

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



Bachelor Seminar on Information Systems and Digital Technology Topic Proposals

Term: Summer 2021

Chair for Information Systems and Systems Development (Prof. Dr. Recker)

Contact Information:

Dr. Janek Richter (janeke.richter@wiso.uni-koeln.de)

Dr. Karl Werder (werder@wiso.uni-koeln.de)

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 today's 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 computational 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 note that we had to cancel our webinars in the first two weeks due to collisions with other courses. We will provide online materials instead and postpone the webinar on literature reviews by one week. Please kindly refer to the ILIAS course for the new timeline and materials.

Dates:

- 06 April 2021 starting at 10:00 Online Meeting: Webinar on Scientific Work (not necessary if you have attended the classroom session on Scientific Work before)
- 12 April 2021 starting at 09:00 – 10:30: Online Meeting: Seminar Kick-off
- 15 April 2021, 08:00, Submission of topic preferences in ILIAS
- 26 April 2021, 09:00 – 17:00 Online Material: Webinar on literature reviews and developing a study protocol
- 10 May 2021, 09:00 – 17:00, Zoom: Review and discussion of the study protocols
- 05 July 2021, 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 on 09th of November. 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 session on the 7th of December, 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..... 5
- II. Digital Options in Case Organizations 6
- III. Tool and methods for automated text analysis 7
- IV. Secondary Data in Information Systems Research 8

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 adoption 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 help increase this effect by generating more value from existing IT capability (Sambamurthy et al., 2003). More specifically, we distinguish 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, when investigating digitized process options (Chen et al., 2014), for digitized knowledge options (Park, Sawy, & Fiss, 2017) and focused on specific technologies, such as ERP systems (Karimi, Somers, & Bhattacharjee, 2007). 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. Furthermore, an overview and synthesis of relevant IS concepts such as digital debt and digital platforms (e.g., Woodard et al. 2013, Rolland et al. 2018) that are related to digital options is missing.

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., & Bhattacharjee, 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.

Supervisor: Dr. Janek Richter

II. 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 adoption 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 help increase this effect by generating more value from existing IT capability (Sambamurthy et al., 2003). More specifically, we distinguish 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 and systematic approaches to measure them from methods that rely on secondary data sources such as annual reports, press releases, public databases, and newspaper articles. 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.
- 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.

Supervisor: Dr. Janek Richter

III. Tool and methods for automated text analysis

The sheer volume of data demands for novel approaches that we can use for their analysis. While we can often rely on our established methods and tools when it comes to quantitative and structured data, qualitative and unstructured data provides a bigger challenge. Hence, researchers call to benefit from new methods and tools and their use by scholars (McKenny et al., 2016). While prior research often relied on the simply counting 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).

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 Doesn't 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>
- 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.

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

Supervisor: Dr. Karl Werder

IV. Secondary Data in Information Systems Research

Given the increasing availability and accessibility of large data sources, researchers can increasingly rely on secondary data, rather than having to collect and create data solely for the purpose of their research project. Scholars can now rely on the use of large data sources that are already available, avoiding the artificial generation of new data. 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 websites in order to process publicly available data provide information systems and management scholars with new opportunities to conduct research, answering new questions that otherwise, we would not be able to answer (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.

Supervisor: Dr. Karl Werder

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 Doesn't Get Measured Does Exist: Improving the Accuracy of Computer-Aided Text Analysis. *Journal of Management*, XX(X), 233–251. <https://doi.org/10.1177/01492063166657594>
- 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>