University of Cologne
Faculty of Management, Economics and Social Sciences
Information Systems Area

Bachelor Seminar on Information Systems and Digital Technology
Topic Proposals

Term: Winter 2021/22

Chair for Information Systems and Systems Development

Contact Information:

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Digital Options: State of the Art and Measurement

Advances in digital technologies provide organizations with increasing options, thus requiring a re-evaluation of their capabilities. Digital options have been suggested to influence organizational agility (Sambamurthy et al., 2003) and given their increasing role in todays' products and services, these offerings are shaped more and more by their digital characteristics. For example, products and services are modular and interconnected. As a result, they become more malleable and generative (Yoo, 2010). With increasing digital options, organizations can increase their repertoire of potential competitive moves in the face of change.

We do not have a good overview what the current state of digital options research is. The majority of studies are conceptual or qualitative in nature (e.g., Sandberg et al., 2014). Digital options have been conceptualized in terms of reach and richness of digitized processes and digitized knowledge (Sambamurthy et al., 2003). Digital options reach is characterized by the extent to which a firm deploys common, integrated, and connected IT-enabled processes and knowledge bases for codified knowledge sharing and transfer. Digital options richness is characterized by the quality and transparency of information on processes as well as the extent of the availability of systems to support interactions among organizational members for sense-making and developing tacit knowledge. However, research is missing overview and synthesis of available conceptualizations as well as systematic operationalizations for digital options. More recent advances in computations text analysis could allow us to use previously untapped

secondary data sources, as for example in the form of annual reports, as a promising source for measurements of digital options.

Fundamentals on Scientific Work

The students learn the fundamentals of scientific work via the Flipped Classroom on Scientific Work. A separate registration (and preparation) is necessary:

- https://www.ilias.uni-koeln.de/ilias/goto_uk_fold_2445676.html

Students are exempted if they have already attended the classroom session of the Flipped Classroom on Scientific Work in the context of another course. If this is the case, students should contact werder@wiso.uni-koeln.de beforehand providing the course name and semester, in which the classroom session on scientific work has been accomplished.

For more information, please visit:
- https://www.wirtschaftsinformatik.uni-koeln.de/de/studies/theses/scientific-work/

Course Activities

The seminar work consists of five main phases:

1. The students acquire the basics of conducting scientific work via the Flipped Classroom.

2. The students learn the fundamentals concerning seminar's theme and literature reviews.

3. The students plan their seminar project by developing a research cycle and study protocol that is presented and discussed.

4. The improved study protocol guides the student to collect their data and assists them in their analysis. Hence, relevant data sources are identified, data is collected and processed in order to develop a key deliverable of the seminar project.

5. The seminar project is documented in a seminar paper. Before the final work is submitted, results are presented via video presentations and shared amongst the seminar participants.

Course Grading

The course grading is threefold:
- Study Protocol (15%):
  Written report including research problem and objective, outline of the paper, and plan of research method. Assessment in accordance with clarity, consistency, and comprehensiveness.
- Final Presentation (15%):
  Video presentation about your results. The 10-minute video should convey central parts of your research project and results. Assessment in accordance with organization of content, oral, and overall presentation.
- Seminar paper (70%):
  Written report about the research project. Assessment in accordance with evaluation scheme provided in ILIAS.

Timeline

Please kindly refer to the ILIAS course for the new timeline and materials.

Dates:

- 08 October 2021 starting at 10:00 Online Meeting: Webinar on Scientific Work (not necessary if you have attended the classroom session on Scientific Work before)
- 11 October 2021 starting at 09:00 – 10:30: Online Meeting: Seminar Kick-off
- 18 October 2021, 08:00, Submission of topic preferences in ILIAS
- 02 November 2021, 09:00 – 17:00 Online Material: Webinar on literature reviews and developing a study protocol
- 15 November 2021, 09:00 – 17:00, Zoom: Review and discussion of the study protocols
- 24 January 2022, Submission of final seminar paper and digital presentation of the results

We use Zoom video conferencing for our Online Meetings. Log-in details will be provided via ILIAS.

Participation Guidelines

Below is a list of mandatory and optional readings. It is imperative that all read all mandatory readings before our first online meeting. A more comprehensive list of readings is available online through the institute's website (https://www.wirtschaftsinformatik.uni-koeln.de/sites/wirtschaftsinformatik/pdfs/teaching/Reading_List-Research_in_IS.pdf).

In preparation for the "Review and discussion of the study protocols" session, you have to submit your own study protocol and review study protocols of your peers. Within this session, you will discuss your own study protocol and the study protocols of your peers that have been assigned to you.

Readings

Mandatory Readings:

Bandara, W., Furtmueller, E., Gorbacheva, E., Miskon, S., & Beekhuyzen, J. (2015). Achieving rigor in literature reviews: Insights from qualitative data analysis and tool-support. Communications of the Association for Information Systems, 37, 154-204.

Kitchenham, B. (2004). Procedures for performing systematic reviews. Keele, UK, Keele University, 33(2004), 1-26.

Rahwan, I., Cebrian, M., Obradovich, N., Bongard, J., Bonnefon, J. F., Breazeal, C., ... & Jennings, N. R. (2019). Machine behaviour. Nature, 568(7753), 477-486.

Rowe, F. (2014). What literature review is not: diversity, boundaries and recommendations. European Journal of Information Systems, 23(3), 241-255.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. MIS quarterly, xiii-xxiii.

Optional Readings:

Recker, J. (2012): Scientific Research in Information Systems: A Beginner's Guide. Springer, Heidelberg, Germany.

Topics:

I. State of the Art of Digital Options Research

Digital options are "a set of IT-enabled capabilities in the form of digitized enterprise work processes and knowledge systems" (Sambamurthy et al., 2003, p.247). With the increasing digitalization, more businesses adopt and integrate digital technology. Given their unique characteristics of the reprogrammability, homogenization of data, and self-reference, digital technologies start shaping work processes and knowledge systems within organizations. Digital options thinking serves managers to identify which investments in IT may provide performance gains. "An option captures a specific investment opportunity and gives the holder a preferential advantage in eventually making the investment" (Sandberg et al. 2014, p. 423). Digital options help to evaluate options of available, actionable, and realized investments to generate more value from IT capability for organizations (Sambamurthy et al., 2003; Sandberg et al. 2014). More specifically, we distinguish digital options between reach and richness of digitized processes and digitized knowledge. Digitized process reach helps organizations to deploy IT-enabled processes in order to increase the flow within the value chain. Digitized processes richness related to the quality of information that are available about events within the value chain. Digitized knowledge reach helps an organization to increase access and comprehensiveness of their explicit knowledge about the organization and its network, whereas digitized knowledge richness relates to the tacit knowledge about the organization, its members and their processes.

Prior empirical research on digital options has merely investigated these interactions in isolated forms. For example, research focused on investigating digital options as digitized process options (Chen et al., 2014), as digitized knowledge options (Park, Sawy, & Fiss, 2017), as related to specific technologies such as ERP systems (Karimi, Somers, & Bhattacherjee, 2007), as options of IT capability investments (Sandberg et al. 2014) and as generators of digital debt and value (Woodard et al. 2013). Since the seminal work of Sambamurthy et al. (2003), research is lacking an overview of research that use digital options as a theoretical foundation for empirical and conceptual work. A consolidated research model of digital options is missing that spans their character as IT capability investments generating value as well as digital debt, as digitized process and knowledge options, and their relation to specific forms of IT such as digital platforms (e.g., Rolland et al. 2018).

Introductory literature:

- Chen, Y., Wang, Y., Nevo, S., Jin, J., Wang, L., & Chow, W. S. (2014). IT capability and organizational performance: the roles of business process agility and environmental factors. European Journal of Information Systems, 23(3), 326-342. doi:10.1057/ejis.2013.4
- Karimi, J., Somers, T. M., & Bhattacherjee, A. (2007). The role of information systems resources in ERP capability building and business process outcomes. Journal of Management Information Systems, 24(2), 221-260.
- Park, Y., El Sawy, O. A., & Fiss, P. C. (2017). The Role of Business Intelligence and Communication Technologies in Organizational Agility: A Configurational Approach. Journal of the Association for Information Systems, 18(9), 648-686.

- Rolland, K. H., Mathiassen, L., & Rai, A. (2018). Managing digital platforms in user organizations: the interactions between digital options and digital debt. Information Systems Research, 29(2), 419-443.
- Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. MIS Quarterly, 27(2), 237-263.
- Sandberg, J., Mathiassen, L., & Napier, N. (2014). Digital options theory for IT capability investment. Journal of the Association for Information Systems, 15(7), 422-453.
- Woodard, C. J., Ramasubbu, N., Tschang, F. T., & Sambamurthy, V. (2013). Design capital and design moves: The logic of digital business strategy. MIS Quarterly, 537-564.

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II. Measuring Digital Options in Case Organizations

Digital options are "a set of IT-enabled capabilities in the form of digitized enterprise work processes and knowledge systems" (Sambamurthy et al., 2003, p.247). With the increasing digitalization, more businesses adopt and integrate digital technology. Given their unique characteristics of the reprogrammability, homogenization of data, and self-reference, digital technologies start shaping work processes and knowledge systems within organizations. Digital options thinking serves managers to identify which investments in IT may provide performance gains. "An option captures a specific investment opportunity and gives the holder a preferential advantage in eventually making the investment" (Sandberg et al. 2014, p. 423). Digital options help to evaluate options of available, actionable, and realized investments to generate more value from IT capability for organizations (Sambamurthy et al., 2003; Sandberg et al. 2014). More specifically, we distinguish digital options between reach and richness of digitized processes and digitized knowledge. Digitized process reach helps organizations to deploy IT-enabled processes in order to increase the flow within the value chain. Digitized processes richness related to the quality of information that are available about events within the value chain. Digitized knowledge reach helps an organization to increase access and comprehensiveness of their explicit knowledge about the organization and its network, whereas digitized knowledge richness relates to the tacit knowledge about the organization, its members and their processes.

The majority of studies are conceptual or qualitative in nature (e.g., Sandberg et al. 2014). Research is missing the status quo of digital options in specific organizations. Researchers require systematic approaches to measure digital options in selected organizations. For example, researcher can use secondary data sources such as annual reports, press releases, public databases, and newspaper articles related to specific organizations to assess their digital options. The goal of this topic is to (1) operationalize digital options for a systematic

measurement, (2) develop a method to elicit digital options in organizations from secondary data, and (3) present results on digital options in selected cases.

Introductory literature:

- Rolland, K. H., Mathiassen, L., & Rai, A. (2018). Managing digital platforms in user organizations: the interactions between digital options and digital debt. Information Systems Research, 29(2), 419-443.
- Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. MIS Quarterly, 27(2), 237-263.
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III.   Computationally Intensive Tools and Methods for Automated Text Analysis

The sheer volume of data demands for novel approaches that we can use for their analysis. While we often rely on our established methods and tools when it comes to quantitative and structured data, qualitative and unstructured data provides different challenges. Researchers call for benefitting from new methods and tools, demanding scholars to add them to their research method repertoire (McKenny et al., 2016). While prior research often relied on simply counting the number of words (e.g., Girod & Whittington, 2017) more sophisticated methods and tools have been suggested. For example, we can use natural language processing in conjunction with dictionaries to extract emotions (e.g., Gorbatai et al., 2020; Werder & Brinkkemper, 2018), or we can use clustering algorithms to identify topics of interest (Diegmann et al., 2018). More research is needed to better understand the current state of the art and their application and potential to information systems research.

Introductory literature:

- Gorbatai, A., Dioun, C., & Lashley, K. (2020). Making Space for Emotions: Empathy, Contagion, and Legitimacy's Double-Edged Sword. *Organization Science*, *October*, orsc.2020.1387. https://doi.org/10.1287/orsc.2020.1387
- McKenny, A. F., Aguinis, H., Short, J. C., & Anglin, A. H. (2016). What Doesnt Get Measured Does Exist: Improving the Accuracy of Computer-Aided Text Analysis. *Journal of Management*, 233–251. https://doi.org/10.1177/0149206316657594

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- Diegmann, P., Dreesen, T., Binzer, B., & Rosenkranz, C. (2018). Journey Towards Agility: Three Decades of Research on Agile Information Systems Development. *International Conference on Information Systems*, 1–17.
- Werder, K. & Brinkkemper, S. (2018). MEME – Toward a Method for EMotions Extraction from GitHub. In *Proceedings of the 3rdInternational Workshop on Emotion Awareness in Software Engineering* (pp. 20-24). Gothenburg, SE: ACM.

Of particular interest are i) methods and tools available for computational text analysis, ii) their application in information systems research, iii) their potential for digital options research.

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IV.   Large Secondary Data Sources and Use in Information Systems Research

Given the increasing availability and accessibility of large data sources, researchers increasingly explore the use of secondary data for their research. That is, rather than having to collect and create a new dataset solely for the purpose of their research project, they rely on previously generated data. These large data sources are often made available to the public. Examples include open-source communities, such as GitHub, where all group interactions are being stored in a publicly available manner. Also, social media, such as twitter provide vast amounts of data that can be used to investigate how people interact with technology. This, in conjunction with the increasing access and simplicity to scrape website in order to process publicly available data provide information systems and management scholars with new opportunities to conduct research, answering new questions that could not be answered otherwise (George et al., 2014; Günther et al., 2017; Müller et al., 2016; Sivarajah et al., 2017).

Introductory literature:

- Hirschheim, R., & Klein, H. K. (2012). A glorious and not-so-short history of the information systems field. *Journal of the Association for Information Systems*, *13*(4), 188.
- Müller, O., Junglas, I., Brocke, J. vom, & Debortoli, S. (2016). Utilizing big data analytics for information systems research: challenges, promises and guidelines. *European Journal of Information Systems*, *25*(4), 289–302. https://doi.org/10.1057/ejis.2016.2
- Günther, W. A., Rezazade Mehrizi, M. H., Huysman, M., & Feldberg, F. (2017). Debating big data: A literature review on realizing value from big data. *Journal of Strategic Information Systems*, *26*(3), 191–209. https://doi.org/10.1016/j.jsis.2017.07.003
- Sivarajah, U., Kamal, M. M., Irani, Z., & Weerakkody, V. (2017). Critical analysis of Big Data challenges and analytical methods. *Journal of Business Research*, *70*, 263–286. https://doi.org/10.1016/j.jbusres.2016.08.001

Of particular interest are i) data sources and measured variables as well as ii) research streams and theories that are being extended using secondary data.

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References

Diegmann, P., Dreesen, T., Binzer, B., & Rosenkranz, C. (2018). Journey Towards Agility : Three Decades of Research on Agile Information Systems Development. *International Conference on Information Systems*, 1–17.

George, G., Haas, M. R., & Pentland, A. (2014). Big Data and Management. *Academy of Management Journal*, *57*(2), 321–326. https://doi.org/10.5465/amj.2014.4002

Girod, S. J. G., & Whittington, R. (2017). Reconfiguration, restructuring and firm performance: Dynamic capabilities and environmental dynamism. *Strategic Management Journal*, *38*(5), 1121–1133. https://doi.org/10.1002/smj.2543

Gorbatai, A., Dioun, C., & Lashley, K. (2020). Making Space for Emotions: Empathy, Contagion, and Legitimacy's Double-Edged Sword. *Organization Science*, *October*, orsc.2020.1387. https://doi.org/10.1287/orsc.2020.1387

Günther, W. A., Rezazade Mehrizi, M. H., Huysman, M., & Feldberg, F. (2017). Debating big data: A literature review on realizing value from big data. *Journal of Strategic Information Systems*, *26*(3), 191–209. https://doi.org/10.1016/j.jsis.2017.07.003

McKenny, A. F., Aguinis, H., Short, J. C., & Anglin, A. H. (2016). What Doesnt Get Measured Does Exist: Improving the Accuracy of Computer-Aided Text Analysis. *Journal of Management*, *XX*(X), 233–251. https://doi.org/10.1177/0149206316657594

Müller, O., Junglas, I., Brocke, J. vom, & Debortoli, S. (2016). Utilizing big data analytics for information systems research: challenges, promises and guidelines. *European Journal of Information Systems*, *25*(4), 289–302. https://doi.org/10.1057/ejis.2016.2

Sambamurthy, Bharadwaj, & Grover. (2003). Shaping Agility through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms. *MIS Quarterly*, *27*(2), 237. https://doi.org/10.2307/30036530

Sandberg, J., Mathiassen, L., & Napier, N. (2014). Digital options theory for IT capability investment. *Journal of the Association for Information Systems*, *15*(7), 422–453. https://doi.org/10.17705/1jais.00365

Sivarajah, U., Kamal, M. M., Irani, Z., & Weerakkody, V. (2017). Critical analysis of Big Data challenges and analytical methods. *Journal of Business Research*, *70*, 263–286. https://doi.org/10.1016/j.jbusres.2016.08.001

Werder, K., & Brinkkemper, S. (2018). MEME – Toward a Method for EMotions Extraction from GitHub. *2018 IEEE/ACM 3rd International Workshop on Emotion Awareness in Software Engineering (SEmotion)*, *Part F1380*, 20–24. https://doi.org/10.1145/3194932.3194941

Yoo. (2010). Computing in Everyday Life: A Call for Research on Experiential Computing. *MIS Quarterly*, *34*(2), 213. https://doi.org/10.2307/20721425