf, a common adaptation to the Internet, preserves a legacy system rather than reimagining it for an order of magnitude gain in community efficiency. Consequently, the design of a new knowledge distribution system should avoid anchoring on the current journal model and start with reviewing the design options available with new communication and semantic technologies. Remember, the journal system was constructed around the dissemination and semantic technologies of its day, a postal system and words on paper.

What are potential mechanisms to increase Energy Informatics community efficiency and how can we design information systems to support them?

3. What are the central activities and key resources?

A science has a set of key skills and resources that participants deploy to answer the central problem that the science addresses. The skill set can differ between practice and research, and thus it is important to identify separately the skills it should teach to future practitioners (e.g., undergraduate students) and future researchers (e.g., doctoral students). At this stage, we have a few established courses and research programs in Energy Informatics, and the panel will use these as a launching point for answering the following questions.

What is the content of an Energy Informatics course for undergraduate or masters students?

What skills do Energy Informatics researchers need?

A science is often dependent on specific resources to fulfill its goals (e.g., chemistry needs labs). A new field should identify its critical resources and make plans to acquire them.

What particular resources do Energy Informatics practitioners and researchers need?

4. How do you assess an effective contribution?

Academics gain recognition in several ways, including publication in reputable peer-reviewed journals, acceptance of papers at prestige conferences, grants, and citation counts. These often become counting rather than evaluation mechanisms. Peer-review is at the heart of the publication and grant processes, but some assess it to be a somewhat arbitrary system masquerading as highly effective. Many scholars would likely agree with the following statement by an editor of *Lancet* (Horton, 2000):

The mistake, of course, is to have thought that peer review was any more than a crude means of discovering the acceptability—not the validity—of a new finding. Editors and scientists alike insist on the pivotal importance of peer review. We portray peer review to the public as a quasi-sacred process that helps to make science our most objective truth teller. But we know that the system of peer review is biased, unjust, unaccountable, incomplete, easily fixed, often insulting, usually ignorant, occasionally foolish, and frequently wrong.

Even if we had a perfect peer review process, the current system falls short on recognizing the contributions of some of the various players (e.g., reviewers, editors) who are critical to its operation. A particularly strong reviewer whose work results in papers that become highly cited receives no reward for exceptional work or value recognition. Furthermore, to make a new field attractive, it must have bridging mechanisms for rewarding scholars operating within legacy systems.

How do we create an effective and reliable system for evaluating scientific work that also ensures that participants in the creation and evaluation process are appropriately rewarded?

Controversial Issues and Panelists' Positions

The panel's contention is that the current model for research in most fields, including IS, is neither effective nor efficient because it is fundamentally based on the technology of the last century. A new field should make every endeavor to avoid accepting that current legacy systems are an appropriate infrastructure for conducting research in today's world.

The panel will contend that by taking a green field approach it can design an infrastructure that will result in a research community that is both effective and efficient. The panelists will aver that an effective applied science has mechanisms that ensure that the problems addressed by the discipline are those that are socially relevant. The panel will elaborate on its concept of effectiveness and discuss means for promoting it. In terms of efficiency, the panel will also define and present the case for efficiency and identify approaches to raising the productivity of those scholars who elect to join the Energy Informatics community.

The panel's stance is provocative because it implicitly states that the IS scholarly community has minimally adapted, ironically, to changes in information technology to create a more productive infrastructure. The panel, as well as proposing a strategy for Energy Informatics scholars to pursue, will thus also challenge the IS community to rethink the fundamental precepts of how it shares and distributes information and reacts, or why it does not react, to changing social needs for information systems knowledge and new channels for distributing such knowledge.

Panel Structure and Audience Participation

Upon this panel's acceptance, the panelists started collecting ideas on how a new scholarly community might conduct its affairs. Thus, we posted each of the critical questions to the AIS list and sought comments, ideas, and discussion. We also posed a similar set of questions to industry leaders concerned with energy efficiency, sustainability, or Green IS. Our industry commentators were drawn from our connections with swisscleantech, the Advanced Practices Council of the Society for Information Management, Siemens, SAP, BMW, Daimler, Walmart, and regional energy utilities.

We synthesized the contributed ideas plus our own in preparing for the panel. We also invited 3-4 of those who provided particularly novel and practical ideas to give a short pitch during the panel session. Our intention is to create an engaged audience both prior to and during the panel by provoking the IS and industry communities to think about alternative and better ways of organizing the infrastructure and processes for research by thinking about how a new field should organize itself to address the four critical goals discussed earlier.

Richard Watson will moderate the panel and the pre-conference electronic discussion.

Biographies

Jan vom Brocke is the Hilti Chair of Business Process Management, Director of the Institute of Information Systems at the University of Liechtenstein and President of the Liechtenstein Chapter of the AIS. Together with his colleagues Stefan Seidel and Jan Recker, he investigates on how organizations can establish sustainability practices in their operations. Jan's research on Green IS has been published and is currently appearing e.g. in *MIS Quarterly*, the *Communications of the AIS* and *Business & Information Systems Engineering*. Jan is co-editor of the book "Green Business Process Management. Towards the Sustainable Enterprise" and has co-organized workshops and panels on this topic, e. g. at the *8th International BPM Conference 2009* in Hoboken, at the *23rd CAiSE 2011* in London and at *ICIS 2012* in Orlando. Jan serves on the advisory board of AIS SIGGreen and as academic counselor to swisscleantech, a trade association for sustainable economy. In addition, he is an advisor on Green IS to the Liechtenstein Government and a delegate on ICT research to the European Commission. Since 2012 he has been Vice-President for Research at his University and co-leader of a university-wide sustainability project, called UniGO! (University Green Organisation!).

Gilbert Fridgen is Professor for Business, Information Systems Engineering and Sustainable IT Management at the University of Bayreuth and head of corresponding research groups at the Fraunhofer Project Group Business and Information Systems Engineering and the Research Center Finance & Information Management. Before that, he served as Deputy Professor for Business Engineering at the

Institute of Materials Resource Management (University of Augsburg). He is track chair for Green Information Systems at the European Conference on Information Systems 2013 and served in editorial roles for various conferences and special issues on the topic. His research relevant for the panel is on the management of energetic and non-energetic resources, smart grids, and on different research approaches within the IS community. His work is published in various conference proceedings (International/European/American Conferences on Information Systems) and journals (e.g., *Journal of the Association for Information Systems*, *Journal of Decision Systems*, *Journal of Strategic Information Systems*, *Zeitschrift für Betriebswirtschaftliche Forschung*), and awarded the Bavarian Cultural Award 2010. He gained practical experience as head of applied research projects with firms such as A.T. Kearney, Fujitsu Technology Solutions, Hilti, and McKinsey.

Helen Hasan is Associate Professor of Information Systems in the Faculty of Business at the University of Wollongong, Australia. She has published extensively in IS and related areas of Human Computer Interaction, Serious Games, Group Decision Support Systems, Knowledge Management, Green IS and Sensible Organisation using frameworks of Complex Activity. Helen manages an activity-based usability laboratory at the university and co-directs both the THEORI Research Centre and the Social Innovation Network. She has led several government-funded, cross institutional research projects and conducts industry-based consulting. She leads local, national and international special interest groups on Green IS. In 2012, Helen received the Vice-Chancellor's Award for Research Student Supervisor of the year.

Wolf Ketter is director of the Erasmus Center for Future Energy Business. The center is focused on enabling the robust, intelligent, efficient, and sustainable energy networks of the future. Wolf is also the founder and chair of the Erasmus Forum for Future Energy Business, an annual forum held in Rotterdam. He is the general chair of the Trading Agent Competition (TAC) since 2010. He is leading Power TAC, a new TAC competition on energy retail markets; the first competition will be held at the AAAI Conference in July 2013 in Bellevue. Since 2011, Wolf also serves as the chair of the IEEE Task Force on Energy Markets. Wolf is Professor of Information Systems at the Department of Decision and Information Sciences at the Rotterdam School of Management of the Erasmus University. He received his Ph.D. in Computer Science from the University of Minnesota in 2007. He was the program co-chair of the International Conference of Electronic Commerce (ICEC) 2011. His research has been published in various information systems, and computer science journals such as *AI Magazine*, *Decision Support Systems*, *Electronic Commerce Research and Applications*, *Energy Economics*, *Energy Policy*, *European Journal of Information Systems*, *OR/MS Today*, *Information Systems Research*, and *International Journal of Electronic Commerce*. He serves on the editorial board of *MIS Quarterly*. In December 2012 he won the prestigious INFORMS Design Science Award.

Richard Watson, with his colleague Marie-Claude Boudreau, has been working on Green IS since early 2007. He co-authored the first academic paper, case study, and book on Energy Informatics. He actively cooperates with IS and engineering scholars in developing Energy Informatics as a solution science that will reduce energy consumption. Professor Watson is the J. Rex Fuqua Distinguished Chair for Internet Strategy in the Terry College of Business at the University of Georgia. He has published over 150 journal articles, written books on electronic commerce, data management, and energy informatics. He has given invited presentations in more than 30 countries. He is a former President of the Association for Information Systems, a visiting professor at the Viktoria Institute in Sweden, the International co-coordinator for the PhD in Information Systems at Addis Ababa University in Ethiopia, co-founder and co-leader of the Global Text Project, and the Research Director for the Advanced Practices Council of the Society of Information Management, an exclusive forum for senior IS executives. In 2011, he received the Association for Information Systems' LEO award, which is given for exceptional lifetime achievement in Information Systems.

References

Horton, R. (2000). Genetically modified food: consternation, confusion, and crack-up". *Medical Journal of Australia*, 172(4), 148–149.

- Watson, R. T., Boudreau, M.-C., & Chen, A. J. W. (2010). Information Systems and environmentally sustainable development: Energy Informatics and new directions for the IS community. *MIS Quarterly*, 34(1), 23-38.
- Watson, R. T., Lind, M., & Haraldson, S. (2012). *The emergence of sustainability as the new dominant logic: Implications for Information Systems*. Paper presented at the International Conference on Information Systems, Orlando, FL.