

Information Systems Research: Analytics for a Sustainable Society (Advanced Master)

Prof. Dr. Wolfgang Ketter
Summer 2020

OVERVIEW

This course is intended to provide the participant with a broad-based exposure to research that occurs in the Information Systems Institute at the University of Cologne, but in particular research on Design Science applied to Sustainability. In addition, the student can expect to be exposed to the work of prior graduates of our program, as well as students and faculty at the institute. Taken together, this course will give you a broad exposure of the kind of research that is possible to conduct in our Master and Ph.D. program.

Four separate referent areas of theory and methods have traditionally been represented in the doctoral program in Information Systems:

- Decision-making and cognitive science theories and methods for research
- Organizational and behavioral theories and methods for research
- Technical, computer science and design science theories and methods for research
- Management science and economics theories and methods for research

The overall design of this class consists of a number of different elements:

- Inclusion of the faculty inside and outside the institute, so that students can begin to know them and become acquainted with their research and teaching interests.
- A relatively large reading list, to ensure that students have the opportunity to develop a broad perspective on the field.
- Five required kinds of deliverables by seminar participants
 - ✓ an essay about a particular topic in information systems research
 - ✓ two oral presentations on research papers
 - ✓ discussant on two research papers and leadership of/participation in discussions
- An encouraging, welcoming and supportive atmosphere and discussion venue for new entrants into the field of Information Systems
- No exams to worry about, but plenty of pressure to keep up with the readings; the need to be well prepared for the class discussions and presentations; and easy access to all of the faculty who participate in the course

GOALS

Next, a brief word about the goals of this course:

- to welcome you as new participants in the fields of Information Systems research;
- to challenge you to develop new ways of thinking, especially in terms of how you approach thinking about, critiquing and later constructing research papers;
- to acquaint you with the scholarship of a world class research faculty in these areas;
- to introduce you to some of the leading issues, theories and methodologies that characterize research in this discipline;
- to encourage you to begin to develop as researchers and scholars, and to make you aware of some of the things that you'll need to do in the future to be successful in your own right.

REMOTE TEACHING AND SUPERVISION IN LIGHT OF COVID-19

Over the course of the semester we will adhere strictly to the University guidelines pertaining to the novel COVID-19 pandemic. Until further notice we will conduct seminar sessions remotely via Zoom (see [here](#)). Remote sessions will take place during the originally announced times (as per KLIPS). We will publish log in details well in advance. Your deliverables (see below) – except for the seminar essay – are expected to take place in the online sessions as well. Please ensure that your Internet connection is stable, generally in all (regular) sessions but especially when you have a specific role.

I look forward to working with you, and to having your input on how to make this experience valuable and fun. Best wishes for a productive experience in this course, and for success in the Master/Ph.D. program and beyond.

To the student: Please contact me when you think we can assist your learning, or when you have problems balancing your workload and you think you need some tips on how to be the most effective. Also, if you need guidance to identify people who share a research interest that you have that I don't cover, feel free to ask. The University of Cologne is a large organization with a wealth of resources located across many different academic units. We can explore them together.

Here's our contact information:

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CLASS TIME, DAY AND LOCATION

Time and Day: Tuesday. 14:00 - 17:00 (except, Monday, May 25th)

Location: EWI at Vogelsangerstraße 321a (conference room 1)

GRADING POLICY

Grading in this course is on three main components:

- **Two in-Class Presentations and Contribution to Discussion (40%):** Please be prepared to give a presentation and critique about an article which is assigned to you or which you select for presentation. Students often ask: PowerPoint slides? Notes for my colleagues? Speaking notes on the back of a napkin? What should I bring? This seminar is your opportunity to try out a number of different ways of communicating about research. They all work for different people to different extents. So don't use just one approach! Use your opportunity in this seminar to develop your own tastes and personal style. The instructors will provide input on how you can make your presentations more valuable for other people, once we see you in action. Generally, you need to show mastery of the paper that goes beyond a pure summary! Are there things (e.g. approach, analysis, and discussion) that you would have done differently? What's missing in the paper? Which research

would you do next based on this paper (i.e. show your future work ideas; potentially also applied to your own research)?

In terms of discussion in class, I expect you to participate in the discussion and critique even those papers that you do not present. Expect to be asked questions, even when you have not presented. (There is no physical deliverable for this portion of your class grade. You just need to be participating to the fullest extent of your ability. Assessment will be subjective. I want to see you “moving into the field.” If I don’t see you trying hard enough, I will let you know.)

- **Two in-Class Role as Discussant (30%):** You will need to read the required paper of the day in detail and come up with detailed questions for the presenter.
- **One Written Seminar Essay (30%):** I would like you to prepare and hand-in a concise seminar paper. We will circulate a detailed list of potential topics in the form of research questions to choose from in the first weeks of the course. In this work I would expect you to (1) give a concise introduction into the topic and state why it is relevant, (2) describe the state-of-the-literature in this field, (3) develop a sound but concise line of arguments to answer the research question and (4) give an outlook of potential further research to be done in your area. As I want you to learn how to structure your thoughts and be as concise as possible I expect you to limit your essay to 5 pages (single-line spacing, 11pt, excl. references and appendices). This will challenge you to really think through what you want to communicate.

ELECTRONIC SOURCES FOR READING MATERIALS IN THE COURSE

Most people who do IS research today rely extensively upon electronic sources for journal articles, conference proceedings paper, and working papers. Many of the articles that we will use in this course are available this way. All you need to do is to figure out how to log into bib services with your password via the www.ub.uni-koeln.de web site. To learn about how to do this, you should ask for help from more senior Ph.D. students in the IS institute or inquire about access with the university library.

SELF-ORGANIZED PRESENTATIONS

After the first session, students who are enrolled in this seminar are asked to manage the assignment of primary presenters of the papers among themselves. If other students register for the course beyond those who are present the first week, we will make some adjustments in the assignments of students in the later weeks of the course to accommodate them.

ISRASS(AM) – Tentative topics and schedule (2020)

Date	Topics/Readings	Instructor
Apr 14	<p><i>Information Systems Research, Design Science, and Paper Reviews</i></p> <ul style="list-style-type: none"> ➤ Hevner, A., March, S. T., Park, J., and Ram, S. “Design Science Research in Information Systems,” MIS Quarterly (28:1) March 2004, pp. 75-105. (EBSCO/AIS) ➤ Arun Rai, et al., Diversity of Design Science Research, MISQ 2017 ➤ Wolfgang Ketter, John Collins, Ori Marom, and Maytal Saar-Tsechansky. Information Systems for a Sustainable Smart Electricity Grid: Emerging Challenges and Opportunities. In ACM Transactions on Management Information Systems, 9(3):–, 2018. ➤ Wei Qi and Zuo-Jun Max Shen. A Smart-City Scope of Operations Management, Productions and Operations Management, 2018 	Ketter
Apr 28	<p><i>Machine Learning I:</i></p> <ul style="list-style-type: none"> ➤ Yixin Lu, Alok Gupta, Wolfgang Ketter, and Eric van Heck. Exploring Bidder Heterogeneity in Multi-Channel Sequential B2B Auctions. In Management Information Systems Quarterly, 40(3):645–662, September 2016. (P:, D:) ➤ Markus Peters, Wolfgang Ketter, Maytal Saar-Tsechansky, and John Collins. Autonomous data-driven decision-making in Smart Electricity Markets. In Machine Learning, 92(1):5-39, 2013. (P:, D:) ➤ Wolfgang Ketter, John Collins, Maria Gini, Alok Gupta, and Paul Schrater. Real-time Tactical and Strategic Sales Management for Intelligent Trading Agents Guided by Economic Regimes. In Information Systems Research, 23(4):1263–1283, 2012. (P:, D:) 	Ketter
May 12	<p><i>Machine Learning II: Smart Charging/Markets and Platforms, and Competitive Benchmarking</i></p> <ul style="list-style-type: none"> ➤ Konstantina Valogianni, Wolfgang Ketter, John Collins, and Dmitry Zhdanov. Sustainable Electric Vehicle Charging using Adaptive Pricing. (P:, D:) ➤ Nicolò Daina, Aruna Sivakumar, John W. Polak. Electric vehicle charging choices: Modelling and implications for smart charging services. In Transportation Research Part C (81):36-56. (P:, D:) ➤ Wolfgang Ketter, Markus Peters, John Collins, and Alok Gupta. Competitive Benchmarking: An IS Research Approach to Address Wicked Problems with Big Data and Analytics. In Management Information Systems Quarterly, 40(4):1057–1080, December 2016. (P:, D:) <p>Read, but no presentation:</p> <ul style="list-style-type: none"> ➤ Martin Bichler, Alok Gupta, and Wolfgang Ketter. Designing Smart Markets. In Information Systems Research, 20th Anniversary Special Issue, 21:688–699, 2010. 	Ketter/ Daina
May 25	<p><i>Energy Storage</i></p> <ul style="list-style-type: none"> ➤ F. Kazhamiaka, Y. Ghiassi-Farokhfal, S. Keshav, and C. Rosenberg, Comparison of Different Approaches for Solar PV and Storage Sizing, Accepted for publication in IEEE Transactions on Sustainable 	Ketter/ Kevhav S.

	<p>Computing, September 2019. (P:, D:)</p> <ul style="list-style-type: none"> ➤ F. Kazhamiaka, C. Rosenberg, and S. Keshav, Tractable Lithium-Ion Storage Models for Optimizing Energy Systems, <i>Energy Informatics</i>, 2:1, 2019. (P:, D:) ➤ F. Kazhamiaka, S. Keshav, C. Rosenberg, and K.-H. Pettinger, Simple Spec-Based Modelling of Lithium-Ion Batteries, <i>IEEE Transactions on Energy Conversion</i>, Vol 33, No. 4, December 2018. (P:, D:) 	
Jun 9	<p><i>Sustainability I</i></p> <ul style="list-style-type: none"> ➤ Loeser, F., Recker, J., vom Brocke, J., Molla, A., and Zarnekow, R. "How IT Executives Create Organizational Benefits by Translating Environmental Strategies into Green IS Initiatives," <i>Information Systems Journal</i> (27:4) 2017, pp 503-553. (P:, D:) ➤ Seidel, S., Chandra Kruse, L., Székely, N., Gau, M., and Stieger, D. 2018. "Design Principles for Sensemaking Support Systems in Environmental Sustainability Transformations," <i>European Journal of Information Systems</i> (27:2), pp. 221-247. (P:, D:) ➤ Seidel, S., Recker, J., and vom Brocke, J. "Sensemaking and Sustainable Practicing: Functional Affordances of Information Systems in Green Transformations," <i>MIS Quarterly</i> (37:4) 2013, pp 1275-1299. (P:, D:) 	Ketter/ Recker
Jun 23	<p><i>Modeling the operation of electricity markets in the mid-term</i></p> <ul style="list-style-type: none"> ➤ E. Centeno, J. Reneses, J. Barquín. Strategic analysis of electricity markets under uncertainty: A conjectured-price-response approach. <i>IEEE Transactions on Power Systems</i>. vol. 22, no. 1, pp. 423-432, February 2007 (P:, D:) ➤ P. Dueñas, J. Reneses, J. Barquín. Dealing with multi-factor uncertainty in electricity markets by combining Monte Carlo simulation with spatial interpolation techniques. <i>IET Generation Transmission & Distribution</i>. vol. 5, no. 3, pp. 323-331, March 2011. (P:, D:) ➤ A. Bello, D.W. Bunn, J. Reneses, A. Muñoz. Medium-term probabilistic forecasting of electricity prices: a hybrid approach. <i>IEEE Transactions on Power Systems</i>. vol. 32, no. 1, pp. 334-343, January 2017. (P:, D:) 	Ketter/ Reneses
Jul 7	<p><i>Auction design and dynamic pricing</i></p> <ul style="list-style-type: none"> ➤ Yixin Lu, Alok Gupta, Wolfgang Ketter, and Eric van Heck. Information Transparency in B2B Auction Markets: The Role of Winner Identity Disclosure. <i>Management Science</i>, 65(9): 4261–4279, 2019. (P:, D:) ➤ Bapna, Ravi and Goes, Paulo and Gupta, Alok. Analysis and design of business-to-consumer online auctions. <i>Management Science</i>. 2003. (49:1), 85—101. (P:, D:) ➤ Gupta, Alok, Dale O. Stahl, and Andrew B. Whinston, "A Stochastic Equilibrium Model of Internet Pricing," <i>Journal of Economic Dynamics and Control</i>, 21, 1997, pp. 697-722. (Elsevier) (P:, D:) <p>Read but no write-up summary:</p> <ul style="list-style-type: none"> ➤ Varian, H. "How to Build an Economic Model in Your Spare Time," in M. Szenberg (editor), <i>Passion and Craft: Economists at Work</i>, University of Michigan Press, Ann Arbor, MI, 1997. <p>www.sims.berkeley.edu/~hal/Papers/how.pdf</p>	Gupta/ Ketter