



# ERCIS

European  
Research  
Center for  
Information  
Systems

## ANNUAL REPORT

2021



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## THE ERCIS NETWORK

ERCIS – the European Research Center for Information Systems – is an international network of scientists conducting cooperative research in the field of Information Systems (IS). The Network was founded in 2004 at the University of Münster and is funded by the German State of North Rhine-Westphalia and the University of Münster.

The Network provides new ways of thinking and multi-disciplinary approaches for finding solutions to the problems arising from an ongoing transformation of society and organisations due to the growing impact of IT. ERCIS has dedicated itself to dealing with these challenges through collaboration and exchange of information between research and practice.

ERCIS is notable for excellent communication and uncomplicated initiation of research cooperation and research projects. Among ERCIS' associated major strengths are the personal contacts between researchers, which make it a vibrant network. ERCIS covers a wide range of disciplines associated with IS and perspectives on IS research.

The Network is headed by the *Board of Directors* in Münster, which is composed of one academic director, namely Prof. Dr. Jörg Becker, and eight additional professors all active in the IS research field. Moreover, ERCIS involves numerous internationally renowned researchers from more than 20 *Associated Research Institutions, Personal Members*, as well as members of the *Advisory Board* coming from diverse industry companies.

All ERCIS research partners are experts in a wide variety of disciplines related to IS. Research conducted by ERCIS ranges from fundamental research to application-oriented research. Besides individual research activities of ERCIS members, the Network brings together and supports selected research aspects of IS in *Competence Centres* aimed at strengthening research in specific areas. The Advisory Board members come from various industry sectors, which guarantees that the research conducted at ERCIS is relevant for practice. Regular meetings of the Board of Directors with the Advisory Board members, as well as annual workshops of ERCIS' associated research institutions, ensure continuous, direct and productive exchange of knowledge.

Finally, students and young researchers also benefit from collaboration at ERCIS, as many ERCIS research partners offer exchange programs that last one or two semesters, which gives students an opportunity to acquire international experience. Joint lectures and guest talks organised by several ERCIS members contribute to the internationalisation of teaching.

If you are interested in connecting with the Network, please feel free to contact us! For further information please visit

[www.ercis.org](http://www.ercis.org)



## PREFACE

### DEAR FELLOW ERCIS PARTNERS AND INTERESTED READERS OF THIS REPORT,

2021 – basically our second Covid-19 year! We continued working from home, organizing research as well as teaching mostly virtual. In Münster, we just started going back to University and teaching “live” in our lecture halls in the winter semester, starting in October. I must say that I really missed that and that I totally enjoy seeing students in front of me and not just as “tiles” in my Zoom window.

However, while getting used to the “new normal”, we still had a lot going on in our network this year. As our Annual Workshop, again, could not take place in presence, we had another online meeting in September this year, where we could at least see each other virtually and talk about and discuss recent developments in the network. The biggest change was certainly the development of our five research clusters, namely (1) Data Science and AI, (2) Process Science, (3) Knowledge and Learning, (4) Smart Manufacturing, (5) Digital Public Services. The clusters were established to enhance the cooperation in the respective research areas. They span from method-orientation to domain-orientation, providing homes to

the members' various research interests and serve as incubators for project proposals, joint research and teaching activities, and joint policy-making in the respective areas. I am curious to see how the clusters develop and take up their work in the next months.

In addition to the clusters, we also joint forces with the Confederation of Laboratories for Artificial Intelligence Research in Europe (CLAIRE), an organisation created by the European AI community that seeks to strengthen European excellence in AI research and innovation. As several ERCIS partners were already founding members of CLAIRE, I think that this collaboration is an excellent add-on to our research cluster Data Science and AI.

As we really want to strengthen collaborations within the clusters, it was clear to us, that we also wanted to discuss them with our advisory board in the context of our virtual advisory board meeting in November. We discussed e.g. the opportunities for the companies to participate in the work of the clusters and to stay informed via our newly established communication platform Mattermost. During the advisory board meeting we could also welcome

› Preface Prof. Becker [www.ercis.org](http://www.ercis.org)

two new companies in the advisory board, namely Flaschenpost and LVM. Great to have you on board!

Furthermore, we also had personnel changes at our headquarters in Münster. Martin Dugas moved to Heidelberg to head the new Institute for Medical Informatics at the University Hospital there. We wish him a very good start and he will stay part of the network as personal member. His successor as ERCIS director is Julian Varghese and we are happy to have him with us to keep the perspective of medical informatics in the headquarter. We could also welcome a second new member to the board of directors, Tobias Brandt, this year. He moved to Münster in July to take up the professorship “Public Sector Digitalization” at our Department of Information Systems in Münster. Great to have you both with us!

For 2022 I hope that we will be able to meet again in presence. Please, save the date for the ERCIS Annual Workshop: On 12 September, the Annual Workshop will take place in Münster just before the 20th BPM conference, which we will host in our beautiful Münster castle! Let's keep our fingers crossed that we will all meet again there – I am very much looking forward to it!

All the best and stay healthy,

Jörg Becker

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## 12<sup>TH</sup> ANNUAL ERCIS WORKSHOP (VIRTUAL)

### 12<sup>TH</sup> ANNUAL ERCIS WORKSHOP (VIRTUAL)

The 2021 Annual Workshop in September was, again, virtual. This obviously limits the opportunities for personal exchange, but has the advantage of many partners being present. 84 participants joined the meeting, discussing the current and future state of the network.

The task given to the headquarters last year – to further define the research clusters and put them to life – has been accomplished, which made their presentation one of the most prominent elements of the workshop. First and foremost, the general goals of the clusters have been defined as

- Better *identification* with the network for the members
- Increased member *involvement* with the network
- Better internal and external *communication* of the network
- Involving the clusters and their leads in the *network's evolution*

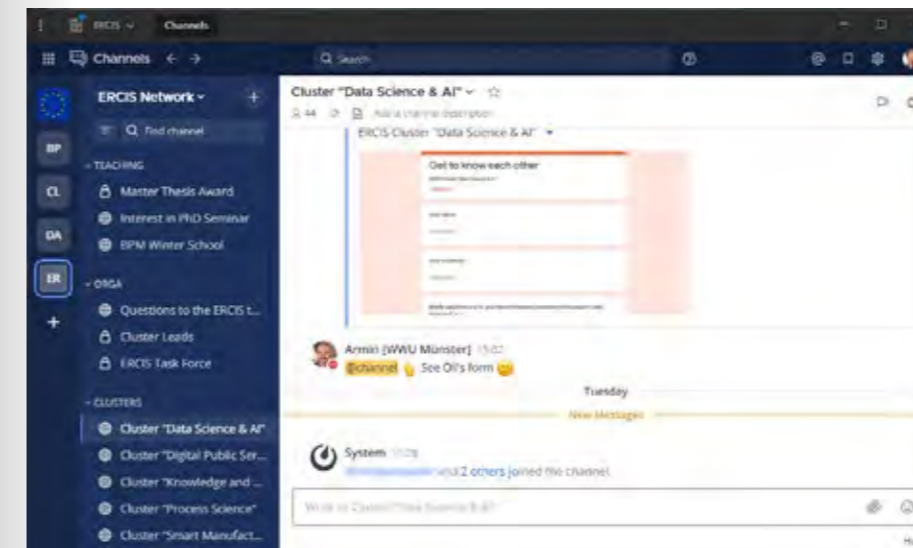
By assigning “cluster leads” from various member institutions, the network organization becomes more decentralized. This results in specific goals of the respective clusters which have not been defined by the headquarters, but by the network members themselves.

For the next year, we envision activities among the cluster participants, like workshops, joint tracks at conferences, joint paper projects, joint seminars, etc. The cluster leads provided already first insights into their plans – we are excited to see where this journey will take us!

Directly related to the research cluster presentation was a discussion about the role of the ERCIS competence centers. General consensus was that both, the competence centers and the research clusters will continue to co-exist, with the competence centers being more fast-moving and specific, and the clusters being more general and robust. Presentations of all of our seven competences demonstrated the dedication of their members.

<b>Data Science and Artificial Intelligence</b> • Mike Preuss, University of Leiden • Oliver Müller, University of Paderborn		
<b>Process Science</b> • Jan vom Brocke, University of Liechtenstein • Jan Mendling, Humboldt-Universität zu Berlin		
<b>Knowledge Management and Learning</b> • Eli Hustad, University of Agder • João Álvaro Carvalho, University of Minho		
<b>Smart Manufacturing</b> • Alessio Maria Braccini, University of Tuscia • Jens Pöppelbühl, Ruhr-Universität Bochum		
<b>Public Digital Services</b> • Robert Krummer, University of Tartu • Reima Suomi, University of Turku		

The five ERCIS Research Clusters with their respective leads.



“Mattermost provides Slack-like communication features for the whole network”

A second major move in 2021 was the establishment of Mattermost as communication platform for all members of the network. Earlier, communication was directed at the institutional representatives, whom we trusted to forward information to their colleagues and PhD students. With this new Slack-like platform, the network offers a low entry barrier for everyone, and interest-driven channels. Naturally, we provide specific channels for the clusters, for joint teaching activities like seminars, or for joint research endeavors. Giving members the permission to create their own teams and channels, we hope to establish Mattermost as well-accepted communication means!

We were also happy to present the newly established Memorandum of Understanding with CLAIRE- the “Confederation of Laboratories for Artificial Intelligence Research in Europe”. Together with CLAIRE, we hope to create impact and collaborate on joint research projects, participate in policy building, and share knowledge among our PhD students and staff.

### SAVE THE DATE

The 2022 Annual Workshop is planned to take place in Münster, Germany.



The Annual Workshop and the BPM 2022 will be hosted by the University of Münster in September 2022.

# RESEARCH CLUSTER

In 2021, the ERCIS network defined five network clusters that serve as umbrella for its members to join forces. They span from method-orientation to domain-orientation, providing homes to the members' various research interests. They serve as incubators for project proposals, joint research and teaching activities, and joint policy-making in the respective areas.

## RESEARCH CLUSTER

### DATA SCIENCE AND ARTIFICIAL INTELLIGENCE

### DIGITAL PUBLIC SERVICES

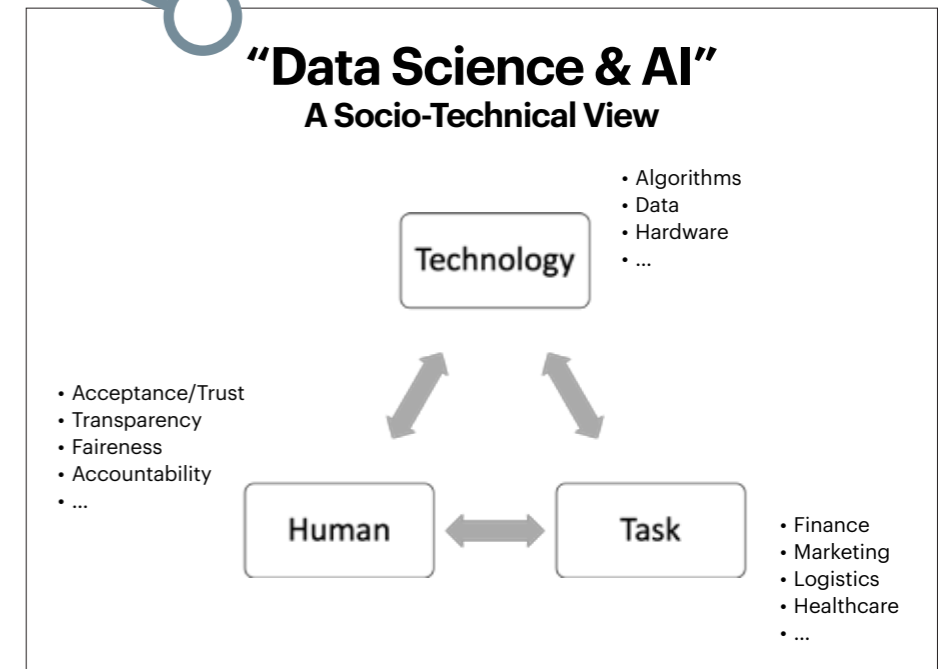
### KNOWLEDGE AND LEARNING

### PROCESS SCIENCE

### SMART MANUFACTURING

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## DATA SCIENCE AND ARTIFICIAL INTELLIGENCE



### DATA SCIENCE AND ARTIFICIAL INTELLIGENCE CLUSTER

In our networked world, data is collected in ways never seen before. Extracting knowledge from this data and leveraging it to build intelligent systems will transform the way business, government, and science are carried out. Many people believe that data science and AI will bring forth changes that will be much more profound than any other technological revolution in human history.

Digital services can adapt to individual humans and situations due to the abundance of data and the improved capabilities to learn from this data. Big steps are made in many scientific areas these times, notably in natural language processing, image recognition, and in finding complex synthesis ways, e.g. for novel drugs and materials.

However, there are also risks associated with algorithmic decision making and autonomous AI systems. They may be used for steering very complex hacking activities, or autonomous weapon systems, or simply decide wrongly according to unknown biases in the data.

In Information Systems, humans and their interaction with technology are traditionally an important topic, and this angle is of specific relevance for enabling real-world use of Data Science and Artificial Intelligence methods, beyond pure algorithmic research. Especially when security aspects or ethical problems of these methods are under consideration, this viewpoint is highly significant.

The mission of the ERCIS “Data Science & AI” cluster is to advance research, education, and practice on human-centered data science and AI in order to augment human capabilities and improve societal well-being. We explicitly take a socio-technical perspective on data science & AI, focusing at the intersection of technologies, humans, and tasks.

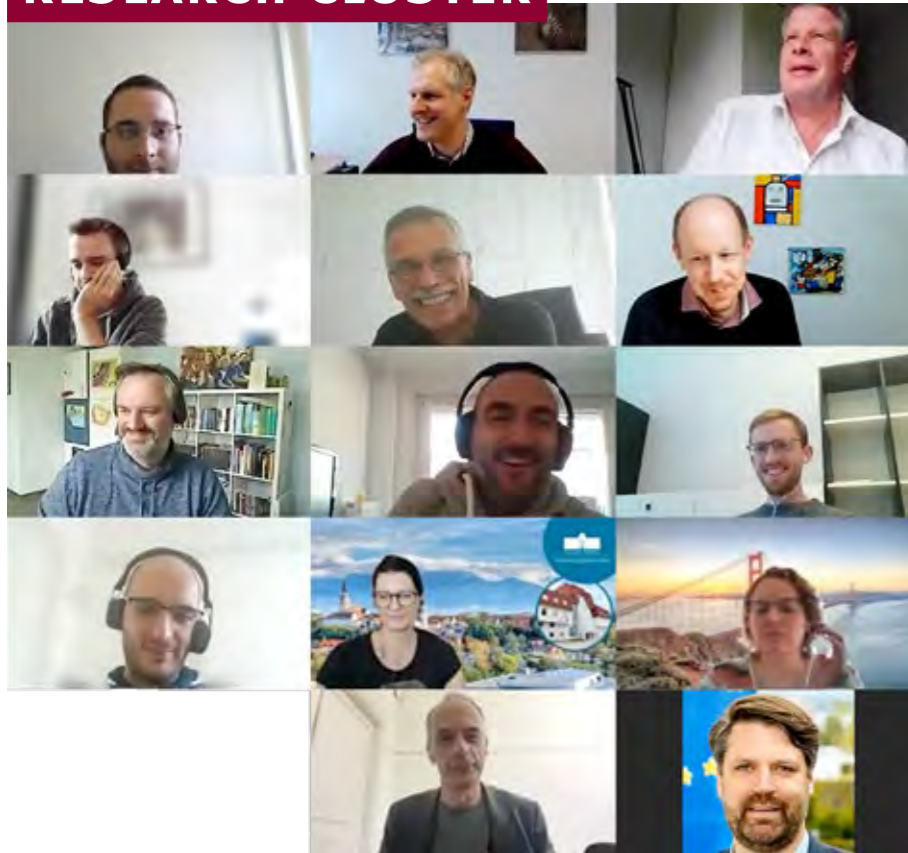
As next steps, we intend to perform a cluster member survey in order to provide insight into the multiple interests of the members and their priorities, and we want to organize a half day cluster focused workshop during the ERCIS annual meeting.

### THE CLUSTER DATA SCIENCE AND ARTIFICIAL INTELLIGENCE IS HEADED BY

• **Oliver Müller** is Professor of Management Information Systems and Data Analytics at Paderborn University. His research interests focus on data-driven judgment and decision making. This includes the design and use of machine learning solutions for supporting human judgment and decision making, with a special focus on the computational analysis of unstructured data (e.g., texts, images), as well as studying the acceptance and implications of data-driven decision making in organizations.

• **Mike Preuss** is assistant professor at LIACS, the Computer Science department of Leiden University. He works in AI, namely game AI, natural computing, and social media computing. He is well known for his works in evolutionary optimization, experimental methodology, and the pioneering drug discovery by means of an AlphaGo inspired method.

## RESEARCH CLUSTER



### DIGITAL PUBLIC SERVICE CLUSTER

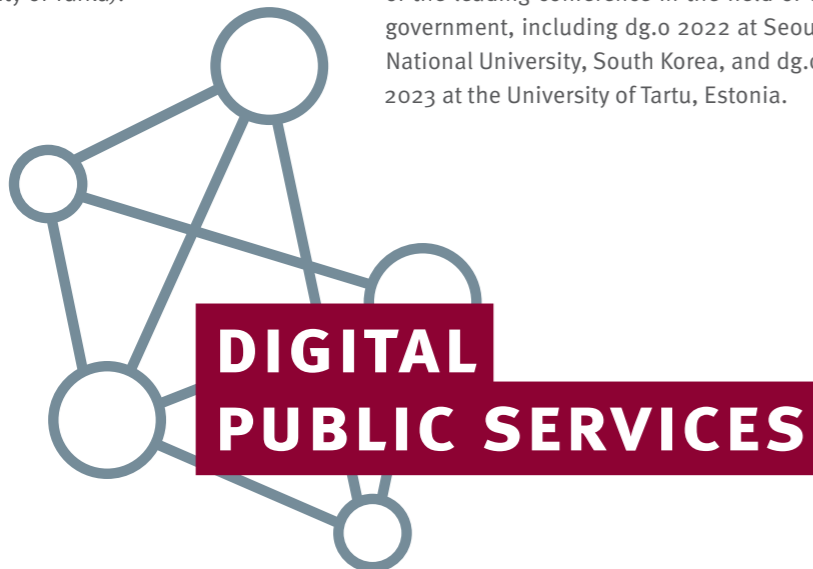
The cluster on Digital Public Services focuses on the use and development of information systems by public organizations to unleash the potential and explore new and better ways of delivering digital public services. The work of this cluster focuses on domains where normal market governance is not the dominant form of organizing and covers topics such as, among other things, the electronic delivery of digital public services, governance of digital public services, e-democracy, e-health. This cluster is led by Prof. Robert Krimmer (University of Tartu) and Prof. Reima Suomi (University of Turku).

Currently, the cluster on Digital Public Services involves 44 individual researchers related to 24 academic institutions. To kick-off, the work, the Digital Public Services cluster organized an online kick-off workshop on 30 September 2021 and gathered ERCIS members interested in the topic of eGovernment. During the workshop, participants discussed and identified the main research trends, key-meeting points, and ongoing projects in smart cities, social media, and e-government in general. Furthermore, members of the Digital Public Services agreed, inter alia, to collaborate and contribute to the track development of the leading conference in the field of e-government, including dg.o 2022 at Seoul National University, South Korea, and dg.o 2023 at the University of Tartu, Estonia.

Members of the Digital Public Services cluster meet at least three times a year to discuss relevant topics and research cooperation ideas. Networking opportunities within the cluster are highly encouraged, especially for Ph.D. students and junior researchers. Participants also agreed to organize joint networking activities, including the ‘brown bag lunch’ and the Kilpisjärvi Information Systems seminar. The cluster on Digital Public Services encourages all its members to participate in creating an informal collaborative atmosphere and continue exchanging interesting and relevant research ideas in the field of digital public services.

### NEXT KEY ACTIVITIES

- The next meetings of the cluster on Digital Public Services will be on 25.11.2021 and 27.01.2022.
- The Cluster will work on preparing a track for dgo.2022 and dgo.2023.
- Present to the *teachingpublicservice.digital* initiative.
- Kilpisjärvi Information Systems seminar (*Kilpisjärvi, Finland 26.03.–02.04.2022*)
- Well-being in the Information Society conference (*Turku, Finland 24–26.08.2022*)



### KNOWLEDGE AND LEARNING CLUSTER

The ERCIS Cluster in Knowledge and Learning (K&L) encompasses a broad range of academic interests. It has been presented as comprising “everything related to Knowledge Management, Teaching, Learning, Education, and the likes”. For this reason, when clusters were initially presented, the K&L cluster was “put in between the other four clusters”. For similar reasons, when ERCIS “members” were asked to assign their research interests to clusters, every single member included the K&L cluster.

The K&L cluster is, therefore, a special case among ERCIS clusters. It can be a challenge to find a way for the K&L cluster to create value to the ERCIS community.

Considering that the role of clusters is open to definition, to differentiation and to evolution, it makes sense to start with caution. This means avoiding defining a vision for the cluster that is too strict or that is biased towards particular perspectives of what knowledge and learning means to the ERCIS community.

So, the initial vision for the K&L cluster is to serve as a “rose of the winds” for those that navigate in the knowledge and learning ocean. With knowledge and learning in its centre, the “rose of the winds” will indicate the different directions where the academic exploration of those topics can lead to.

Furthermore, the vision of this cluster is to become a knowledge-sharing space where participants come together to learn from one another face-to-face and/or virtually. We see the clusters as a promoter of informal undertakings that demand some coordination, facilitation, cultivation, and nurturing. Members in the cluster will decide on specific topics that are timely to address and which will relate to the research interests of the members.

### WHAT ACTIVITIES WOULD WE LIKE TO INITIATE IN OUR CLUSTER?

#### • Mapping of research interests

The first activity of the K&M cluster will involve the creation of a map of academic interests anchored in knowledge and learning. This map will depict the wide range of possible academic interests that, somehow, are related to knowledge and learning. The creation of the map will be carried out collaboratively, involving as much as possible the ERCIS community. The endeavour will involve activities that promote creativity in a collaborative way such as a knowledge café.

Initially, the map will be created by doing the following exercise among the participants:

#### Why do you think the K&L cluster is relevant for you?

- I teach knowledge management topics
- I do research in knowledge management
- I teach and teaching involves conveying knowledge of some kind.
- I teach and I expect my students to learn
- I do research on topics related to organizational/enterprise learning
- I teach topics related to organizational/enterprise learning
- I do research, so I create knowledge
- Information systems involves information; often, information correspond to representations of knowledge

- I am involved in IS professional practices; such practices involve knowledge
- I am member of a community-of-practice; the way it works triggered my interest in knowledge and knowledge management.
- I act as knowledge broker in my institution
- I have academic interests in AI; therefore, I am concerned with knowledge and with learning
- I participate in the design of courses and degree programs; they involve knowledge and learning
- Expanding knowledge  
We would like to encourage cluster members to organize mini tracks in selected conferences focusing on topics related to K&L that can contribute to the establishment of an encompassing view of K&L in information systems research.

- Connecting to other ERCIS clusters  
Activities that aim at creating links between the other ERCIS clusters. Members act as knowledge brokers and aim to stimulate boundary-crossing activities with clusters that explore common interests.

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**PROCESS SCIENCE CLUSTER**

Process science is an innovative field of science that intends to pull together contributions from various disciplines, such as computer science, management science and information systems, to better understand and develop processes. To be inclusive, process science follows a broad understanding of processes that is agnostic to single extant disciplines. We define processes as a coherent series of changes which evolves over time, occurs at various levels and constitutes a phenomenon of interest.

The following figure depicts a core summary of Process Science. At the core of process science is the study of processes (*focus*). It aims to describe, explain and intervene in processes (*objective*). Thereby, it embraces an interdisciplinary viewpoint, integrating contributions from various disciplines (*perspective*).



Process Science Framework.

Three reasons lead to the establishment of Process Science. First, processes are increasingly growing out of existing containers, and processes constitute a phenomenon of interest of themselves, specifically going beyond established units of analysis, such as application systems or organizations. Secondly, the world is increasingly changing and the study of processes helps to understand change, to deal with change and also to actively shape change. Third, the ubiquitous availability of data, combined with advanced data analytics capabilities, offers new opportunities to study processes using multiple data sources, such as digital trace data, social media data, body data together other quantitative and qualitative data.

Please check **Process Science**: *The Interdisciplinary Study of Continuous Change for the Process Science Idea*, a paper authored by ten significant researchers on the topic!

The cluster Process Science is headed by

- **Jan vom Brocke** is a professor for Information Systems at the University of Liechtenstein. He is the Hilti Endowed Chair of Business Process Management and Director of the Institute of Information Systems. Jan's work and research interest is on strategy and organizational design, with a focus on various aspects of digital innovation and transformation as well as the management of collaboration in a digital world.
- **Jan Mendling** is the Einstein-Professor of Process Science with the Department of Computer Science at Humboldt-Universität zu Berlin, Germany. His research interests include various topics in the area of business process management and information systems.

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**SMART MANUFACTURING CLUSTER**

In the ERCIS cluster "Smart Manufacturing", we would like to initiate and conduct joint research activities in order to study how firms use digital technologies in manufacturing in order to create new ways of providing customer value. We intend to connect the information systems discipline, which is at the heart of the ERCIS network, with adjacent disciplines such as operations management, mechanical engineering, computer science, and service science, which are also represented in the network. This way, we can benefit from the multiple perspectives that exist on the digital transformation of the manufacturing industry in Europe.



The concept of smart manufacturing refers to fully integrated and collaborative manufacturing systems that respond in real-time to meet the changing demands and conditions in the factory, supply chain, and customers' needs. Digital technologies such as the Internet of Things (IoT), sensors, cloud computing, and big data analytics have tremendously influenced the production systems of manufacturing firms over the last years and continue to do so as part of the ongoing fourth industrial revolution. Production sites with digitally enhanced machines and assets (*smart products*) become connected and automated, and they generate and exchange data through the IoT. Actors in the wider supply chain can use this data to fine tune the management of the supply chain and to offer novel data-driven service that complement existing products, transforming supply chains into service ecosystems. Finally, the digital transformation in manufacturing leads to completely new ways of providing customer value with customized and outcome-based solutions instead of traditional product sales.

In our cluster, we will organize regular meetings to discuss the transformation of manufacturing firms through digitalization (*e.g., at the next ERCIS annual meeting plus additional video meetings*). We are also looking forward to joint research/publication projects on smart manufacturing topics (*e.g., industrial internet of things, digital platforms in manufacturing, retrofitting, smart services, digital servitization, digital workplaces, supply chain management*). Future joint activities can also include the exploration of funding opportunities for joint research projects, the organization of conference tracks and journal special issues as well as the exchange of PhD students within the ERCIS network.

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# HEADQUARTERS

The ERCIS headquarters is located in Münster, Germany. All full professors of the department of information systems at the University of Münster serve in the board of the network and are active in the fields of information systems, computer science, data science, supply chain management, medical informatics, and law. Additionally, the management team at the headquarters works with the board to organise regular meetings, joint teaching endeavours, and research proposals with the network partners.



## UNIVERSITY OF MÜNSTER CHAIR FOR INFORMATION SYSTEMS AND INFORMATION MANAGEMENT

### ABOUT THE INSTITUTION

The Chair for Information Systems and Information Management at the University of Münster, directed by Prof. Dr. Dr. h.c. Dr. h.c. Jörg Becker, Professor h.c. (NRU-HSE, Moscow), currently comprises seven postdocs and twelve research assistants. The courses offered by the Chair for BSc and MSc in Information Systems study programs include Application Systems, Information Modeling and Workflow Management (*Process Modeling field*), as well as Data Management and Management Information Systems and Data Warehousing (*Data Modeling field*). Moreover, the courses Retail and Production Planning and Control cover both Process Modeling and Data Modeling in their respective domains. Members of the Chair are involved in research projects funded nationally and internationally. They publish results of their work in journals like BISE (*Business & Information Systems Engineering*), BPMJ (*Business Process Management Journal*), Electronic Markets, EMISA (*Enterprise Modeling and Information Systems Architectures*), ISeB (*Information Systems and e-Business Management*), and GIQ (*Government Information Quarterly*), as well as in conference proceedings like ICIS (*International Conference on Information Systems*), ECIS (*European Conference on Information Systems*), ER (*International Conference on Conceptual Modeling*), and HICSS (*Hawaii International Conference on System Sciences*).

### RESEARCH TOPICS

Conceptual modeling has become a mainstream method for describing, designing, and reorganising Information Systems in the last decade. Many large companies use conceptual models for tasks like business process reengineering, software introduction, and compliance management. Conceptual modeling, when being transferred into practice, supports the creation of business value for companies and governmental organisations.

Retail is an area of research that focuses on organisations and application systems in the respective domain, including wholesale, stationary retail, and e-commerce. Focal topics accounting for interdependencies between an organisation and an application system involve process management and conceptual modeling in retail, as well as Enterprise Resource Planning (ERP) systems.

E-Government deals with the aspects of administrative processes and services within governmental and inter-governmental organisations and the citizens and businesses using Information and Communication Technology (ICT). E-Government links the field of strategic management with aspects of process management and economic viability and focuses on front- and back-office. E-Government topics can be addressed in terms of content, as well as from technical and conceptual perspectives.

Smart Cities is the field of research that uses the advances in information and communication technologies to increase the operational efficiency, information sharing, and quality of services of the four constituent areas of a city: Retail, government, mobility, and energy. A focal topic is the development of integrated and configurable reference models these areas, in order to advance the scientific knowledge and yield practical value for the creation of smart cities. Further important topics are the theory of the citizens' digital sovereignty and its consideration and integration within these reference models.

### SELECTED CURRENT RESEARCH PROJECTS



The project e-GovCampus targets the development of a massive open online courses (MOOC)-platform, which will help to facilitate the development of the digitalization of the public sector in Germany. The main objective of both platform and project is to provide public officials with an educational offer, that enables them to develop their skills in a location-independent, interactive and self-responsible fashion. The Chair for Information Systems is responsible for the project coordination. This firstly entails the conception and development of the platform, which includes the establishment and analysis of stakeholder requirements. Furthermore, activities are targeted to ensure the platform's sustainable impact, closely related future-proof business models and appropriate marketing efforts to ensure the existence of the platform even beyond the period of public financing.

For more information, please visit:  
<https://egov-campus.org>

## MODERAT!

In recent years, a rapid increase in racist, political and religiously motivated hate commentary has led many newspaper editors to deactivate their online comment functions on the websites. While this is understandable from an economic point of view for the individual publisher, severe problems for the public discourse arise given restriction quotas of up to 50%. The MODERAT! project aims to use an integrative and interdisciplinary approach to develop software tools and a web platform that will enable operators to moderate web debates with significantly less effort. Comments are analysed automatically, so that only a small number of critical comments have to be viewed manually. In this way, media houses and publishers are being enabled to offer web debates again on their own websites and thus enter into a more active exchange with the readership.

For further information, please visit:  
<https://www.moderat.nrw/>

### AWARDS

Jörg Becker, Bettina Distel, Marco Niemann, and Sebastian Halsbenning were awarded for the Most Innovative Paper Award for their article "Playing (Government) Seriously: Design Principles for E-Government Simulation Game Platforms" at the 16<sup>th</sup> International Conference on Business & Information Systems Engineering (WI 2021) in March 2021.

Together with Denis Dennehy, Kieran Conboy, Jaganath Babu, Johannes Schneider, Joshua Handali, and Jan vom Brocke, Armin Stein and Benedikt Hoffmeister received the Commendable Research Paper Award for their article "Adopting Learning Analytics To Inform Postgraduate Curriculum Design" at the IFIP WG8.6 Working Conference in December 2020.

### SELECTED PUBLICATIONS

Please see <https://www.wi.uni-muenster.de/departments/groups/is/publications> for a complete list of publications.

Coombs, C., Stacey, P., Kawalek, P., Simeonova, B., Becker, J., Bergener, K., Carvalho, J. Á., Fantinato, M., Garmann-Johnsen, N. F., Grimme, C., Stein, A., & Trautmann, H. (2021). What Is It About Humanity That We Can't Give Away To Intelligent Machines? A European Perspective. *International Journal of Information Management*, 58.

Rosemann, M., Becker, J., & Chasin, F. (2021). City 5.0. *Business & Information Systems Engineering (BISE)*, 2021(1).

Halsbenning, S., Niemann, M., Distel, B., & Becker, J. (2021). Playing (Government) Seriously: Design Principles for E-Government Simulation Game Platforms. In Proceedings of the 16. Internationale Tagung Wirtschaftsinformatik (WI 2021), Essen, Deutschland.

Hermann, A., Gollhardt, T., Cordes, A.-K., & Kruse, P. (2021). PlanDigital: A Software Tool Supporting the Digital Transformation. In Proceedings of the DESRIST 2021: 16<sup>th</sup> International Conference on Design Science Research in Information Systems and Technology, Kristiansand, Norway, 356–361.

Stierle, M., Brunk, J., Weinzierl, S., Zilker, S., Matzner, M., & Becker, J. (2021). Bringing Light Into the Darkness – A Systematic Literature Review on Explainable Predictive Business Process Monitoring Techniques. In Proceedings of the European Conference on Information Systems 2021, Marrakech, Morocco.

Distel, B., Koelmann, H., Schmolke, F., & Becker, J. (2021). The Role of Trust for Citizens' Adoption of Public E-Services. In Blöbaum, B. (Ed.), *Trust and Communication. Findings and Implications of Trust Research* (pp. 163–184). Springer.

In addition, four further articles in journals, ten conference papers, three books, and two additional articles in books have been published.



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### DISSERTATIONS

Barann, Benjamin: Orchestrating E-Service Touchpoints in Brick-and-Mortar Retail

Brunk, Jens: Prediction of Business Processes – Selection and Development of Interpretable Machine Learning-based Next Activity Prediction Techniques

Heuchert, Markus: Event Information Systems – A Process and Data Reference Model for Event Management

von Lojewski, Lasse: E-Commerce und Verbundgruppen – Strukturierung von Konzepten und Unterstützung bei der Auswahl



# UNIVERSITY OF MÜNSTER DATA SCIENCE: MACHINE LEARNING AND DATA ENGINEERING

## ABOUT THE INSTITUTION

Fabian Gieseke is head of the Machine Learning and Data Engineering group and a director of ERCIS. The group's research focus is on the development of efficient implementations for modern machine learning techniques and their application to various domains such as remote sensing or smart grids and smart cities. The group is currently involved in numerous collaborations with both national and international as well as industrial partners.

## RESEARCH TOPICS

The data volumes have increased dramatically in various domains over recent years. This is the case, for instance, in remote sensing, where satellites produce data volumes in the petabyte range per year. A similar "data flood" can be observed in many other disciplines as well, including medicine, social media, finance, or in the context of modern energy systems. In most cases, the sheer data volume renders a manual analysis impossible, which necessitates the use of automatic data analysis tools.

Machine learning techniques aim at automatically extracting knowledge and have been identified as one of the key drivers for discoveries and innovation both in research as well as in industry. While machine learning methods usually significantly reduce the time needed to analyze the data at hand, processing tera- and

petabytes of data still depicts a challenging problem. A prominent example for such a computational bottleneck is the generation and application of deep neural networks: even when powerful compute servers are used, both the training as well as the testing phase can easily take weeks.

We work on reducing the practical runtime needed to process such compute- and memory-intensive tasks. For instance, we resort to high-performance computing and distributed computing to accelerate the overall analysis of the data. Another example is the development of conceptually new techniques, which only consume a fraction of the compute and memory resources but still yield high-quality models similar to those obtained via their original counterpart (e.g. "tiny" models that can be used on mobile phones or microcontrollers). The group is also involved in the development of models that are tailored to novel applications from a variety of domains.

## RESEARCH PROJECTS

The group is currently involved in collaborations with geographers (e.g., analysis of satellite time series data), municipalities (e.g. collaboration in the context of smart cities/grids), and industrial partners.

## Monitoring Changes in Big Satellite Data via Massively-Parallel Artificial Intelligence

The remote sensing field witnesses an ex-

plosion in the amount of available data. Such data allow the identification of fine details in the landscape and the recent breakthroughs in artificial intelligence (AI) facilitate application areas such as agricultural monitoring, infrastructure management, mapping forest development, and many others. Applying AI models on a global scale can become extremely time-consuming with analyses potentially taking weeks, months, or even years. This project aims at the development of highly-efficient parallel implementations for AI methods that allow to detect and monitor "changes" visible in time series satellite data. The project is supported by the Independent Research Fund Denmark (DRF) and is conducted in a close collaboration with experts from the University of Copenhagen.

## Deep Learning for Accurate Quantification of Carbon Stocks (DeepCrop)



Recent technological developments in deep learning and drone-borne LIDAR scanners have paved the way for constraining the uncertainty inherent to quantify and project ecosystems' carbon stocks. With a rising demand for biomass, DeepCrop aims to precisely measure the so-called above ground biomass and to estimate

carbon sinks in croplands and forests. The ambition is to bridge expertise of experimental scientists and computer scientists to develop novel tools for the automated processing of LIDAR data utilizing deep learning and drones. The project is conducted in collaboration with the University of Copenhagen and is supported by the Vilum Foundation and the Data+ program of the University of Copenhagen.

## Automatic Information Extraction

Structured, machine-readable information is a key input to digital business processes. Yet, this information is often hidden in unstructured business documents. In this project, we develop AI-based methods for automatic information extraction from these documents. In contrast to traditional approaches, which rely on, e.g., prescribed rule sets or hand-crafted layout templates, we develop AI models that parse information items from generic (even unseen) document layouts. To this end, we leverage recent advances in both natural language processing and graph neural networks. The resulting model architectures are trained and tested on tens of thousands of annotated documents. The project is a joint collaboration between Münster University of Applied Science, University of Münster, and d.velop, a leading provider of content services platforms.

## PUBLICATIONS

Munksgaard, P., Breddam, S., Henriksen, T., Gieseke, F., & Oancea, C. E. (2021). Dataset Sensitive Autotuning of Multi-Versioned Code Based on Monotonic Properties. In Proceedings of the 22<sup>nd</sup> International Symposium on Trends in Functional Programming (TFP), pages 3–23, Lecture Notes in Computer Science, volume 12834, Springer.

Munksgaard, P., Breddam, S., Henriksen, T., Gieseke, F., & Oancea, C. E. (2021). Dataset Sensitive Autotuning of Multi-Versioned Code Based on Monotonic Properties. In Proceedings of the 22<sup>nd</sup> International Symposium on Trends in Functional Programming (TFP), pages 3–23, Lecture Notes in Computer Science, volume 12834, Springer.

Hellweg, T., Oehmcke, S., Kariryaa, A., Gieseke, F., & Igel, C. (2021). Ensemble Learning for Semantic Segmentation of Ancient Maya Architectures. In Proceedings of the ECML/PKDD 2021 Discovery Challenge "Discovery the Mysteries of the Maya".

Dai, Y., Gieseke, F., Oehmcke, S., Wu, Y., & Barnard, K. (2021). Attentional Feature Fusion. In Proceedings of the Workshop on Applications of Computer Vision (WACV), pages 3559–3568, IEEE.

Lechtenbörger, J. (2021). Infrastructure and lightweight markup language for OER: The case of emacs-reveal (abstract). In Proceedings of the OERxDomains.

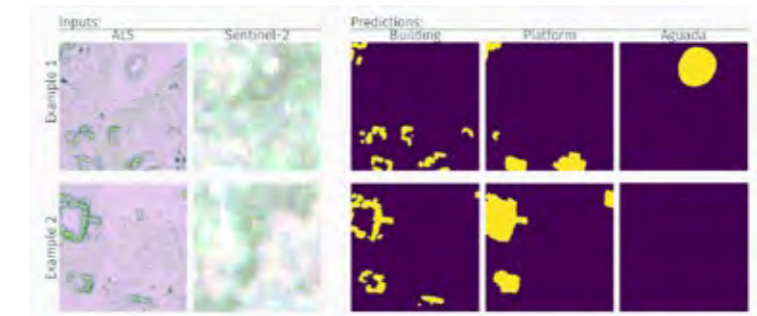
Oehmcke, S., Nyegaard-Signori, T., Grogan, K., & Gieseke, F. (2021). Estimating Forest Canopy Height With Multi-Spectral and Multi-Temporal Imagery Using Deep Learning. In Proceedings of the IEEE Big Data 2021, Virtual Event. (Accepted)

## EVENTS

In June, a workshop on "Machine Learning in Remote Sensing" took place as a virtual event with participants from the University of Münster and the University of Copenhagen.

## AWARDS

Thorben Hellweg, Stefan Oehmcke, Ankit Kariryaa, Fabian Gieseke, and Christian Igel participated in the ECML PKDD 2021 Discovery Challenge "Discover the Mysteries of the Maya" and ended up among the top-performing teams with their approach "Ensemble Learning for Semantic Segmentation of Ancient Maya Architectures", see image below.



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Philip Munksgaard, Svend Lund Breddam, Troels Henriksen, Fabian Gieseke, and Cosmin Oancea received the Best Paper Award at TFP 2021 (Trends in Functional Programming) for their work on "Dataset Sensitive Autotuning of Multi-versioned Code Based on Monotonic Properties".



## UNIVERSITY OF MÜNSTER CHAIR FOR INFORMATION SYSTEMS AND SUPPLY CHAIN MANAGEMENT



### RESEARCH TOPICS

The Chair for Information Systems (IS) and Supply Chain Management, directed by Prof. Dr.-Ing. Bernd Hellingrath, provides research contributions in the areas of supply chain as well as operations management and investigates how IS can support decision makers in these domains. A focus lies in the evolution of traditional modeling and planning methods by integrating innovative approaches, investigating the digital supply chain under different perspectives. In this context, research is fostered by a culture of internationalisation, illustrated by the growing number of international research partners and projects conducted.

### MAIN RESEARCH TOPICS

The group's research activities can be divided into three main research areas, namely **Supply Chain Digitalisation**, **Supply Chain Integration**, and **Supply Chain Security and Crisis Management**:

Within the research area of **Supply Chain Digitalisation**, the chair addresses the challenges of digitalising supply chains and investigates how organisations can exploit arising opportunities. To achieve this, the chair conducts research on topics such as digital maturity evaluation, production planning within Industrie 4.0, predictive maintenance, and data analytics-driven

performance measurement. In addition, we research how supply chain digitalisation can be facilitated through the means of computational intelligence and supply chain analytics.

The research area of **Supply Chain Integration** focuses on the cross-functional integration within a company and along the company's supply chain. Supply Chain Integration is deemed inevitable for business success and achieving sustainable competitive advantage. Hence, the group investigates and extends state-of-the-art solutions like Sales&Operations Planning (S&OP) and develops concepts to facilitate their efficient industrial applications. This includes the application of methods from enterprise architecture management and the usage of business analytics, among others.

The third research area **Supply Chain Security and Crisis Management** addresses challenges in uncertain and unsteady environments exposed to disruptive events. Our research activities are dedicated to understanding the use of IS to ensure a rigor and relevant solution design and evaluation. The goal is to provide reference models and procedures to assess current

and future scenarios by means of modeling, visualisation, analysis, and simulation. Research topics within this group currently encompass blood supply chain management, decision support systems for epidemics prevention, and the design and evaluation of humanitarian IS, among others.

### RESEARCH PROJECTS

- In the BMBF-funded project **BISKIT**, we provide a simulation-based toolkit and enterprise architecture-based models to improve the crisis resilience of the South African blood supply chain. Thereby, we aim to ensure, that the limited resource “blood” is efficiently distributed in times of crises. In various stakeholder workshops, participants from all over the world showed great interest in our results, underlining the importance of this work.

- In the Horizon 2020 funded project **STAMINA**, we provide methodological support to more than 12 trial events on pandemic management innovations. Each of the trials addresses distinct practitioner interests in the management of pandemic outbreaks. For that, innovative solutions are trialed according to a rigorous and robust evaluation approach in realistic scenarios executed jointly by practitioners, researchers, and solution providers.

- In the BMBF-funded **EpiPredict** and **Co-Predict** projects, we are using simulation-based IS to understand the interaction of

non-pharmaceutical interventions and infectious disease outbreaks with a distinct focus on the ongoing SARS-CoV-2 pandemic. Partnering up with members of the German SARS-CoV-2 Modelling Initiative, we will utilise the software to provide regular forecasts in our new DFG-funded project Spacelmpact where we will use spatial mobility and contact data to achieve more regionally granular forecasts.

- Within a DAAD and CAPES-funded **PROBRAL** project, the chair closely collaborates with researchers from the **Pontifical Catholic University (PUC)** in Rio de Janeiro, Brazil, and addresses various issues within the field of **S&OP**. Current work focuses on guiding the successful implementation and transformation of S&OP processes, e.g. by integrating data analytics, sustainability, and risk management.

- In collaboration with researchers from **PUC** and the **Global Manufacturing Research Group (GMRG)**, the chair investigates the **digital transformation of supply chains**. An ongoing international survey is covering topics like sustainability and supply chain digitalisation. The chair gives conceptual input and plans to support the data collection.

### EVENTS

- In February, PUC hosted the **International Joint Conference on Industrial Engineering and Operations Management**. In collaboration with Prof. Márcio Antonio Thomé and Prof. Luiz Felipe Scavarda, the chair shared current research in the areas of analytics-driven S&OP, S&OP's impact on sustainability, and maturity of digital supply chains.

- During the **31<sup>st</sup> Annual Conference of the Production and Operations Management Society** in April, Bernd Hellingrath and Adam Widera chaired the session “Applications of Simulation in Humanitarian Logistics”. This session aimed at providing a structured overview of the application of simulation in humanitarian logistics research and its potential to enhance humanitarian logistics practices.

- Together with the **Main School of Fire Service** in Warsaw, Poland, the chair and the Competence Center for Crisis Management (**C<sup>3</sup>M**) co-organised the first two **International Scientific Conferences on Evaluation Mechanisms in Crisis Management (CM)**. While the first edition in April covered the topic of how CM exercises can be evaluated, the second edition in June dealt with the assessment of CM innovations.

- Under the title “Logistics for a Sustainable Future – Contributions from Science”, the 10<sup>th</sup> **International Scientific Symposium on Logistics** took place in June this year. As a member of the programme committee, Bernd Hellingrath was responsible for the symposium's success. The chair contributed by sharing current research findings on the application of supply chain analytics and its industrial adoption.

### PUBLICATIONS

*Kreuter, T., Kalla, C., Scavarda, L. F., Thomé, A. M. T., & Hellingrath, B. (2021). Developing and implementing contextualised S&OP designs – an enterprise architecture management approach. International Journal of Physical Distribution & Logistics Management, Vol. 51(6), pp. 634–655.*

*Ponge, J., Enbergs, M., Schüngel, M., Hellingrath, B., Karch, A., Ludwig, S. (2021). Generating Synthetic Populations Based on German Census Data. Accepted for Publication at Winter Simulation Conference '21.*

*Lechtenberg, S., & Hellingrath, B. (2021). Digitalization's Effects on Transport Planning and Specifically the Transport Coordinator's Role. In Buscher, U., Lasch, R., & Schönberger, J. (Eds.), Logistics Management Contributions of the Section Logistics of the German Academic Association for Business Research, 2021, Dresden, Germany (pp. 33–48). Lecture Notes in Logistics. Dresden: Springer.*

### DISSERTATIONS

A Process-Centric View on Predictive Maintenance and Fleet Prognostics (*Carolin Wagner, 2021*).



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# UNIVERSITY OF MÜNSTER INSTITUTE FOR INFORMATION, TELECOMMUNICATION AND MEDIA LAW (ITM) – CIVIL LAW DEPARTMENT

## ABOUT THE INSTITUTION

The ITM is the leading Institute for Information, Telecommunication and Media Law in Germany. The Institute's work aims at exploring the legal framework and underlying policies of the information society with a particular focus on "information" as an economic and cultural good. The Institute emphasises the importance of interdisciplinary work since a proper understanding of technological or economic backgrounds is a prerequisite for successful regulation. Many activities are carried out in close cooperation with the Faculty of Economics of the University of Münster. In 2002, the ITM was appointed as Competence Centre in Information, Telecommunication and Media Law for North Rhine-Westphalia.

Dr. Thomas Hoeren is a professor of civil law at the University of Münster and has been the director of the ITM since 1997. Due to international projects such as TIMBUS, Prof. Hoeren has built a reputation as a specialist in Information Law throughout Europe.

## RESEARCH TOPICS

Our research focuses on Information Law, Telecommunication Law and Media Law, and related areas such as Copyright, Platform Regulation or E-Commerce, and Consumer Protection Law. Our current projects address the emerging subjects of Artificial Intelligence Law and Algorithms, Data Protection Law, or the Future of Legal Professions and Institutions. Since Information, Telecommunication and Media Law is characterised as a cross-sectional matter, it cannot be fully covered by any of the traditional legal disciplines by itself. The ITM, therefore, strives for interdisciplinary research and teaching activities.

## CURRENT RESEARCH PROJECTS

Currently, the ITM is involved in several EU-funded and national projects:

- **GOAL:** The GOAL ("Governance of and by Algorithms") -Project is an interdisciplinary project funded by the Federal Ministry of Education and Research. The project partners are the University of Münster, University of Kaiserslautern, Karlsruhe Institute for Technology (KIT),

Ruhr-University Bochum (RUB) and University of Hamburg. The GOAL-Project deals inter alia with the issues of algorithmic behaviour control and artificial intelligence. The aim of the project is to identify governmental, technical and regulative requirements and options for the design of comprehensive governance structures.

- **Research Center for Industrial Property Rights:** The ITM also hosts the Research Center for Industrial Property Rights, which offers training and conducts research activities in the field of Industrial Property Rights trying to connect science and economics. The Research Center is supported by an association of companies, lawyers and patent attorneys.
- **Art Law Clinic** is a project in cooperation with the Academy of Fine Arts Münster. Its basic idea is: "Law students for art students". Art students can seek the help of law students in senior classes to solve their fundamental legal problems, which occur during their academic studies. The service is entirely free and coordinated by employees from the ITM and the Academy of Fine Arts Münster. Additionally, a

legal guideline has been provided, giving students an entry point and further information on the topic of art law. By combining the inherently different but closely connected topics of law and art, the project will increase the interdisciplinary and mutual understanding between law students and art students and their respective subjects.

- **Matters of Law in the German Research Network (DFN):** The German Research Network (*Deutsches Forschungsnetz/DFN*) provides a communication network for universities and research facilities in Germany that not only connects them with one another but also with the community of research and education networks worldwide. Increasingly, the DFN-members are facing legal questions regarding liability, telecommunications, and data protection. The ITM assists in solving those challenging issues and offers general legal advice to the members.

- **Legal Information Office DH.NRW:** The Legal Information Office DH.NRW (*Rechtsinformationsstelle DH.NRW*) is a contact point for all those involved and interested in e-learning and digital teaching. In May 2020, it was established under the organizational umbrella of the Digital University of North Rhine-Westphalia today is located at the Institute for Information, Telecommunication and Media Law (ITM). Since then, the Office has provided teachers and students legal guidance concerning e-learning and teaching and continues to do so. The main focus lies on data protection law, copyright law and examination law.

- **FAIR Data Spaces:** FAIR Data Spaces is an interdisciplinary project funded by the Federal Ministry of Education and Research. Along with the University of Münster, the project partners comprise the Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (FhG) and fourteen further representatives from research and industry. The FAIR Data Spaces-Project deals inter alia

with the issues of the immaterial-legal classification of data exchanged via NFDI and Gaia-X. The project aims to establish a common cloud-based data space for industry and science by merging the two initiatives Gaia-X and NFDI.

## DISSERTATIONS/HABILITATIONS

*Johannes Baur (2020):* Die gesellschaftsrechtliche Außenhaftung für die Verbindlichkeiten von Decentralized Autonomous Organizations

*Matthias Mörike (2020):* Urheberrechtliche Zulässigkeit von Drittanbietersoftware in Online-Spielen

*Corbinian Koller (2020):* Die Einheitlichkeit der Unionsmarke im Verletzungsverfahren

*Daniel Wittig (2020):* Die produzentenrechtlichen Verkehrssicherungspflichten von Softwareproduzenten

*Jonas Völkel (2021):* Sache des Rechts oder Sache der Ehre? Autorschaft und Plagiat in der Wissenschaft

*Daniel Hußmann (2021):* Contra Dateneigentum – Analyse der Diskussion um Eigentumsrechte an Daten unter besonderer Betrachtung des Insolvenzrechts

*Armin Strobel (2021):* Reverse Engineering im Spannungsfeld des Sonderschutzrechts – Eine urheber-, patent- und lauterkeitsrechtliche Analyse des Reverse Engineering vor dem Hintergrund des harmonisierten Geheimnisschutzrechts

*Jan Niklas di Fabio (2021):* IPTV, OTT-TV und das Recht der Kabelweiterleitung – Eine urheberrechtliche Untersuchung unter besonderer Berücksichtigung der europäischen Online-Satelliten und Kabelrichtlinie

*Toshihiro Wada (2021):* Verarbeitung von Kundendaten im Wege des Asset Deals im Insolvenzverfahren

*Anton Frey (2021):* Die Aufbrauchfrist im Patentverletzungsverfahren



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*Karsten Müller (2021):* Lauterkeitsrechtliche Verantwortlichkeit der Betreiber von Bewertungsportalen – Eine Untersuchung am Beispiel von Bewertungsportalen für medizinische Behandlungsleistungen unter Berücksichtigung des „New Deal for Consumers“

*Henning Brockmeyer (2021):* Text und Data Mining – Eine rechtsökonomische Analyse der neuen Schranken im Urheberrecht

*Sabrina Seak (2021):* Grenzen der Datenübermittlungen aus der EU in Drittstaaten – Anhand des Beispiels der USA



# UNIVERSITY OF MÜNSTER CHAIR FOR IS AND INTERORGANISATIONAL SYSTEMS

## ABOUT THE INSTITUTION

Our research explores the impact of information and communication infrastructures in an organisational context. We are interested in the development of the digital organisation: how do organisations and leaders respond to the challenges and opportunities of an informed society and economy. In particular we study new modes of organising, coordination and collaboration from the micro level of work practices to the meso level of group practices and the macro level of infrastructure development.

We aim to understand the dynamics of transformation in a historical, societal, regulatory, and economic context. Our work is theoretically and empirically grounded, we employ multiple methods and research approaches with an emphasis on qualitative, interpretative approaches.

It is our research philosophy that the implications of innovative ICT become visible and understandable in the context of (communities of) practices. In order to study practices in situ, we advocate approaches, which facilitate research and experimentation in complex real world settings addressing business or societal innovation. Typically multiple stakeholders and researchers from different disciplinary backgrounds are involved.

## CURRENT RESEARCH PROJECTS

### Ambidexterity and Human Resources

Management (M. Werner, Dr. J. Stockhinger) Recent advancements in information technology have invigorated organisations to experiment, learn, and innovate with digital technologies to address new markets and customer needs (exploration). At the same time, contemporary organisations strive for higher levels of efficiency and op-

erational excellence in current businesses (exploitation). The ability to simultaneously manage both demands of exploration and exploitation is called ambidexterity.

The project examines how human resource management supports an organisation's pursuit of ambidexterity. By doing so, we aim to investigate how HR activities such as recruitment, work design, training, performance review and development help to provide a context in which employees are equipped to cope with these different stipulations of innovativeness and efficiency.

### From artifact to infra structura – The prescription as intellectual and material vantage point to the design of social infrastructure

(Dr. S. Schellhammer, P. Troglauer, in collaboration with RWTH Aachen, Philipps University of Marburg and the German Pharmacy Museum Heidelberg)



From artifact to infra structura – Example of digitizing and analyzing drug prescriptions

The historical examination of drug prescriptions in an interdisciplinary context shows that its social significance goes beyond that of a request to dispense a drug. The collaboration partners aim at revealing the social innovations and design decisions of the past inscribed in the drug prescription. Because of its unique identifiability over time, the prescription offers a unique way to bear witness to the health policy, economic, information technology, and medical innovations of the time and to provide food for thought for the future health care information infrastructure.

### Digital Transformation and the Role of Improvisation

(Dr. J. Stockhinger, M. Werner) The COVID-19 pandemic has illustrated that we live in an age of discontinuity, in which strategic planning becomes increasingly difficult. Given the environmental volatility and disruptions executives face today, reconfiguring through formal planning alone seems impossible. Instead, as firms encounter unexpected events that demand rapid actions, executives need to improvise with the means immediately at hand.

The project examines the role of organisational improvisation in strategic decision-making processes. In particular, we are interested in exploring how organisational improvisation practices affect the digital transformation process and how companies can build improvisational capabilities that support their digital transformation journey.

### Contract Design for Short-Term Software Development Outsourcing: An Empirically Supported Economic Analysis

(Dr. Cornelia Gaebert) Ms. Gaebert's paper-based PhD thesis applies New Institutional Economics as conceptual frame and a multi-method research design to explore "Short-Term Software Development Outsourcing" (stSDO). The thesis addresses two research goals:

1. To understand the distinctive properties of stSDO and
2. to find the appropriate contract type for stSDO to protect the parties' investments and to motivate and incentivise the parties to contribute to the project in a constructive manner.

She combines conceptual and empirical work based on 25 years of experience as a vendor in software development projects in Germany. The empirical papers aim at classifications (e.g., forms of contracts), while the conceptual work is partly explanatory and partly normative.

### Development of Digital Platforms in Health Care

(Prof. S. Klein, in collaboration with FU Berlin) Multi-sided platforms in healthcare often focus their business model on standardising care for wide spread, chronic diseases. However, there is a lack of knowledge on platform business models enabling individualised care coordination for patients with rare diseases. This project analyses the development of a complex platform business model addressing Amyotrophic Lateral Sclerosis, a severe neurological disease that requires the coordination of a diverse network of medical specialists, care, and equipment providers. A longitu-

dinal case study examines the platform's development, focusing subsequently on qualitative and efficient care coordination, care research, and active and direct involvement of patients, as well as establishing two business models, namely, care coordination and care research. We reconstruct how these complex platform business models were configured to improve patient care and care research, thereby creating immediate value for patients and insights for long-term care improvements. The ongoing platform development carefully balances value generation for diverse stakeholders and economic sustainability.

## SELECTED PUBLICATIONS

Avci, M., Grothusheitkamp, K., Troglauer, P., Schellhammer, S., Friedrich, C., Huwer, E., & Simon, B. (2020). Vom analogen zum digitalen Arzneimittelrezept. Eine lange Transformationsgeschichte. *Deutsche Apotheker Zeitung*, 160(43), 78–85.

Fürstenau, D., Klein, S., Auschra, C., & Vogel, A. (2021). Multi-Sided Platform and Data-Driven Care Research: A longitudinal case study on business model innovation for improving care in complex neurological diseases. *Electronic Markets*. <https://doi.org/10.1007/s12525-021-00461-8>

Gaebert, C. (2020). Contract Design for Short-Term Software Development Outsourcing: An Empirically Supported Economic Analysis. Dissertation at the University of Münster.

Gaebert, C., & Kautz, K.-H. (2021). The Contract-Type Choice for Short-Term Software Development Outsourcing: The Role of Behaviour-Based Formal Control. *Journal of Information Technology*. <https://doi.org/10.1177/0268396220967669>

Schellhammer, S., Avci, M., Troglauer, P., & Grothusheitkamp, K. (2021). Metamorphoses – Reconstructing The Imprint Of Socio-Technical Evolution On Medical Prescriptions. Poster session presented at the Annual Meeting of the Society for Social Studies of Science (4s), Toronto.



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Stockhinger, J. (2021). Studying Digital Transformation Strategy Through an Organizational Improvisation Lens. In ICIS 2021 Proceedings, Austin, Texas.

Schiffer, S., Stockhinger, J. (2021). Facing Digitalization in the Insurance Industry. The InsurTech Case of DEVK. In Digitalization Cases Vol. 2.

Troglauer, P., Avci, M., Grothusheitkamp, K., & Schellhammer, S. (2021). Von hohen Freiheitsgraden zum Ausfüllen des Massenmediums? Formalisierungsprinzipien des Arzneimittelrezeptes im Wandel der Zeit. Poster session presented at the Digital Academy: Data Stories. Wie Datafication neue Erzählformate herausfordert und Wissenschaftskommunikation befördert, Bielefeld.



## UNIVERSITY OF MÜNSTER CHAIR OF PRACTICAL COMPUTER SCIENCE

### ABOUT THE INSTITUTION

Prof. Dr. Herbert Kuchen is leading the Practical Computer Science group since 1997. He teaches in the area of software engineering, programming languages, and programming. Maintaining close collaborations with several local companies, his group is offering students the chance to write bachelor and master theses with high practical relevance.

### RESEARCH TOPICS

The research of the group focuses on selected aspects of Software Engineering and Programming. Fields of research are Testing, Model-Driven Software Development, Domain-Specific Languages, Process-Driven Applications, the Integration of Programming Paradigms, Parallel and Distributed Programming, Swarm Intelligence Algorithms, and Machine Learning.

### CURRENT RESEARCH PROJECTS

We work on different applications of Model-Driven Software Development techniques within various fields. First, based on our Domain-Specific Language modAL we introduced a model-driven approach to customising the ERP system Microsoft Dynamics 365 Business Central. We plan to expand this work in collaboration with best practice consulting AG to extend develop-

ment in SAP ERP. Second, there is ongoing research in cooperation with the Institute of Medical Informatics to ease the analysis of clinical study data. Lastly, we collaborate with the research group for Clinical Biomechanics at the Institute of Sport and Exercise Sciences to develop an application supporting the collection of study data during sports injury rehabilitation.

The research on Parallel Programming focuses on high-level frameworks based on algorithmic skeletons. It aims to minimise the expertise required to create parallel programs by abstracting, e.g. from memory allocations or the number of parallel processes started. Programs written in the framework are converted to MPI, OpenMP, or CUDA programs. For this purpose, we maintain two distinct approaches: the domain-specific language Musket and an extension to the C/C++ standard library Muesli.

The research on the Münster Logic-Imperative Language (*Muli*) has progressed to support free arrays and free objects. Free arrays are arrays the size and elements of which are of symbolic nature while free objects represent objects with a free type. Both concepts allow for new formulations of constraint satisfaction problems, object

graph generation, and automatic test case generation. The capabilities of *Muli* justify a new performant rewrite to enable the practical applications of these concepts. We furthermore aim to dedicatedly apply the concepts of *Muli* to test case generation.

Moreover, research has been done on automatically identifying data-flow relations in form of def-use chains for Java programs. This is achieved by instrumenting the Java Bytecode of the program to dynamically derive the relevant information during the execution. Currently, the approach is being extended by symbolic execution to enable the detection of those data-flow relations of the program that were missed by the execution.

Within our research on Parallel Programming (*Musket* and *Muesli*) we focused on creating efficient Skeletons for stencil operations. Especially, we target multi-node, multi-CPU, and multi-GPU environments. Future research targets multi-language support, and the optimisation for non-identical-sized data structures.

Another active research area is machine learning in organic chemistry. In close cooperation with the research group of Prof.

Glorius at the Organic Chemistry Institute, we are working on several projects for the application of machine learning in the field of organic chemistry. Our goal is to provide tools and methods that enable other researchers to perform their laboratory work in a more sustainable and time-efficient way. In addition, we are developing methods to represent molecules in order to better describe chemical problems. Due to close cooperation and interdisciplinary exchange, we have been able to establish ourselves in the field of molecular machine learning.

A new field of research is multimedia systems. We started to work around new approaches for video processing, delivery control systems as well as live streaming. Our work will be practically evaluated and applied in the emerging service educast.nrw, a video platform for Universities in the state of North Rhine-Westphalia.

### EVENTS

From September 29<sup>th</sup> to 30<sup>th</sup>, the 18<sup>th</sup> ACM SIGPLAN International Conference on Managed Programming Languages & Runtimes was organised as a hybrid event in Münster. MPLR is a premier forum for presenting and discussing novel results in all aspects of managed programming languages and runtime systems, which serve as building blocks for some of the most important computing systems around, ranging from small-scale (*embedded and real-time systems*) to large-scale (*cloud-computing and big-data platforms*) and anything in between (*mobile, IoT, and wearable applications*).

On November 18<sup>th</sup>, the Jobhub IT, the IT job fair of the University of Münster, was organised in the palace of Münster, 10 companies from the Münsterland region participated.

On December 1<sup>st</sup>, the award ceremony for celebrating the best theses in applied computer science was organised at the Chamber of Industry and Commerce (*IHK*), Münster.

### PUBLICATIONS

*de Melo Menezes, B. A., Herrmann, N., Kuchen, H., & de Lima Neto, F. B. (2021).* High-Level Parallel Ant Colony Optimization with Algorithmic Skeletons. *International Journal of Parallel Programming*, DOI <https://doi.org/10.1007/s10766-021-00714-1>.

*Gomes Pereira de Lacerda, M., de Araujo Pessoa, L. F., Buarque de Lima Neto, F., Ludermit, T. B., & Kuchen, H. (2021).* A Systematic Literature Review on General Parameter Control for Evolutionary and Swarm-based Algorithms. In Das, S., Suganthan, P. N., & Ali, M. (Eds.), *Swarm and Evolutionary Computation* (p. 100777).

*Kuchen, H., Singer, J. (2021)* MPLR '21: 18<sup>th</sup> ACM SIGPLAN International Conference on Managed Programming Languages and Runtimes, Münster, Germany, September 29–30, ACM.

*Schneid, K., Di Bernardo, S., Kuchen, H., & Thöne, S. (2021).* Data-Flow Analysis of BPMN-Based Process-Driven Applications: Detecting Anomalies across Model and Code. *ERCIS Working Papers 38*, In Becker, J., Dugas, M., Hellingrath, B., Hoeren, T., Klein, S., Kuchen, H., Trautmann, H., & Vossen, G. (Eds.).

*Schneid, K., Kuchen, H., Thöne, S., & Di Bernardo, S. (2021).* Uncovering data-flow anomalies in BPMN-based process-driven applications. In *Proceedings of the 36<sup>th</sup> Annual ACM Symposium on Applied Computing*, Republic of Korea, 1504–1512.

*Schneid, K., Stapper, L., Thöne, S., & Kuchen, H. (2021).* Automated Regression Tests: A No-Code Approach for BPMN-based Process-Driven Applications. In *Proceedings of the IEEE EDOC 2021, Gold Coast, Australia. (In press)*.

*Winkelmann, H., & Kuchen, H. (2021).* Symbolic execution of NoSQL applications using versioned schemas. In *Proceedings of the 36<sup>th</sup> Annual ACM Symposium on Applied Computing*, Republic of Korea, 1778–1787.



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*Winkelmann, H., Dageförde, J. C., & Kuchen, H. (2021).* Constraint-Logic Object-Oriented Programming with Free Arrays. In *Proceedings of the 28<sup>th</sup> International Workshop on Functional and Constraint Logic Programming, WFLP 2020, Bologna, Italien*, 129–144.

*Winkelmann, H. (2021).* Constraint-Logische Objektorientierte Programmierung mit *Muli*. In Hanus, M., & Prott, K.-O. (Eds.), *Ta-gungsband zum 21. Kolloquium Programmiersprachen und Grundlagen der Programmierung (pp. 115–125)*. Kiel Computer Science Series: Vol. 2021/7. Kiel: Department of Computer Science, Kiel University.

# UNIVERSITY OF MÜNSTER

## DATA SCIENCE: STATISTICS AND OPTIMIZATION

### ABOUT THE INSTITUTION

Heike Trautmann is head of the Data Science: Statistics and Optimization group as well as a director of ERCIS. Together with Christian Grimme she leads the ERCIS Competence Center “Social Media Analytics”. Since 2021, she is also Adjunct Professor of Data Science in the Data Management & Biometrics Group at the University of Twente, in the Netherlands. Her team contributes to the research areas of data science, artificial intelligence, social media analytics, (multi-objective) optimisation, evolutionary computation as well as automated algorithm selection and configuration in international and industrial collaborations.

### RESEARCH TOPICS

Some of the most challenging real-world problems involve the systematic and simultaneous optimisation of multiple conflicting objectives. As most of those Multi-Objective Optimization problems cannot be solved exactly, we apply optimisation techniques from Evolutionary Computation to approximate optimal compromises with special focus on multimodality.

In the context of Algorithm Benchmarking, the group evaluates the performance of nature-inspired techniques and contributes to algorithm design from an empirical as well as a theoretical perspective. Algorithm Selection deals with the selection of the best-suited algorithm for a given problem in an automated fashion. Methodologically, identified problem properties are matched to known algorithms’ performance (*Exploratory Landscape Analysis*). Artificial Intelligence and machine learning techniques, in particular deep learning and classification approaches, play a fundamental role in constructing accurate and efficient selection models. Together with the Configuration and Selection of Algorithms (*COSEAL*) research group, the team is strongly involved in this area focusing on vehicle routing and continuous optimisation.



## WIRTSCHAFTS INFORMATIK & STATISTIK

Moreover, the group is highly interested in designing automated algorithm configuration and selection strategies operating on data streams. Specifically, textual streaming data is analysed by Dennis Assenmacher, Lena Clever, Moritz Seiler, Janina Pohl, and Christian Grimme with the aim of propaganda and disinformation detection in online media (*Projects DemoRESILdigital, Moderat!, Competence Center Social Media Analytics, Topical Program Algorithmization and Social Interaction*).

### CURRENT RESEARCH PROJECTS

Hybrid – Real-time detection of disinformation campaigns in online media (<https://algorithmization.org/?p=607>, 2021-2024): The aim of the BMBF-funded joint project is to develop methods and tools, which enable experts to better assess disinformation campaigns. The partners from computer science, social science, journalism, and practice combine computational analysis with human expertise to detect, analyse, and classify disinformation campaigns.

DemoRESILdigital ([www.demoresildigital.uni-muenster.de](http://www.demoresildigital.uni-muenster.de)): “Democratic resilience in times of online-propaganda, fake news, fear- and hate speech”. This junior research group is supported by the Digital Society research programme funded by

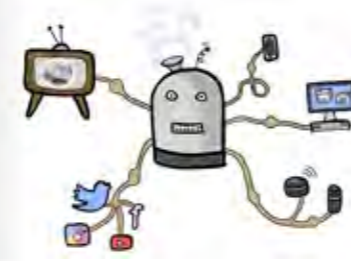
the Ministry of Culture and Science of the German State of North Rhine-Westphalia. It is associated with the Department of Communication at WWU Münster and the Data Science: Statistics and Optimization Group.

Moderat! (<https://www.moderat.nrw>) The project aims to use an integrative and interdisciplinary approach to develop software tools and a web platform that will enable operators to moderate web debates with significantly less effort. Comments will be analysed automatically, so that only a small number of critical comments have to be reviewed manually.

WWU Topical Program “Algorithmization and Social Interaction” ([www.algorithmization.org](http://www.algorithmization.org)) The topical program is an interdisciplinary and international collaboration of researchers in computer science, information systems, management, economics, social and political sciences, law and communication science. It specifically investigates how algorithmization affects individuals and society at large.

## ALGORITHMIZATION AND SOCIAL INTERACTION

Social Bots during German Elections (2021): The project is funded by the German Federal Ministry of The Interior and



investigates current technologies for realising social-bot-based campaigns. Additionally, the project investigates current social bot activities by applying a new real-time topic detection mechanism, which helps in campaign detection as a prerequisite for subsequent forensic identification of automated actors.

The group strongly supports the joint European initiative CLAIRe (*Confederation of Laboratories for Artificial Intelligence Research in Europe*, [www.clai-re-ai.org](http://www.clai-re-ai.org)) that seeks to strengthen European excellence in AI research and innovation. This year, the group played a key role in agreeing on a Memorandum of Understanding between CLAIRe and ERCIS.



### AWARDS

Pascal Kerschke was appointed as Professor of Big Data Analytics in Transportation, TU Dresden, in March 2021.

The paper “Mersmann, O., Bischl, B., Trautmann, H., Preuss, M., Weihs, C., & Rudolph, G. (2011). Exploratory landscape analysis. In Proceedings of the 13<sup>th</sup> annual conference on Genetic and evolutionary computation (GECCO), 829–836” won the 2021 ACM SIGEVO impact award. It rewards up to three papers a year that were published in the GECCO conference 10 years earlier and which are both highly cited and deemed to be seminal by the SIGEVO Executive Committee.

Lennart Schäpermeier received the CLAAS AlumniUM-Master-Award for his Master Thesis on “Multimodal Search Structures in Continuous Multi-Objective Optimization”.

### EVENTS

Invited talk series related to Topical Program “Algorithmization and Social Interaction”, were integrated in the ERCIS Lunch Time Seminar during the Summer and Winter Term.

### SELECTED PUBLICATIONS

Assenmacher, D., Niemann, M., Müller, K., Seiler, M., Riehle, D.M., & Trautmann, H. (2021). RP-Mod and RP-Crowd: Moderator- and Crowd-Annotated German News Comment Datasets, Thirty-fifth Conference on Neural Information Processing Systems Datasets and Benchmarks Track (*NeurIPS*).

Coombs, C., Stacey, P., Kawalek, P., Simonova, B., Becker, J., Bergener, K., Carvalho, J. Á., Fantinato, M., Garmann-Johnsen, N. F., Grimme, C., Stein, A., & Trautmann, H. (2021). What Is It About Humanity That We Can’t Give Away To Intelligent Machines? A European Perspective. *International Journal of Information Management*, 58.

Grimme, C., Kerschke, P., Aspar, P., Trautmann, H., Preuss, M., Deutz, A., Wang, H., & Emmerich, M. (2021). Peeking beyond peaks: Challenges and research potentials of continuous multimodal multi-objective optimization. *Computers & Operations Research*, 136.

Assenmacher, D., Weber, D., Preuss, M., Calero, V. A., Bradshaw, A., Ross, B., Cresci, S., Trautmann, H., Neumann, F., & Grimme, C. (2021). Benchmarking Crisis in Social Media Analytics: A Solution for the Data-Sharing Problem. *Social Science Computer Review*.

Bossek, J., Peng, P., Neumann, F., & Sudholt, D. (2021). Time Complexity Analysis of Randomized Search Heuristics for the Dynamic Graph Coloring Problem. *Algorithmica*, 2021.

Heins, J., Bossek, J., Pohl, J., Seiler, M., Trautmann, H., & Kerschke, P. (2021). On the Potential of Normalized TSP Features for Automated Algorithm Selection. In Proceedings of the 16<sup>th</sup> ACM/SIGEVO Workshop on Foundations of Genetic Algorithms (FOGA XVI), Dornbirn, Austria.

Schäpermeier, L., Grimme, C., & Kerschke, P. (2021). To Boldly Show What No One Has Seen Before: A Dashboard for Visualizing Multi-objective Landscapes. In Proceed-



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ings of the 11<sup>th</sup> International Conference on Evolutionary Multi-Criterion Optimization (EMO), Shenzhen, China.

Prager, R. P., Seiler, M., Trautmann, H., & Kerschke, P. (2021). Towards Feature-Free Automated Algorithm Selection for Single-Objective Continuous Black-Box Optimization. In Proceedings of the IEEE Symposium Series on Computational Intelligence (SSCI), Orlando, USA.

Clever, L., Schatto-Eckrodt, T., Clever, N., & Frischlich, L. (2021). Extremism on the Second Glance: Automated Content Analysis of Covert Propaganda on Instagram. In Proceedings of the The 3<sup>rd</sup> Multidisciplinary International Symposium on Disinformation in Open Online Media, Oxford, UK.





### ABOUT THE INSTITUTION

The Institute of Medical Informatics (IMI) is dedicated to research and teaching the full range of informatics applications in medicine. It was founded in 1973 and belongs to the Medical Faculty. Martin Dugas headed the IMI from 2009 until April 2021. Since May 2021 Julian Varghese is acting director and received his professorship for medical informatics in January 2021 at the IMI. The IMI provides lectures, seminars and courses in small groups regarding Medical Informatics for medical as well as informatics students. The institute has a long tradition regarding research on information systems in healthcare. Nowadays, the future of information systems in healthcare, specifically regarding electronic health records (EHRs), is a key research focus. Personalised medicine is built upon clinical and molecular data. IMI's research focus is on data mining and pattern recognition techniques for genomic data, in particular derived from next-generation sequencing of cancer tissue or clinical data from electronic health records or mobile health systems.

### RESEARCH TOPICS

Due to the digital revolution, the relevance of informatics within all fields of medicine is constantly rising. There is a wide scope of applications, ranging from molecular biology over clinical medicine to public health and methods from medical information systems, Machine Learning in medical data and bioinformatics in high throughput data.

The integration of clinical and molecular data, especially analysis of next-generation sequencing (NGS) in cancer research, is a well-established focus of the institute with national and international coopera-



#### An infrastructure to share medical data models

MDM-Portal (Medical Data Models) is a meta-data registry for creating, analyzing, sharing and reusing medical forms. It serves as an infrastructure for academic (non-commercial) medical research to contribute a solution to this problem. It contains forms in the system-independent CDISC Operational Data Model (ODM) format with more than 500,000 data-elements. The Portal provides numerous core data sets, common data elements or data standards, code lists and value sets. This enables researchers to view, discuss, download and export forms in most common technical formats such as PDF, CSV, Excel, SQL, SPSS, R, etc. A growing user community will lead to a growing database of medical forms. In this matter, we would like to encourage all medical researchers to register and add forms and discuss existing forms.

#### Reusing clinical metadata

Electronic forms for the documentation of patient data are a crucial part within the workflow of physicians. A huge amount of data is collected either through routine documentation forms for electronic health records (EHRs) or as case report forms (CRFs) for clinical trials. This raises major scientific challenges for health care, since different health information systems are not necessarily compatible with each other and information exchange of structured data is hampered. Software vendors provide a variety of individual documentation forms without publishing them. Currently, less than 5 % of medical forms are freely accessible. This lack of transparency impedes the harmonization processes and reuse of data models in health care. MDM is a research infrastructure for standardized data management and FAIR principles in medicine. Medical data shall be findable, accessible, interoperable and reusable ([www.force11.org/fairprinciples](http://www.force11.org/fairprinciples)). Key problems in the domain of medicine are lack of transparency regarding data models and similar, but incompatible data.

tions for many years. The rapid increase in data volumes of high-throughput sequencing in molecular medicine poses constant challenges from an informatics point of view.

The IMI is part of the nationwide Medical Informatics Initiative and established the Medical Data Integration Centre of the University of Münster to integrate primary information systems of the University Hospital in Münster for research re-use. To foster interoperability of different systems the Institute applies and researches data standards, meta data standards with utilization of medical terminologies and ontologies. Clinical Data analyses focuses on Machine Learning and several Deep Learning methods for clinical Decision Support utilizing medical time-series and mobile health devices.

### CURRENT RESEARCH PROJECTS

#### Digital Health & AI in Medicine

The largest public portal of **medical data models** is managed by the IMI of Münster and Heidelberg. It is a registered official European Research Infrastructure. To date it contains **24.000+ data models and 500.000+ data items** with semantic annotations. (<https://medical-data-models.org>)



The Smart Device System utilizes smartwatches, smartphones, tablets and advanced AI-algorithms for time-series analyses for digital neurological examination of Movement Disorders. The system is being applied in the Neurology Department of the University Hospital in Münster. (<https://smartdevices.uni-muenster.de/>)

### IT-Infrastructure in Medicine

IMI is part of the HiGHmed-Consortium, which is funded by the Federal Ministry of Education and Research. Münster is actively involved in the use case infection control: This automated early warning system will help to protect patients from new infections, but also to understand their causes and how infectious diseases spread. Moreover, the IMI provides and maintains IT-infrastructure for several large scale & international observational studies. ([www.highmed.org](http://www.highmed.org))

### Biomedical Informatics

The IMI participates in the DFG clinical research group **“Male Germ Cells: from Genes to Function” (CRU 326)**, taking care of all OMICs data analyses. The project studies male infertility by means of genomics and transcriptomics analyses, including humans as well as model organisms like zebrafish or marmoset. Well-established techniques like targeted and whole-exome sequencing are used as well as latest techniques like single-cell RNA-seq and single-cell ATAC-seq to identify new subgroups, biomarkers and therapeutic options. Integrating longitudinal data characterizing a tumor, the IMI also performs analyses on clonal evolution.

### AWARDS

**Dr. Carolin Walter:** WWU PhD Award for her studies “Benchmarking of 4C-seq pipelines based on real and simulated data” to optimize bioinformatics pipelines for 4C-seq data: <https://www.uni-muenster.de/news/view.php?cmdid=11411>.

**Marta Interlandi:** German Conference on Bioinformatics, Poster Prize for her work on “InterCellar empowers lab-scientists in the downstream analysis of cell-cell communication from single-cell transcriptomics”.

### EVENTS

The IMI has been certified by the TÜV SÜD for its quality management system in order to develop software systems for clinical decision support, genomic analyses and medical data integration.



### PUBLICATIONS

*Varghese J, Sandmann S, Ochs K, Schrempf I-M, Frömmel C, Dugas M, Schmidt HH, Volkenberg R, Tepas P-R.* Persistent symptoms and lab abnormalities in patients who recovered from COVID-19. *Sci Rep.* 2021 Jun 17;11(1):12775.

*Blitz R, Storck M, Baune BT, Dugas M, Opel N.* Design and Implementation of an Informatics Infrastructure for Standardized Data Acquisition, Transfer, Storage, and Export in Psychiatric Clinical Routine: Feasibility Study. *JMIR Ment Health.* 2021 Jun 9;8(6):e26681. doi:10.2196/26681.

*Varghese J, Alen CM van, Fajarski M, Schlake GS, Sucker J, Warnecke T, Thomas C.* Sensor Validation and Diagnostic Potential of Smartwatches in Movement Disorders. *Sensors.* 2021 Apr;21(9):3139.

*Dugas M, Grote-Westrick T, Merle U, Fontenay M et al.* Lack of antibodies against seasonal coronavirus OC43 nucleocapsid protein identifies patients at risk of critical COVID-19. *Journal of Clinical Virology.* 2021 Jun 1;139:104847.

*Reutter K, Sandmann S, Rohde J, et al.* Reconstructing clonal evolution in relapsed and non-relapsed Burkitt lymphoma. *Leukemia.* 2021;35(2):639-643. doi:10.1038/s41375-020-0862-5.



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*Wei L, Dugas M, Sandmann S.* SimFFPE and FilterFFPE: improving structural variant calling in FFPE samples. *Gigascience.* 2021;10(9):giabo65. doi:10.1093/gigascience/giabo65.

# DBIS Group

Databases & Information Systems

## UNIVERSITY OF MÜNSTER CHAIR OF COMPUTER SCIENCE – DBIS GROUP

### DISSERTATION PROJECT „FUNDAMENTAL DATA MINING TECHNIQUES FOR DECLARATIVE PROCESS MINING”

Process mining is a relatively new technology at the intersection of Business Process Management (BPM) and Data Mining. The basic idea is to use traces of process executions supported by information systems for process analysis. Thus, it represents a reverse approach compared to process modeling and the as-is analysis of a process is based on factual event data. Process mining consists of three types. One of them is process discovery where the goal is to generate a process model from given event data that describes the process executed and perform KPI analysis about it. Nearly all academic and commercial process mining tools (<https://www.processmining-software.com/>) use process models in form of graphs like BPMN or Petri nets. However, there is also the declarative paradigm where a process is described through constraints and conditions it has to meet and all other behaviour that is not touched by any constraint is allowed. Declarative modeling is especially useful for complex and loosely structured processes with many variants whose process graph representations may be large and confusing. Suitable notations like Declare already exist.

Ph.D. candidate Nico Grohmann deals with the application of fundamental data mining techniques like association rule and sequential pattern mining to process event data for declarative process discovery. The goal is to establish a routine that is easily applicable in practice and helps to shed light on relationships in processes in a transparent, straightforward way. Simultaneously, users understand how the resulting patterns and rules are transformed to model elements in a declarative modeling language like Declare. This approach may be used whenever classic process mining does not lead to satisfactory results but users still want to gain knowledge about the coherences of a process.

### PROJECT SEMINAR “PROCESS MINING IN A HOSPITAL CONTEXT”

During summer semester 2020, six students of the master IS programme did their project seminar entitled “Process Mining in a Hospital Context” in cooperation with the Business Intelligence (BI) department of the University Hospital Münster. The goal was to develop a process mining software with which the BI department can analyze diverse business processes in the hospital context. Users of the tools can get detailed insights into a given process and detect potential bottlenecks. Examples for such processes are Order-to-Cash (O2C) processes or administrative and clinical processes. The developed application implements the process discovery type and is able to generate a process model in Petri net or BPMN notation from event data input in CSV format. Furthermore, it allows an analysis of Key Performance Indicators (KPIs). Technically, the tool uses state-of-the-art technologies like the Angular and Django web development frameworks inside a Docker container. This makes it easy to extend the application and gives it a promising future for process mining activities inside the BI department.

The BI department provided event data from the internal patient transport process. With that data, the students could clearly

demonstrate the capabilities and functionalities of the tool and show how a process mining analysis and its results look like. At the end of the project seminar, the university supervisors, students and representatives of the BI department were very satisfied with the results. The process mining application is comparable to other existing tools regarding usability and functionalities. It is very likely that the BI department will use the application in practice and that it serves as a starting point for process mining activities in the university hospital.

### PROJECT SEMINAR “360°-ANALYSIS OF CAMERA SYSTEMS AND CLIENTS @XIMEA”

In Winter Semester 2020/21, the DBIS group collaborated with Ximea GmbH, a company whose mission is the development of cameras at the forefront of machine vision and imaging. Seven students of the IS Bachelor Programme were actively involved in the Project Seminar called “360°-Analysis of Camera Systems and Clients @XIMEA” (originally, “360°-Analyse von Kamera-Kunden @XIMEA”). Ximea designs, develops, manufactures, and sells leading-edge cameras to scientific and industrial markets. Google, Amazon, and NASA are among their customers. The project seminar aimed to create detailed customer profiles based on Web and Economic data for boosting marketing and sales results with real-time, data-driven insights.

As a result, the students developed a highly customized plugin for Ximea’s CRM system, a prototype of which had earlier been developed by a project seminar, where client information is shown in a Web dashboard. The data were collected from heterogeneous online sources such as Wikidata, DBpedia, Twitter, and LinkedIn. The system architecture was developed with a big-data-driven mindset, where high volumes of structured and unstructured data must be collected, integrated, and analyzed dynamically. For this reason, the development used Python, Javascript, and the Elasticsearch stack technologies. The dashboard has found its way into Xi-

mea’s day-to-day business processes, helping their collaborators on decision-making support and customer relationship management.

### PUBLICATIONS

*G. Vossen, A. Löser*: Kommerzielle Datenmärkte; in: M. Putnings, H. Neuroth, J. Neumann (Hrsg.): Praxishandbuch Forschungsdatenmanagement; Verlag De Gruyter Saur, Berlin 2021, 147–163.

*G. Vossen*: Search Engines and Algorithms; erscheint in S. Roth, H. Corsten (eds.): Handbuch Digitalisierung, Vahlen-Verlag, 2021.

*N. Grohmann, G. Vossen*: Data Science Methods for Declarative Process Mining, in: EMISA Workshop 2021 Proceedings, vol. 12, 2021.

### DISSERTATIONS

*F. Nolte*: Text to Process Model: Automating Process Model Creation from Text, Wissenschaftliche Schriften der WWU Münster, Reihe IV, Bd. 20, 2021.

*L. Homann*: Benchmarking recommender systems, 2021.

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# INTERNATIONAL PARTNERS

The associated partners are research institutions mainly from Europe, but also from around the world, that have long-standing connections with the network. All associated members are outstanding Information Systems institutions, and, more importantly, the personal relations and close ties between the researchers lead to short communication lines and reliable structures for joint research endeavours.

# VIENNA UNIVERSITY OF ECONOMICS AND BUSINESS DEPARTMENT OF INFORMATION SYSTEMS AND OPERATIONS MANAGEMENT

## ABOUT WU VIENNA

Vienna University of Economics and Business (*WU Vienna*) aims to achieve and maintain a place among the world's leading institutions of higher education. Since 2015, WU holds triple accreditation by EQUIS, AACSB, and AMBA, the three most prestigious accreditation agencies for business and economics universities, confirming the high standards of our faculty's efforts in teaching and research.

## ISOM

The Department of Information Systems and Operations Management (*ISOM*) was founded in the course of WU's organizational restructuring in 2005. Originally, it consolidated the know-how and reputation of six well-established chairs, but has grown since and consists of nine distinctive chairs now – with yet another one joining next year. Further, the ISOM faculty comprises eleven associated professors and more than 70 affiliated researchers and lecturers, conducting research and teaching with their own specific focuses, providing a broad representation of IS topics.

The ISOM department contributes to WU's bachelor's program with a major in Information Systems as well as a variety of IS

related specializations available for all branches of study. In addition, the department has the lead for two master's programs:

Our **MSc in Supply Chain Management** graduates are well prepared to design and manage the future's most competitive supply chains while also addressing economic, environmental, and social dimensions. The high quality of this well-established and prestigious transdisciplinary master's program was also confirmed by the SCM specific QS ranking, which has ranked it in 2021 as 1<sup>st</sup> in Europe and 2<sup>nd</sup> in the world.

The new interdisciplinary **Master's Program in Digital Economy**, has been launched in the winter term 2021/22 and exceptionally received by the market, ranked first across all Master programs at WU. It was designed together with a board of leading Austrian stakeholders from industry and academia to equip students with the expertise and methodological skills they need to help steer the path of digitalization. The decision-makers of tomorrow must be able to perform tasks like creating and maintaining digital ecosystems, designing new digital business areas in companies, and contributing to digitalization-driven social change.

## ISOM RESEARCH TOPICS

The ISOM chairs are incorporated in six institutes: The Institute for Data, Process and Knowledge Management conducts research in the area of business- and technology-driven innovations with a specific focus on business process management, data management, and knowledge management. The Institute for Information Management and Control's focus is on the needs of organizations and societies in regard to managing and controlling digital transformation, especially considering opportunities and risks. The research areas of the Institute for Information Systems and New Media emphasize two major areas: new media, in particular computational media, active media, polymorphic media, and information systems, in particular highly flexible systems and application engineering. The Institute for Information Systems and Society aspires to use a wide range of methods to contribute to the development of sustainable technology aspects. The institute's aim is to be a think tank for business and society that focuses on the sustainable design of information technology. The Institute for Production Management is focusing on research in the area of supply-chain management.

In December 2020 the Institute for Digital Ecosystems was newly founded, with a research focus on the digitalization of decision making in different ecosystems

as well as developing algorithms and systems to support decision makers.

The chair for Distributed Ledgers and Token Economy was established in September 2021, concentrating on the cutting-edge research in the fundamentals of blockchain technology and its applications to economics, law, business, and social sciences.

## CURRENT RESEARCH PROJECTS

**Causal Process Mining: Concepts and Tool** (*Kate Revoredo, Philipp Waibel; 2021/22*): This project explores, whether the problem behind so called Spaghetti models in process mining is fundamentally rooted in the semantic relationships that most process mining algorithms use. Based on this observation, the goal of this project is to define a novel mining approach that considers casual relations between events. Its key idea is to first semantically enrich observed execution sequences before aggregating them. The proposed foundational research project includes development of novel concepts and algorithms, their validation, and creating a tool for practical use and experimental validation.

**Erasmus+ „Developing Process Mining Capabilities at the Enterprise Level“** (*Uni Liechtenstein, WU Wien, Uni Bayreuth; 2021–2023*): Existing research on process mining is little concerned with how pro-

cess managers adopt, use, and manage process mining in practice. In particular, smaller companies are largely unaware of how they should proceed when they want to implement this technology. This project pursues three central objectives: **1.** Understand companies' needs with respect process mining adoption, use, and management. **2.** Design framework(s) to develop process mining capabilities, which support organizations in adopting, using, and managing process mining. **3.** Teach findings to professionals and students in higher education.

## SELECTED PUBLICATIONS

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*Brunk, J., Stierle, M., Papke, L., Cerqueira Revoredo, K., Matzner, M., Becker, J. 2021.* Cause vs. effect in context-sensitive prediction of business process instances. *Information Systems*. 95.

*Walser, R., W. A. Cram, E. W. N. Bernroider and M. Wiener (2021).* “Control choices and enactments in IS development projects: Implications for legitimacy perceptions and compliance intentions.” *Information & Management* 58(7): 1–16.

*Hrusovsky, M., Demir, E., Jammernegg, W., Van Woensel, T. 2021.* Real-time disruption management approach for intermodal freight transportation. *Journal of Cleaner Production*. 280 (2).

*Wachs, J., Vedres, Bs. 2021.* Does crowdfunding really foster innovation? Evidence from the board game industry. *Technological Forecasting and Social Change*. 168.

*Kirrane, S. 2021.* Intelligent software web agents: A gap analysis. *Journal of Web Semantics*. 71.



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*Grisold, Th., Groß, St., Stelzl, K., vom Brocke, J., Mendling, J., Röglinger, M., Rosemann, M. 2021.* The Five Diamond Method for Explorative Business Process Management. *Business & Information Systems Engineering*.

*E. Kušen, M. Strembeck:* Building blocks of communication networks in times of crises: Emotion-exchange motifs, In: *Computers in Human Behavior*, Vol. 123, October 2021.



## KU LEUVEN LEUVEN INSTITUTE FOR RESEARCH ON INFORMATION SYSTEMS AND PUBLIC GOVERNANCE INSTITUTE

### ABOUT KU LEUVEN

Situated in Belgium, in the heart of Western Europe, KU Leuven has been a centre of learning for nearly six centuries. Today, it is Belgium's largest university and, founded in 1425, one of the oldest and most renowned universities in Europe. KU Leuven is a research-intensive, internationally oriented university that carries out both fundamental and applied research. It is strongly inter- and multidisciplinary in focus and strives for international excellence.

Following the integration of the university colleges, the 'entire' KU Leuven counted 57,777 students as of October 2019. The largest student populations are found in the faculties of Economics and Business, Medicine, Engineering Technology, Arts, and Law. Students from approximately 163 countries study at KU Leuven.

### LIRIS

The Leuven Institute for Research in Information Systems (LIRIS), founded in 1987, coordinates research in the area of information technology and management in organizations. This research embodies: fundamental issues of information systems in organisations, applied research, and research on the use and implications of information systems throughout society. The LIRIS Faculty currently counts 8 professors, 2 postdocs and around 15 PhD researchers.

### PUBLIC GOVERNANCE INSTITUTE

The KU Leuven Public Governance Institute has as the mission to gain knowledge and insight regarding politics, administration and public policies on local, regional, federal, European and international levels. We intend to make scientific contributions to an improvement in the policy-making, organisation and management of public administrations.

The KU Leuven Public Governance Institute is an internationally oriented and interdisciplinary research institute that focusses on different aspects of public governance. Both fundamental and applied research are part of our activities, with special attention on theory, empirical research and practice. Comparative research in particular is one of our core competencies.

### RESEARCH TOPICS

The LIRIS research focuses on the entire trajectory of assessing the as-is business situation (through discovery, analysis, mining), modeling the concepts, improving the model to obtain the to-be situation, and engineering the model to an implementation. This integrated approach of models, rules, decisions, processes, structures aims at creating innovative business solutions and is referred to as Business Engineering. It combines knowledge from the fields of business administration as

well as information technology and relates it to the transformation from the industrial society into an information society, where creation, integration, processing, management and use of information and knowledge is a significant economic activity.

### Important research topics of LIRIS are:

- Analysis, modeling and architecture of information systems;
- Knowledge discovery, data and process mining;
- Architecture and infrastructure;
- Data, process and decision modeling;
- Business data, process, service, rules and decision management;
- Information strategy.

Public Governance Institute focuses on three distinguishable but partly overlapping clusters within the public governance domain:

- **Politics, citizens and policies:** this research cluster focuses on the understanding of the relationship between governments, citizens and policy practices.

- **Administrative organization and HRM:** this cluster focuses on the changes in the governmental landscape and the way in which the government handles its human capital.

- **Management of information, performance and finance:** this cluster focuses on research about methods and approaches to manage, use and exchange information by governments in the policy, management and financial cycles. This may be within as well as between administrative organizations, but also across and between governments.

### CURRENT RESEARCH PROJECTS

Research projects within LIRIS are conducted in four major areas:

- **Engineering information solutions**  
Engineering information solutions, dealing with conceptual modeling, data qual-

ity and requirements management is a first important area. It allows creating innovative solutions, based on sound modeling principles and aligned with the business. Example:

- **AM3BIT:** A multi-stakeholder multi-modelling multi-representation based approach to developing information systems, 2020–2024.

### Business processes intelligence

A second important area is the area of business processes intelligence. This includes some important new contributions to the theory of process analytics and discovery, and applies process analytics to some specific new domains (auditing, learning, service, customers and administrative processes), giving rise to auditing analytics, e-learning analytics, service analytics, etc.

- Improving the Interpretability, Bias, and Fairness of Process-Driven Decision Models, 2020–2024.

### Business decision management

Business decision management (modeling, mining and implementing decision representations and business rules) is an area with a long tradition in LIRIS. The research recently led to an industry standard, DMN (Decision Model & Notation), adopted by the OMG.

- Open Automated Decision Model Generation for Structured Standard Online Advice, 2020–2024.

### Business Analytics & Data Science

In close collaboration with a worldwide network of companies and fellow researchers, we study various research topics within the field of data science. Another key research track concerns the development of social network based analytical models for fraud detection, credit risk modeling and marketing analytics (e.g. churn prediction).

- Machine learning for fraud analytics, 2020–2024.

LIRIS



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KU LEUVEN



## KU LEUVEN LEUVEN INSTITUTE FOR RESEARCH ON INFORMATION SYSTEMS AND PUBLIC GOVERNANCE INSTITUTE

Recent research projects of Public Governance Institute are:

- Inclusive governance models and ICT for integrated public service co-creation and provision (*EC Horizon 2020, 2021–23*)
- ODECO, Towards a sustainable open data Ecosystem (*MSCA-ITN-ETN, 2021–25*)
- Interoperability framework for smart cities and communities (*European Commission, 2020–21*)
- Terra Mosana, Interreg V Euregio Meuse – Rhine, Belgium, Germany, The Netherlands (*2018–2021*)
- Digi4Fed, Digital (R)evolution in Belgian Federal Government: An Open Governance Ecosystem for Big Data, Artificial Intelligence and Blockchain (*Belspo, 2020–22*)

### LIRIS RESEARCH CHAIRS WITH INDUSTRY

The Business Information Systems group has a long tradition in industry-funded research chairs. This partnership with industry is a strong valorization of the research efforts and a good source of relevant research questions. Some current research chairs in business processes, decisions and information management:

#### ING Research Chair:

Applying deep learning on metadata as a competitive accelerator.

#### Brussels Airport Chair:

Smart airport operational analytics.

### EDUCATION

**Erasmus+:** Higher Education Joint Master Degrees – Master of Science in Public Sector Innovation and eGovernance together with Westfälische Wilhelms-Universität

Münster – University of Münster Framework and Tallinn University of Technology.

**GEOBIZ** – Business driven problem-based learning for academic excellence in geoinformatics (*Erasmus+, Western Balkan+ Moldova, 2019–22*).

**SEED4NA** – Spatial Data Infrastructure and Earth Observation Education and Training for North Africa (*Erasmus+, North Africa, 2019–22*).

### JOURNAL PUBLICATIONS

Engaging Citizens in the Smart City through Participation Platforms: A Framework for Public Servants and Developers, *Simonofski A, Hertoghe E, Steegmans M, Snoeck M, Wautelet Y, 2021, Computers In Human Behavior, vol. 124.*

robROSE: A robust approach for dealing with imbalanced data in fraud detection, *Baesens B, Höppner S, Ortner I, Verdonck T, 2021, Statistical Methods And Applications.*

Improving Teamwork in Agile Software Engineering Education: the ASEST+ Framework, *Tamayo Avila D, Van Petegem W, Snoeck M, 2021, IEEE Transactions On Education.*

Instance-Dependent Cost-Sensitive Learning for Detecting Transfer Fraud, *Höppner S, Baesens B, Verbeke W, Verdonck T, 2021, European Journal Of Operational Research.*

Shopping hard or hardly shopping: Revealing consumer segments using clickstream data, *Zavali M, Lacka E, De Smedt J, 2021, IEEE Transactions On Engineering Management.*

Digital transformation as an interaction-driven perspective between business, society, and technology, *Van Veldhoven Z, Vanthienen J, 2021, Electronic Markets.*

Deep Learning for Credit Scoring: Do or Don't?, *Gunnarsson B, vanden Broucke S, Baesens B, Óskarsdóttir M, Lemahieu W, 2021, European Journal Of Operational Research.*

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Optimization framework for DFG-based automated process discovery approaches, *Augusto A, Dumas M, La Rosa M, Leemans S, vanden Broucke S, 2021, Software And Systems Modeling.*

Redefining Profit Metrics for boosting Student Retention in Higher Education, *Maldonado S, Miranda J, Olaya D, Vásquez J, Verbeke W, 2021, Decision Support Systems, vol. 113493.*

Expert-driven Trace Clustering with Instance-level Constraints, *De Koninck P, Nelissen K, vanden Broucke S, Baesens B, Snoeck M, De Weerd J, 2021, Knowledge And Information Systems.*

Governance Assessment of a Blue-Green infrastructure project in a small size city in Belgium. The potential of Herentals for a leapfrog to Water Sensitive, *Casiano Flores, C., Vikolainen, V., Crompvoets, J., 2021, CITIES The international journal of policy and planning, 177.*

Governance assessment of UAVs' implementation to improve the land administration system in Kenya, *Casiano Flores, C., Tan, E., Crompvoets, J., 2021 Technology in Society, 66.*

A capacity assessment framework for the Fit-forpurpose land administration systems: The use of UAV in Rwanda and Kenya, *Tan E., Pattyn V., Casiano Flores C, Crompvoets J, 2021. Land Use Policy.*

Blockchain governance in the public sector: A conceptual framework for public management, *Tan E, Mahula S, Crompvoets J, 2021, Government Information Quarterly, 9(17).*

Changing stakeholder influences in managing authoritative information – the case of the Centraal Referentie Adres- Bestand (CRAB) in Flanders, *Coetzee S, Vanlshout S, Buyle R, Beyaert V, Siebritz L, Crompvoets J, 2021, Journal of Spatial Science, 66(3): 401–423.*

Governance interactions of spatial data infrastructures: an agent-based modelling approach, *Sjoukema JW, Samia J, Bregt AK, Crompvoets J, 2021, International Journal of Digital Earth, 14(6): 696-713.*



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Identifying Users' Requirements for Emergency Mapping Team Operations in Small Island Developing States: Caribbean Perspective, *Rosario Michel G, Manzano Aybar F, Neris Guzmán L, Villalta Calderón C, Jiménez Durán T, Crompvoets J, 2021, ISPRS International Journal of Geo-Information, 10(5): 307.*

# UNIVERSITY OF SÃO PAULO SCHOOL OF ARTS, SCIENCES AND HUMANITIES

University of São Paulo (copyright – Jornal da USP)

## ABOUT THE INSTITUTION

The University of São Paulo (USP), founded in 1934, is the leading institution of higher education and research in Brazil. USP is a free public university with open access to students selected for an entrance exam. USP forms a large part of Brazilian masters and PhDs and alone accounts for over 20% of all national research production, delivering on average almost 50 research papers per day. There are seven university campi in the state of São Paulo; the main campus is in the city of São Paulo, the state capital. The university has nearly 50 schools and institutes covering all areas of knowledge. There are about 250 undergraduate programs and 250 graduate programs serving almost 100,000 students.

The School of Arts, Sciences and Humanities (EACH), created in 2005, is an interdisciplinary unit of USP that brings together 11 undergraduate and 11 graduate programs in different areas of knowledge. Of these, we act in the Bachelor's in Information Systems undergraduate program, with nearly 40 faculty members, and in the Master of Science and PhD in Information Systems graduate program, with nearly 20 faculty members. Our graduate program

in information systems has two broad research lines – “systems management and development” and “systems intelligence” – both with strong appeal in applied computing.

Two other USP units with a strong presence in the information systems and applied computing area are: the Institute of Mathematical and Computer Sciences (ICMC), in the campus of São Carlos, with nearly 50 faculty members, and the School of Philosophy, Science and Literature (FFCLRP) with the Department of Computing and Mathematics, in the campus of Ribeirão Preto, with nearly 15 faculty members.

## RESEARCH TOPICS

With a total of over 100 researchers in the computing field, USP contributes research in a variety of areas, including some focused specifically on information systems. Some important research topics are: **artificial intelligence; big data; bioinformatics; bio-inspired computing; biometrics; business process management; chemistry; complex networks; computational intelligence; computational neuroscience; concurrent programming; databases; distance learning; distributed systems; economics; education; e-government; embedded systems; enterprise environments;**

**functional genomics; games; graphics processing; health; human-computer interface; internet of things; IT management; linguistics; machine learning; medical images; mobile devices; mobile robotics; multimedia interactive systems; natural language processing; pattern recognition; process mining; robotics; serious games; smart toys; social networks; software engineering; systemic biology; web systems.**

## CURRENT RESEARCH PROJECTS

### Process Mining

The quality of business processes running in organizations is of utmost importance in achieving the organization's strategic goals. This project aims to explore key machine learning and computational intelligence techniques to discover advanced process knowledge for process and organizational improvement.

### Smart Toys and Social Robots

Smart toys are becoming more attractive to children and their sales may increase considerably soon. This project seeks to propose solutions for both toy makers and privacy regulations to be ready to deal with risks posed to children's privacy when the time comes. Another possible reality soon, social and companion robots can be used to diagnose depression and anxiety in the



School of Arts, Sciences and Humanities – USP East (copyright – Natalia Dourado)

elderly in their homes and to propose activities to reduce these states, providing a better quality of life.

## EVENTS

**6<sup>th</sup> Symposium on Computing in Social Robots and Smart Toys**, Organized by P. Hung, M. Fantinato, F. Iqbal, J.-H., Morin, at the 55<sup>th</sup> Hawaii Int'l Conference on System Sciences (HICSS 2022), Jan 3<sup>rd</sup>, 2022.

## PUBLICATIONS

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# CHARLES UNIVERSITY

## FACULTY OF MATHEMATICS AND PHYSICS – DEPARTMENT OF SOFTWARE ENGINEERING

› Charles University, Faculty of Mathematics and Physics – Department of Software Engineering [www.ksi.mff.cuni.cz](http://www.ksi.mff.cuni.cz)



### ABOUT THE INSTITUTION

The natural sciences have been a part of the research teaching at Charles University since its founding in 1348.

The Faculty of Mathematics and Physics has been created by separating a part of the Faculty of Natural Sciences on 1 September 1952. Today it consists of three schools: School of Physics, School of Mathematics, and School of Computer Science.

The School of Computer Science at the Faculty of Mathematics and Physics includes eight prestigious teaching and scientific workplaces. The quality of their graduates is widely recognized. Among them are a number of top experts working as computer program developers and technological innovators. They are also successful as entrepreneurs. Members of the School of Computer Science achieve outstanding scientific results in discrete mathematics, especially in graph theory and its application in intelligent systems, optimization, programming methods, semantics and building large software systems, processing natural language, and many others.

The Department of Software Engineering focuses on research and teaching in the areas of database systems, semantic web, similarity search, bioinformatics & cheminformatics, general indexing, multimedia,

XML technologies, parallel computing, Big Data, and e-Science.

### RESEARCH TOPICS

The department consists of three research groups.

#### Similarity RETrieval Research Group (SiRet)

<http://siret.ms.mff.cuni.cz/>

SiRet was founded in 2006 at the Department of Software Engineering, Faculty of Mathematics and Physics, Charles University in Prague. SiRet deals with database methods for efficient and effective similarity search in databases of complex unstructured objects. In particular, SiRet is interested in three areas – general methods of indexing similarity (*metric and non-metric spaces*), biological applications of the similarity search, indexing image databases for content-based retrieval. The research in bioinformatics focuses on the development of software tools applicable mainly in the domain of structural bioinformatics and visualization. This includes tools for protein binding site detection, with the application in computational drug discovery, or tools for visualization of macromolecular structures. All the methods are implemented as software solutions used by thousands of users all over the world.

#### XML and Web Technologies Research Group (XRG)

The XML and Web Technologies Research

Group focuses on XML and Web technologies and their exploitation, service-oriented architectures (*design, implementation, management*), evolution, change management and adaptability of applications, efficient processing of graph data (*XML, RDF, linked data*), ontologies, Web 2.0, and semantic web services. The research group is currently mostly concerned with Big data, Linked data, and graph databases research. XRG is also focused on multi-model databases.

#### Parallel Architectures/Algorithms/Applications Research Group (PARG)

<http://www.ksi.mff.cuni.cz/parg/>

The PARG focuses on multi-core CPUs and NUMA servers programming, many-core GPUs and GPGPU computing, utilization of emerging parallel architectures (*Intel MIC, Parallela/Epiphany*), distributed computing on tightly coupled clusters, parallel data processing, concurrency in database systems, and languages (*and compilers*) for parallel processing. In general, PARG is focused on architectures, algorithms, applications in the area of high-performance computing.

#### CURRENT RESEARCH PROJECTS

The department members are involved in a number of research projects funded by the Czech Science Foundation and the Technology Agency of the Czech Republic. In the SiRet group the projects concern three scientific areas: Bioinformatics & Cheminformatics, e.g., rPredictorDB is a

predictive database of secondary structures of individual RNAs and their formatted plots. The structures are generated by template-based prediction of RNA secondary structure with experimentally identified structures as templates. Multimedia projects include a multimedia exploration framework (*creation of efficient multimedia exploration applications*) – an extensible solution for creating such applications. For example, the Sketch-based Video Browser (*or Video Hunter*) is an interactive video retrieval tool for known-item search tasks, and the project SIR (*Smart Image Retrieval*) combines traditional MPEG-7 visual descriptors with feature signatures, resulting in improved similarity search in image collections.

The XRG is involved in a project concerning multi-model data. Such data is naturally organized in different and mutually interlinked data formats and logical models, including structured, semi-structured, and unstructured ones. Conceptual modelling of multi-model data, inference of multi-model schemas, unified and conceptual querying, evolution management, and autonomous multi-model data management are investigated.

The PARG is involved in the projects Bobox and AstroPara. The Bobox parallelization framework provides a run-time environment that is used to execute a generalized (*non-linear*) pipeline in parallel. The goals of the AstroPara entail the applica-

tion of advanced methods of knowledge discovery in astrophysics, including soft-computing techniques like evolutionary design in the development of new data mining, and knowledge discovery algorithms and techniques.

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# UNIVERSITY OF TARTU

## JOHAN SKYTTE INSTITUTE OF POLITICAL STUDIES



### ABOUT THE INSTITUTION

As mentioned in the last year's report, Prof. Robert Krimmer was elected by the University of Tartu for the ERA Chair in E-Governance and started his new position in the Johan Skytte Institute of Political Studies in October, 2020. The research conducted in the Skytte Institute encompasses the main subfields of political science (*comparative politics, international relations and political theory*). The Center of IT Impact Studies (CITIS) being the research unit of the institute, is one of the few research groups in Estonia focusing on quantitative assessment and modelling of the impact of public e-services, using big data. CITIS is in turn strengthened by the ERA Chair of E-Governance and Digital Public Services, led by Prof. Krimmer, researching data-driven public innovation in addition to e-governance and public e-services.

The University of Tartu (UT), founded in 1632, is one of the oldest universities in Northern and Eastern Europe. The UT belongs to the top 1.2% of the world's best universities by ranking 285<sup>th</sup> in the QS World University Rankings 2020 and within the 251–300 range in the Times Higher

Education (THE) World University Rankings 2021. It is placed 2<sup>nd</sup> in the QS University Rankings: Emerging Europe and Central Asia (QS EECA University Rankings 2021). The university has four faculties – Arts and Humanities, Social Sciences, Medicine, Science and Technology – annually teaching around 13,000 students (*including around 1,700 international students from 90 countries*).

### RESEARCH TOPICS

ECePS ERA Chair in CITIS is an interdisciplinary research team that focuses on three main research streams:

**1. Life-event based and pro-active public digital services:** concentrating on the use of proxy data sources, e.g. logs of e-public services used to identify life-events that could pro-actively trigger public services without user action.

**2. Cross-border governance and service impact assessment:** Research focusing on the use of automated impact assessment tools to improve implementation of the Single Digital Gateway Regulation (SDGR) which mandates cross-border access to a range of public services by the end of 2023.

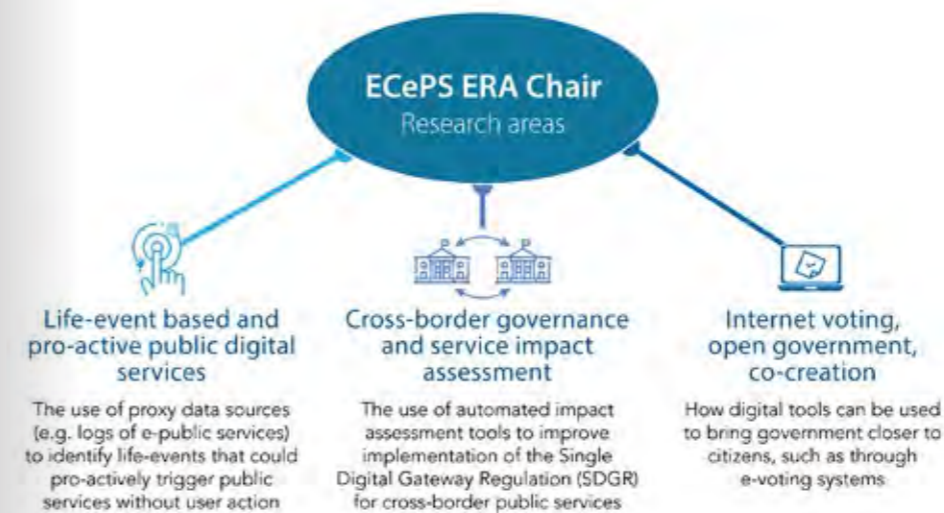
**3. Internet voting, open government and co-creation:** The ECePS team conducts research on how digital tools can be used to bring governments closer to citizens, e.g. through e-voting systems.

Our research contributes to solving the most pressing long-term challenges for Estonia and the EU, as well as to achieving the UN's Sustainable Development Goals.

### CURRENT RESEARCH PROJECTS

**ECePS ERA Chair in E-Governance and Digital Public Services.** ECePS sets out to strengthen the Center of IT Impact Studies (CITIS) at the UT, in order for the research unit to act as a world leader in the field of e-governance, public e-services and data driven public innovation.

**mGov4EU – Internet Voting as Part of Mobile Cross-Border Government Services for Europe** is developing inclusive mobile Government services in Europe, bringing those in line with EU citizens' expectations for safe, resilient and sustainable mobile communication. Key elements: innovating electronic identity management, storage of data and the exchange of electronic documents.



**CIVICS – Comprehending internet voting impact on open government:** An international comparative study will explore how the use of i-voting for e-consultations, e-referenda, and especially e-elections promotes direct, participatory, and representative democracy as well as more transparent, inclusive and accountable governance. Hosting Marie Curie funded CIVICS projects, we also welcome Marie Curie fellowship proposals.

**Machine learning and AI driven services.** The project develops machine learning (ML) and artificial intelligence (AI) powered automated decision-making support models in four societal domains – labor market, internal security, health and cybersecurity. The proposal includes: **1)** designing and creating four data driven applications in the form of minimum viable products (MVP); **2)** evaluating the impact of the MVPs on the business process of the selected public institution in their respective domain, including cost-effectiveness and efficiency; **3)** evaluating the general readiness of the state IT infrastructure to enable scalable ML and AI decision support tools in the public sector; **4)** giving a legal opinion on the usability of ML and AI tools in the public sector.

### EVENTS

The ECePS international research team kicked-off this academic year, consisting of 20 researchers, including 6 new PhD students. CITIS was involved in co-organizing the virtual E-Vote-ID conference 2021

– the leading global event for e-voting experts providing a forum for open interdisciplinary discussion on all matters related to electronic voting. The 3<sup>rd</sup> Eastern Partnership conference 'Disinformation in the Digital Age – Effects on Democracy, State and Society' will be organized in November 2021 together with the EC.

### PUBLICATIONS

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*Krimmer, Robert; Prentza, Andriana; Mamrot, Szymon; Schmidt, Carsten; (2021).* The Once-Only Principle: A Matter of Trust. In: Krimmer, Robert; Prentza, Andriana; Mamrot, Szymon; (Ed.). The Once-Only Principle (1–8). Cham: Springer International Publishing. (*Lecture Notes in Computer Science*; 12621). DOI: 10.1007/978-3-030-79851-2\_1.

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# UNIVERSITY OF TURKU TURKU SCHOOL OF ECONOMICS – INSTITUTE OF INFORMATION SYSTEMS SCIENCE

## ABOUT THE INSTITUTION

The roots of the Institute for Information Systems Science were established in 1971. Nowadays, the Institute is a part of the Department of Management and Entrepreneurship at the University of Turku. The mission of the Institute is to educate professionals who master both general management as well as Information Systems skills. In research, the Institute focuses on supporting companies and public organizations as well as the third sector in their Information Systems management. Issues at an individual, industry, national, and international level are not neglected. Furthermore, the Institute has been a pioneer in English-speaking education even at the level of the whole university, running three international master degree programs.



## RESEARCH TOPICS

Information System Science completes the sphere of Information Sciences at the University of Turku adding to the more technically / natural science -oriented work at the Department of Computing at the Faculty of Technology. Research covers widely the topics of Information Systems Science, with a focus on Governance of ICT, ICT ethics, consumer behavior in ICT, and ICT exploitation in organizational settings.

## CURRENT RESEARCH PROJECTS

The institution runs a rich portfolio of projects in different areas. The AIGA project (2020–2022) explores how to execute responsible artificial intelligence (AI) in practice. The DigiReactor project (2021–2023) supports the digitalisation of small businesses by developing competences for digital product development together with designing regional operating models. The main sponsor of the project is the European Social Fund.

## PUBLICATIONS

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## DISSERTATIONS

**University of Turku Information Systems Science Doctoral Theses 2021:**

*Peltoniemi, T.:* The digitalization of medicine supply chain.

*Zimmer, M. P.:* Digital transformation in an incumbent organisation.



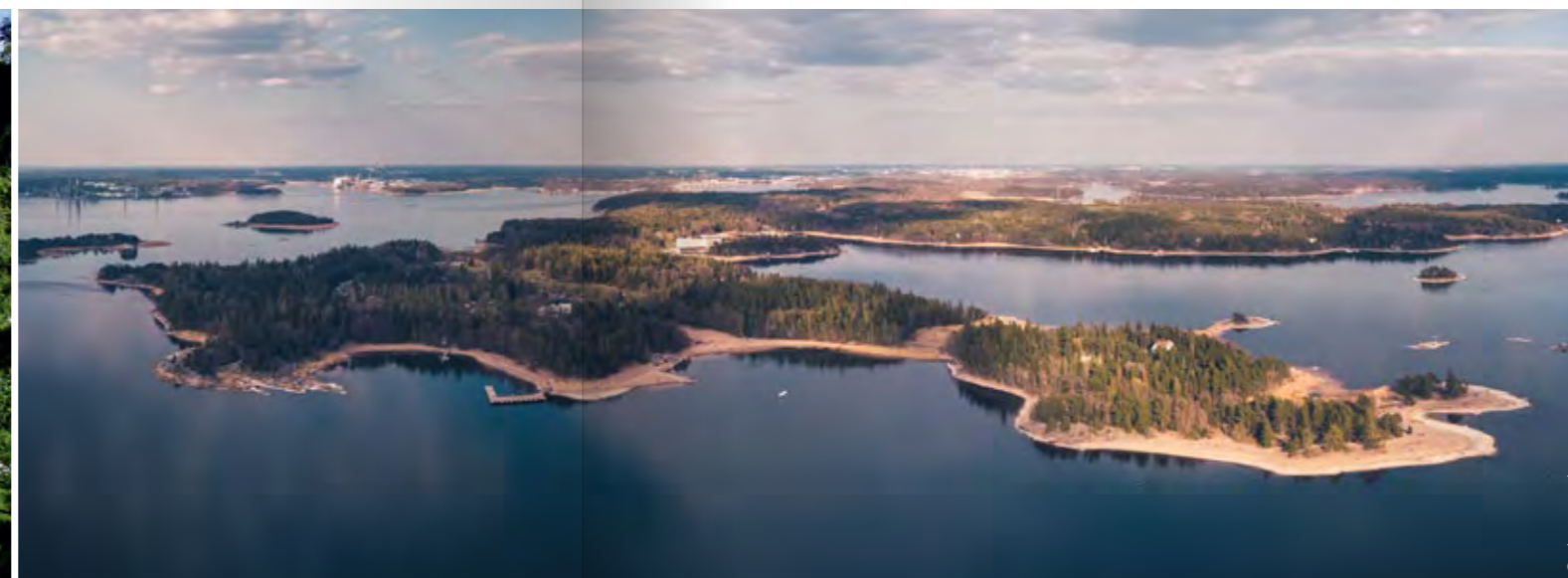
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## KEDGE BUSINESS SCHOOL DEPARTMENT OF OPERATIONS MANAGEMENT AND INFORMATION SYSTEMS (MOSI)



### ABOUT THE INSTITUTION

Founded in 1874, KEDGE is a leading French business school with four campuses in France (Paris, Bordeaux, Marseilles and Toulon), three abroad (Shanghai, Suzhou and Dakar) and three partner campuses (Avignon, Bastia and Bayonne). The KEDGE community is made up of 12,500 students (including 50% coming from abroad), 174 professors (including 51% coming from abroad), 275 international academic partners and more than 60,000 alumni around the world.

Kedge Business School offers a variety of degree programmes, from undergraduate to PhD, performed by its core faculty and also covers areas such as global responsibility, supply chain management, wine and spirits management, arts & culture management and innovation in SME. The "Operations Management and Information Systems" (MOSI) department is valued

for its competency in the area of Information and Decision Science, Supply Chain Management, Knowledge Management, Serious Games, e-business, and Organisational Learning. The main objective of the department of MOSI at Kedge Business School is to develop applied research within the following fields: ISM, procurement and supply chain management, and quality management.

### RESEARCH TOPICS

The majority of research topics currently conducted by the faculty of MOSI department includes multiple disciplines, given in the following: IS in operations management, purchasing and IS, e-distribution, e-commerce, e-business, supply chain and operations management, decision-making & decision analysis, digital transformation in supply chain, organisational learning/knowledge management/competences – communities of practices; gamification in supply chain, supply chain network design, sustainable supply chain and manufacturing, humanitarian logistics, simulation and optimisation in supply chain management, maritime transportation and port management.

### CURRENT RESEARCH PROJECTS

#### 1) Analysis of quantum computing development using dynamic communities' detection and topic modelling

A better understanding of the dynamics of the quantum computing field is the objective of this project. Basing on the view that meso-level structures, communities, play a key role in the development of scientific knowledge, networks of co-authorships for successive time windows between 1976 and 2019 have been built; for each of these networks, the communities were identified. The different events communities have been analyzed to specify how they evolve to investigate the co-evolution of knowledge and communities. If growing and merge are the key events leading to new knowledge production, the last periods are characterised by a high number of community dissolution suggesting that communities are sustainable only if they really contribute to a now structured field.

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#### 2) DESIDE – logistic chains in an uncertain world

Funded by the French National Research Agency (ANR) in 2021, this research project aims on the conception of spatio-temporal networks (STN) in stochastic and dynamic environment for modelling and managing supply chain logistics in the uncertain context. The objective of this research is related to the development of resilient logistic chains which has become urgent in the drastically changing business environment.

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#### 3) COVID-19 outbreak era – how to mitigate the disruption impacts on supply chains' resilience and robustness

This empirical study investigates the role of IS in supply chain risk management (SCRM) to mitigate the effects of disruption impacts on supply chain resilience and robustness in the context of COVID-19 outbreak. Using structural equation modeling on a survey data from 470 French firms, the results confirm the mediating role of SCRM practices and the prominent role they play in fostering supply chain resilience and robustness is emphasised.

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#### 4) VitiREV – Innovons pour des territoires VITicoles Respectueux de l'EnVironnement

The project VitiREV (2019–2024) of the total budget of 14 Mln € involves 139 professional, institutional and academic partners, and focuses on the sustainability in wine sector (including logistics and wine tourism). The virtual wine tours creation and the analysis of the impact of auditory perception (text, music, sounds of natures, noise) aim to develop a variety of innovative tools and enhance wine tourism practices and experiences.

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### PUBLICATIONS

M CHOUKI, V FERNANDES, S RUEL, B BORJA DE MOZOTA "Towards the «Digital Project Integration»: contributions of an analogical approach with the Supply Chain Integration" – Supply Chain Forum: An International Journal, 2020.

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# UNIVERSITY OF LIECHTENSTEIN INSTITUTE OF INFORMATION SYSTEMS – HILTI CHAIR OF BUSINESS PROCESS MANAGEMENT



## ABOUT THE INSTITUTION

The Institute of Information Systems at the University of Liechtenstein was founded in the early (1990s) and has grown continuously ever since. It is represented by the Hilti Chair of Business Process Management, held by Prof. Dr. Jan vom Brocke. The institute hosts two further chairs, the Hilti Chair for Data and Application Security, held by Prof. Dr. Pavel Laskov as well as the Chair for Technology and Innovation, held by Prof. Dr. Stefan Seidel.

Members of the institute have published in leading information systems journals, including MISQ, ISR, JAIS, JMIS, JIT, EJIS, ISJ, Communications of the ACM, MIT Sloan Management Review, and Management Science. The institute offers a master's degree in Information Systems with three subject areas (*Business Process Management, Data Science, and Data and Application Security*), a Ph.D. program in Information and Process Management, and a bachelor's degree in Business Administration majoring in Information Management & Information Technology. The current three years AIS Research Performance Ranking lists the institute #3 in the DACH region (*Germany, Austria, Switzerland*), #9 in Europe, and #42 worldwide.

The institute is also a co-founder of the Hilti Fellowship Program, which provides ER-CIS students with the opportunity to combine an internship at the Hilti Corporation

with a semester abroad at the University of Liechtenstein. The institute represents the Association for Information Systems (AIS) in Liechtenstein through the Liechtenstein Chapter of the AIS (LCAIS), which was recognised as Outstanding Chapter of the AIS for the seventh consecutive year in 2020.

## RESEARCH TOPICS

Our research addresses information systems from four complementary perspectives (*in alphabetical order*):

- **Data** – Data science focuses on capabilities to harvest and analyse data as a key enabler for improving and innovating processes as well as services, products, and business models.
- **Innovation** – Digital innovation focuses on the transformative power of digital technologies to create new IT-enabled products, processes, and business models.
- **Processes** – Business process management takes an innovation-driven and value-oriented perspective on business processes to identify and evaluate the business potential of information and communication technologies in contemporary organisations.
- **Security** – Data and application security focuses on the development of reactive and proactive security mechanisms.

## CURRENT RESEARCH PROJECTS

**Erasmus+ Project: Developing Process Mining Capabilities at the Enterprise Level**

Together with the University of Bayreuth, and the Vienna University of Economics and Business, the University of Liechtenstein is working on this project. Digital technologies support, replace or augment human work, and they require special skills and competencies by those who use them. Hence, our work intends to support practitioners, and future students, in understanding, estimating, and managing the implications of process mining.

## Liechtenstein Research Fund: Towards a Science of Processes. Conceptual and Methodological Foundation

Since the only constant in our today's world is change, the University of Liechtenstein together with ERCIS partners, proposed the establishment of Process Science, which is concerned with understanding and influencing change. It entails discovering and understanding processes as well as designing interventions to shape them into desired directions.

## EEA Grant: Advancing Human Performance in Cybersecurity, ADVANCES

Together with (ERCIS) partners from Lithuania, Norway, Latvia, Estonia, the University of Liechtenstein is part of the project, which aims to develop a comprehensive, science-based interdisciplinary framework to develop and assess generic and subject-related competences of the current and future cybersecurity workforce. Among others, the project will result in the creation of a set of methodologies and tools that will include specific software components to gather and analyse data.

## AWARDS

**World Scientist and University Ranking 2021:** Prof. Dr. Jan vom Brocke has been listed in World Scientist and University Ranking 2021 among the top 1% most cited researchers in Europe across all fields of science (#2288 out of 216537), ranked #25183 worldwide (out of 699268), and #1 for Liechtenstein.

**AIS Outstanding Chapter Award 2020:** In 2021, the Liechtenstein Chapter of the AIS (LCAIS), received the AIS Outstanding Chapter Award 2020 for achievements in research, teaching, and knowledge transfer. The LCAIS is among the 41 AIS Communities to earn the designation of Outstanding SIG, College or Chapter for 2020.

**BPM 2021 Case Innovation Award:** Prof. Dr. Jan vom Brocke, Dr. Thomas Grisold and Manuel Weber have been awarded the BPM 2021 Case Innovation Award for the research paper "A Matrix for Context-Aware Business Process Management: Empirical Evidence from Hilti", presented at the 19<sup>th</sup> International Business Process Management Conference 2021 (*Industry Forum*) in Rome, Italy.

**AIS Best Information Systems Publications Award:** Prof. Dr. Stefan Seidel received together with his co-authors Nicholas Berente (*University of Notre Dame, USA*) and Hani Safadi (*University of Georgia, USA*) the "AIS Best Information Systems Publications Award" for the article "Data-driven computationally intensive theory development" published in the Information Systems Research journal.

**Digital Leader 2020:** For the year 2020, Prof. Dr. Jan vom Brocke and Prof. Dr. Pavel Laskov have been appointed "Digital Leader 2020" by the initiative Digital Liechtenstein, for taking an active role in the development of Liechtenstein and its region towards an innovative ecosystem for digital innovation and transformation.

## PUBLICATIONS

*Gerster, D., Dremel, C., Conboy, K., Mayer,*

*R., & vom Brocke, J. (2021). How Fujitsu and Four Fortune 500 Companies Managed Time Complexities Using Organizational Agility. MIS Quarterly Executive (MISQe), 20(2), 127–150.*

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*Govindarajan, V., Srivastava, A., Grisold, T. & Klammer, A. (2020). COVID-induced opportunity to selectively unlearn past practices. California Management Review Insights: <https://cmr.berkeley.edu/2020/10/selective-unlearning/>*

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## DISSERTATIONS

*Michael Reiner Kamm: „IoT Technologies and Advanced Data Analytics as Enablers of Data-Driven Processes“.*

*Peyman Badakhshan: “Value Creation with Business Process Management”.*

# KAUNAS UNIVERSITY OF TECHNOLOGY

## DEPARTMENT OF INFORMATION SYSTEMS /

### CENTRE OF INFORMATION SYSTEMS

#### DESIGN TECHNOLOGIES



#### ABOUT THE INSTITUTION

The Department of Information Systems at the Kaunas University of Technology (KTU) was founded in 1993 as a result of more than 20 years of research in the field of information systems (IS). Since then, we have grown to become one of the leading departments in the KTU Faculty of Informatics. In 2012, the Department's Laboratory of Information Systems and Databases Design was restructured into the Centre of Information Systems Design Technologies (headed since by prof. R. Butleris). In 2014, the Center has been expanded as part of the move to the newly established Integrated Science, Studies and Business Valley "Santaka". As of autumn 2021, the Department and Centre combined employed over 30 researchers and teachers. Over the years, we established good relationships with the local IT companies and accumulated valuable research experience with Lithuanian and international partners.

Our academic work is about providing quality education on fundamental and ad-

vanced subjects in the field of information systems. The Department has developed first and second cycle study programmes titled "Information Systems" and "Information Systems Engineering" respectively. For the 2021–2022 study year, 33 new students were admitted to the Bachelor study programme, and 10 – to the Master's. There were also 8 PhD students at the Department.

#### RESEARCH TOPICS

The KTU Department of Information Systems / Centre of IS Design Technologies specialize in areas related to Information Systems and Software Engineering, namely:

- Model driven development, model-to-model transformations
- Computer aided software engineering (CASE) technologies
- Conceptual modeling and databases
- Modeling of business processes, business vocabularies, and business rules
- User needs analysis and requirements modeling
- Ontologies and solutions for the Semantic Web
- Big data and business intelligence
- Knowledge based systems
- Model-driven testing of information systems

- Project management
- Information systems user interface and usability
- Machine learning
- Blockchain technologies

#### SELECTED RESEARCH AND DEVELOPMENT PROJECTS

- Modernization and Development of the Lithuanian State Forest Inventory Information System (2021–2022). Funded by the Lithuanian State Forest Survey Service.
- The Model for Estimation of Feasibility of Resource Recovery from Landfills and its Evaluation in Lithuanian Conditions (2021–2022). Commissioned by the Kaunas Region Waste Management Center.
- Enterprise Financial Performance Data Analysis Tools Platform (AIFA) (2020–2022). Funded by the EU Structural Funds, Investment Action Programme measure "Smart FDI", project coordinator – JSC "Intellerts".
- Development of Measures to Increase Efficiency of the Public Sector Buildings Life-Cycle by Applying Building Information Modeling – BIM-LT (2019–2022). Funded by EU structural funds. The project is carried out in cooperation with the Vilnius Gediminas Technical University as well as several Lithuanian public institutions and



coordinated by the Ministry of Environment of Lithuania.

- Development of Data Management Web Services for the Lithuanian State Forest Cadastre (2020–2021). Funded by the Lithuanian State Forest Survey Service.
- Smart homes and intelligent agents for improved physical and mental well-being (SOAR) (2020–2021). Funded by the European Regional Development Fund. Coordinated by the Chalmers University of Technology and carried out in partnership with Halmstad University and University of Oslo.
- National Information Impact Identification and Analysis Ecosystem (NAAS) (2020–2021). Funded by the European Union Funds Investment Operational Program and coordinated by the National Agency for Science, Innovation and Technology (MITA).
- Modeling of the System for Financial Data Analytics, Business Rules, and Decision Management in Enterprises (2020–2022). Commissioned by JSC "Kvantas".
- Development of the Artificial Intelligence and Statistical Models Ensemble Construction Algorithm (2019–2021). Commissioned by JSC "RIVILÉ".

#### EVENTS

The 27<sup>th</sup> International Conference on Information and Software Technologies took place on October 14–16, 2021, in Kaunas, Lithuania. ICIST is organized annually by the Faculty of Informatics of Kaunas University of Technology and is chaired by the professor Audrius Lopata of the Department of Information Systems.

#### PUBLICATIONS

- Bankauskaitė, J., Morkevičius, A., Butleris, R. (2021). Model-based evaluation of the system of systems architectures used to perform trade studies and sensitivity analyses. IEEE access, Piscataway, vol. 9, 114609–114621.*
- Drungilas, V., Vaičiukynas, E., Jurgelaitis, M., Butkienė, R., Čeponienė, L. (2021). Towards blockchain-based federated machine learning: Smart contract for model inference. Applied sciences, Basel : MDPI, vol. 11, iss. 3, 1–21.*
- Jurgelaitis, M., Drungilas, V., Čeponienė, L., Vaičiukynas, E., Butkienė, R., Čeponis, J. (2021). Smart contract code generation from platform specific model for hyperledger Go. WorldCIST' 21 conference proceedings, Cham : Springer, 63–73.*
- Skersys, T., Danėnas, P., Butleris, R., Ostreika, A., Čeponis, J. (2021). Extracting SBVR*



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*Vaičiukynas, E., Danėnas, P., Kontrimas, V., Butleris, R. (2021). Two-step meta-learning for time-series forecasting ensemble. IEEE Access, Piscataway, vol. 9, 62687–62696.*

#### DISSERTATIONS

*Donatas Mažeika (2021): Model-Based Systems Engineering Method for Creating Secure Systems.*



## UNIVERSITY OF AGDER DEPARTMENT OF INFORMATION SYSTEMS



### ABOUT THE INSTITUTION

The Department of Information Systems (IS) is one of four departments within the Faculty of Social Sciences at the University of Agder (UiA). With an academic staff of 28 permanent positions and 4 adjunct professors, this is one of the largest IS departments in Norway.

The department offers a three-year bachelor's programme in IT and Information Systems, a one-year undergraduate study in IT and Information Systems, and a two-year master's programme in Information Systems which started in 1999 as the first IS master programme in Norway. In addition, a two-year joint master's programme in Cybersecurity was established in 2019. The department does also offer a three-year PhD programme in Information Systems which currently has 14 research fellows enrolled.

The Department of Information Systems contributes actively to the IS community by publishing in leading IS journals, and hosting and participating in international conferences.

### RESEARCH TOPICS

The research in the Department of IS is mainly organized in three interdisciplinary centres:

**Centre for Digital Transformation (CeDiT)** conducts advanced social science research on the relationships between digital technologies and societies, organizations, and individuals. CeDiT applies disciplinary, multidisciplinary, and interdisciplinary approaches and draws on a wide range of theories from social science.

**Centre for eHealth** carries out user-centered research focusing on co-creation in telemedicine and welfare technology. The aim of the centre is to make everyday life easier in today's health society by developing technological solutions such as smart house solutions and digital home-care services.

**Centre for Integrated Emergency Management (CIEM)** focuses on technology-based innovation for societal resilience. CIEM conducts research in collaboration with emergency stakeholders and focuses on community resilience and crisis communication, information sharing for situational awareness, technological advancements to support humanitarian aid, cybersecurity, and new technologies for emergency

management operations (e.g., drones, robotics, and augmented reality).

### CURRENT RESEARCH PROJECTS

The Department of IS at UiA is involved in several research projects. The following describes a few examples of current projects led by researchers at the department.

**AI4Users (2020–2024)** is a project funded by the Research Council of Norway addressing the “black box” problem contributing to the responsible use of AI when digitalizing public services. The novelty of AI4Users is that it targets specifically non-experts extending the reach of research beyond data scientists.

**Digitalizing public welfare services (2021–2024)** is a project funded by the Research Council of Norway. The objective is to identify public services suitable for digital communication.

**Virtual Open Innovation Lab (VOIL) (2020–2021)** is an ERASMUS + project. The project aims at developing resources to support the learning of emerging technologies and

assess their potential for digitally transforming SMEs and micro-enterprises.

**Sharing incident and threat information for common situational understanding (INSITU) (2019–2022)** is a project funded by the Research Council of Norway. INSITU will develop knowledge and solutions for effective information sharing among emergency responders in complex operations requiring collaboration between several agencies.

**Covid19 Network Technology based Responsive Action (CONTRA) (2020–2021)** is a project funded by the Research Council of Norway. CONTRA aims to develop a decision support system for pandemic responders to design a supply chain for Covid-19 vaccines that is effective, efficient, sustainable, and fair.

**Digital Infrastructure for Robust and Scalable Patient Monitoring in Pandemic Response Situations (DIPAR) (2020–2022)** is a project funded by the Research Council of Norway. The aim is to provide digital homecare for patients with Covid-19 infection. The project expanded an existing solution for digital follow-up of residents with chronic illnesses.

### EVENTS

**InfraHealth 2021:** Digitalization and Personal Health Data was hosted by UiA in September 2021. The conference is the 8<sup>th</sup> International Conference on Infrastructures in Healthcare. The focus is on personal health data and their use through new types of applications, and the use of AI and new types of work processes.

### PUBLICATIONS

*Ajer, A. K. S., Hustad, E., & Vassilakopoulou, P. (2021).* Enterprise architecture operationalization and institutional pluralism: The case of the Norwegian Hospital sector. *Information Systems Journal*, 31(4), 610–645.

*Busch, P. A., Hausvik, G. I., Ropstad, O. K., & Pettersen, D. (2021).* Smartphone usage

among older adults. *Computers in Human Behavior*, 121, 106783.

*Danielsen, F., Olsen, D., & Framnes, V. A. (2021).* Toward an Understanding of Big Data Analytics and Competitive Performance. *Scandinavian Journal of Information Systems*, 33(1), 155–192.

*Garmann-Johnsen, N. F., Olsen, D. H., & Eikebrokk, T. R. (2021).* The Co-creation Canvas. *Procedia Computer Science*, 181, 189–197.

*Hasan, S. K., & Gjørseter, T. (2021).* Screen Reader Accessibility Study of Interactive Maps. In *International Conference on Human-Computer Interaction* (pp. 232–249). Springer.

*Lindgren, I., Melin, U., & Sæbø, Ø. (2021).* What is E-Government? Introducing a Work System Framework for Understanding E-Government. *Communications of the Association for Information Systems*, 48(1), 503–522.

*Pappas, I. O., & Giannakos, M. N. (2021).* Rethinking Learning Design in IT Education During a Pandemic. *Frontiers in Education*, 6, 652856.

*Pappas, I. O., & Woodside, A. G. (2021).* Fuzzy-set Qualitative Comparative Analysis (fsQCA): Guidelines for research practice in Information Systems and marketing. *International Journal of Information Management*, 58, 102310.

*Radianti, J. (2021).* Experimental Command and Control Center for Crisis and Disaster Management: A Living-Lab Approach. In *Emerging Technologies for Disaster Resilience* (pp. 201–227). Springer.

*Shahi, G. K., Dirkson, A., & Majchrzak, T. A. (2021).* An exploratory study of covid-19 misinformation on twitter. *Online social networks and media*, 22, 100104.

*Steen-Tveit, K., & Munkvold, B. E. (2021).* From common operational picture to



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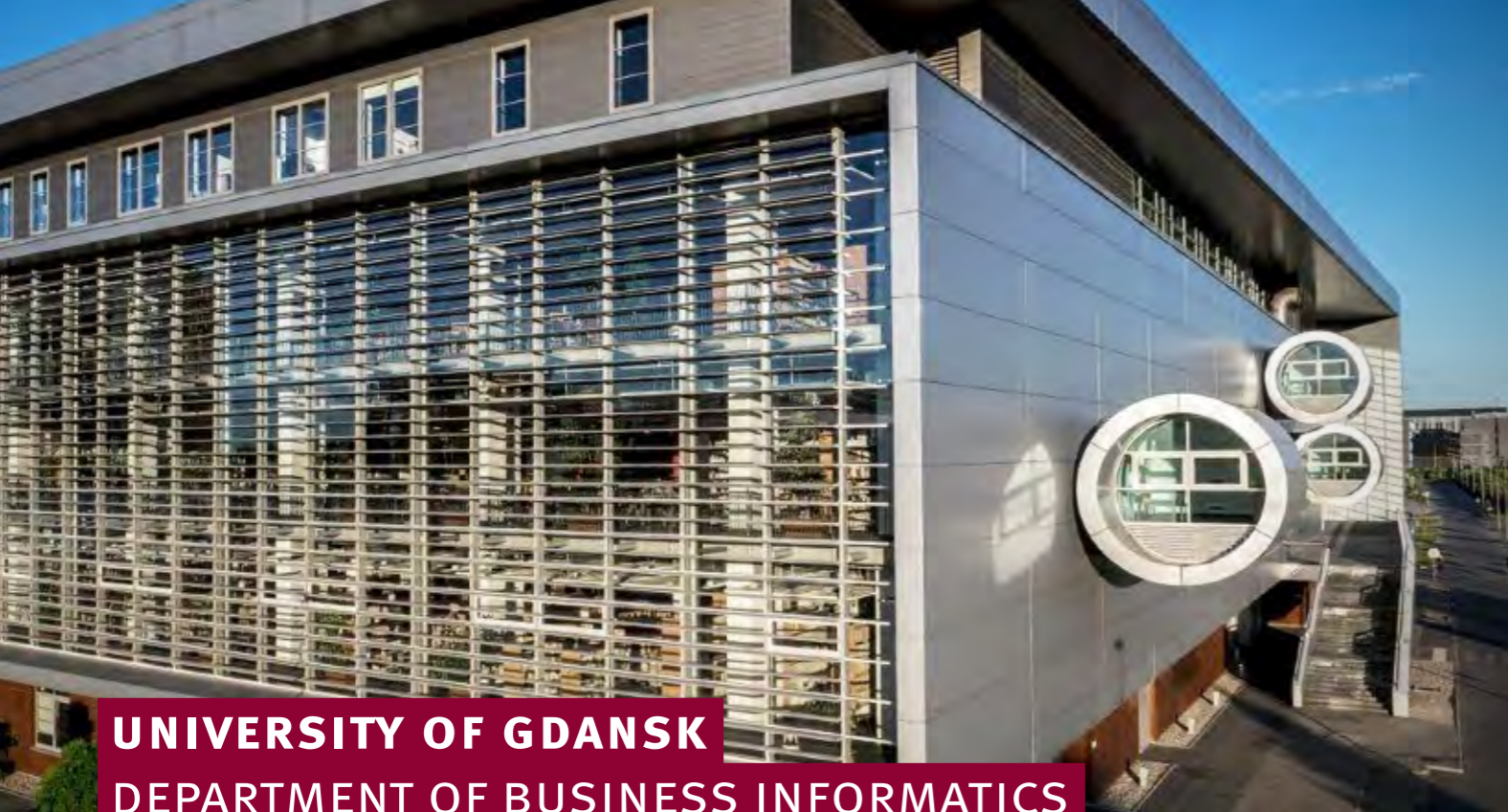
common situational understanding: An analysis based on practitioner perspectives. *Safety Science*, 142, 105381.

*Vassilakopoulou, P., & Hustad, E. (2021).* Bridging digital divides: A literature review and research agenda for information systems research. *Information Systems Frontiers*, 1–15.

### DISSERTATIONS

*Bui, N. N. (2021).* Implementation of Building Information Modelling in Infrastructure Construction: Lessons from Norway and Vietnam.

*Rahman, M. T. (2021).* Supporting Humanitarian Relief Distribution Decision-Making under Deep Uncertainty. *A System Design Approach*.



## UNIVERSITY OF GDANSK DEPARTMENT OF BUSINESS INFORMATICS



### UNIVERSITY OF GDANSK

#### ABOUT THE INSTITUTION

With 21,958 students, 11 faculties, and 1,767 academic staff members, the University of Gdansk is the largest institution of a higher education in the Pomeranian, Poland. It offers the opportunity to study in 89 different fields of studies with more than 270 specialisations.

The Department of Business Informatics (BI) of the University of Gdansk is involved in research and teaching in the field of Business Informatics on the Bachelor, Master, Post-Diploma, and Doctoral levels. For 20 years, the Department of Business Informatics has been running the Pomeranian Regional Academy Cisco, educating hundreds of computer network administrators with professional skills confirmed by international Cisco certificates.

As far as teaching is concerned, some of the Departments' academic manuals are bestsellers in Poland, like 896 pages book "Business Informatics. Theory and

Applications.", PWN, 2019 (*in Polish*). This book was awarded in the Competition of Polish Society for Informatics, for the best informatic book of 2019. The Department is also active internationally, organising conferences including the 10<sup>th</sup> European Conference on Information Systems (*ECIS 2002*) titled "Information Systems and the Future of the Digital Economy", The 7<sup>th</sup> International Conference on Perspectives in Business Informatics Research (*BIR 2008*), The 8<sup>th</sup> International Conference on European Distance and E-learning Network (*EDEN 2009*), and the series of events re-branded now as EuroSymposium on Digital Transformation. The Department is the associate partner of the European Research Center for Information Systems (*ERCIS*) consortium, from 2004.

In the years 2013–2017, the Department of Business Informatics of University of Gdansk participated in the World IT Project (*S. Wrycza and D. Gajda*), regarding ITOC – Occupational Culture of IT in various civilisation areas, coordinated by University of North Carolina, USA. In 2019 the summarising publication 552 pages book entitled "The World IT Project. Global Issues in Information Technology", World Scientific-Now Publishers, 2020, was published. In the succeeding chapters, the outcomes of research from 37 countries are presented.

The Department is involved in the following international and research initiatives:



**Polish Chapter of Association for Information Systems – PLAIS** was awarded five times by AIS as the outstanding chapter – in 2014, 2016, 2017, 2018, and 2019. Polish Chapter of AIS – PLAIS was established in 2006 as the joint initiative of Prof. Claudia Loebbecke, University of Cologne, Germany, former President of AIS and Prof. Stanisław Wrycza, University of Gdansk, Poland. PLAIS co-organises international and domestic conferences on Business Informatics and now on Digital Transformation. There is a very dynamic and creative Gdansk AIS Student Chapter at the Department of Business Informatics, one of only few European AIS Student Chapters. Student teams of this branch are awarded annually in the global AIS Competition for students for their projects and works in 2015–2020, successively at: University of Alabama (2015), Indiana University (2016), Birgham Young University (2017), University of Texas in Dallas (2018), and Illinois State University (2019 – 1<sup>st</sup> place). Gdansk

AIS Student Chapter gained the title of Best New Chapter Award for the years 2015–2016 and in 2017 the title of Outstanding Fundraising Award for AIS Student Chapter. Each yearly Student Competition is connected with the advanced Annual AIS Student Chapter Leadership Conference.



The Annual International Conference on Perspectives in Business Informatics Research – BIR.



**NTIE** (*Naukowe Towarzystwo Informatyki Ekonomicznej*) – Polish Society for Business Informatics Research.

#### RESEARCH TOPICS

The areas of research interest at Department of Business Informatics cover the following theme:

- Agility
- Big Data
- Business Informatics
- Business Processes Modelling
- Digital Transformation
- ERP, CRM, SCM, WFM, BI Systems
- Information Systems Development
- ICT Global Development
- IT Acceptance Research
- SCRUM
- Social Media Analytics
- UML and SysML

#### CURRENT RESEARCH PROJECTS

Development and launch of Master Studies on Business Informatics (*in English*) at the Faculty of Management of University of Gdansk in the academic year 2021–2022 in intensive cooperation with SUA – SAP University Alliance including alliances, its rich educational e-learning resources.

#### PUBLICATIONS

##### Edited books

*Wrycza, S., & Maślankowski, J. (Eds.). (2021). Digital transformation: 13<sup>th</sup> PLAIS EuroSymposium on Digital Transformation, PLAIS EuroSymposium 2021, Sopot, Poland, September 23, 2021: proceedings. (S. Wrycza & J. Maślankowski) Lecture Notes in Business Information Processing. Cham. <http://doi.org/10.1007/978-3-030-85893-3>*

##### Journal articles

*Marcinkowski, B., & Gawin, B. (2021). Data-driven business model development – insights from the facility management industry. Journal of Facilities Management, 19(2), 129–149. <http://doi.org/10.1108/JFM-08-2020-0051>*

*Ostrowski, P., Wrycza, S., Gajda, D., & Marcinkowski, B. (2021). Decision factors behind cisco networking hardware acceptance in business environments. Journal of Theoretical and Applied Electronic Commerce Research, 16(4), 1097–1119. <http://doi.org/10.3390/jtaer16040062>*

##### Monograph articles

*Krauze-Maślankowska, P. (2021). Open data and smart city initiatives for digital transformation in public sector in Poland. A survey. In S. Wrycza & J. Maślankowski, S. Wrycza & J. Maślankowski (Eds.), Digital transformation: 13<sup>th</sup> PLAIS EuroSymposium on Digital Transformation, PLAIS EuroSymposium 2021, Sopot, Poland, September 23, 2021: proceedings (pp. 71–81). [http://doi.org/10.1007/978-3-030-85893-3\\_5](http://doi.org/10.1007/978-3-030-85893-3_5)*

*Jatkiewicz, P., & Konkel, M. (2021). Rola związków zawodowych w konflikcie pracowniczym. In M. Stanisławska & W. Zaborowski, M. Stanisławska & W. Zaborowski (Eds.), Prawo i administracja: w poszukiwaniu optymalnych rozwiązań (pp. 75–89).*

*Jatkiewicz, P. (2021). Wybrane aspekty zarządzania bezpieczeństwem danych osobowych. In M. Tomczyk & K. Kwiecień, M. Tomczyk & K. Kwiecień (Eds.), Ekonomia i zarządzanie wobec wyzwań współczesnego świata (pp. 91–103).*



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#### Conference materials

*Kuciapski, M., Lustofin, P., & Soja, P. (2021). Examining the role of trust and risk in the Software-as-a-Service adoption decision. In Proceedings of the 54<sup>th</sup> Hawaii International Conference on System Sciences (pp. 4693–4702). University of Hawaii. Lustofin Paweł, Soja Piotr, Kuciapski Michał: Investigating the role of business-IT alignment in the software-as-a-service adoption decision: a preliminary model, in: AMCIS 2020: Proceedings, 2020, Association for Information Systems, ISBN 978-1-7336325-4-6, pp. 1–11, Article number:21.*

*Marcinkowski, B., & Gawin, B. (2021). Organizational vs technical excellence. What fosters IT projects in Pan-European setting? In AMCIS 2021 Proceedings (pp. 1–10). Association for Information Systems.*

# WROCLAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

## DEPARTMENT OF APPLIED INFORMATICS

### ABOUT THE INSTITUTION

The Department of Applied Informatics (DAI), chaired by Professor Ngoc Thanh Nguyen, is a part of the Faculty of Information and Communication Technology at the Wrocław University of Science and Technology. The Faculty of Information and Communication Technology (FICT), the largest institution of this type in Poland, was officially opened on 15 September 2021 at Wrocław University of Science and Technology. FICT consists of 12 fields of study and as many as 5,000 students, 8 departments and 400 academic teachers. The new faculty will conduct research in the rapidly developing fields of computer science related to Industry 4.0. As a result, it will be able to provide students with modern didactic tools that respond to socio-economic needs. The faculty will conduct both basic and implementation research, focused on active cooperation with economic entities and on the commercialisation of results. In the 2021/2022 academic year, twelve fields of study will be launched, covering the entire scope of ICT.

Our department currently consists of 52 computer science scientists and 10 Ph.D. students. We regularly co-organize three international scientific conferences: Asian Conference on Intelligent Information and Database Systems (ACIIDS), International Conference on Computational Collective Intelligence (ICCCI), and International Conference on Multimedia and Network Information Systems (MISSI). We also teach students of the Faculty of Information and Communication Technology at two levels of education: three-and-half-year bachelor's degree and one-and-half-year master's degree. Our Department offers two specialisations for full-time study programme in the field of Computer Science. We supervise PhD candidates conducting

research in areas linked to our work. Since 2021, we are taking part in creating an AI Centre of Excellence at the Wrocław University of Science and Technology.

### RESEARCH TOPICS

Our main objective is to carry out basic and applied research in the field of Applied Informatics (AI). Due to ERCIS classification, the following clusters have been identified: (1) Data Science and Artificial Intelligence, (2) Process Science, (3) Knowledge and Learning, (4) Supply Chain Management and finally (5) Digital Public Services. The major issues, perspectives and challenges are as follows:

- **Computational Collective Intelligence**, mainly established in cluster (1), is understood as an AI sub-field dealing with soft computing methods that enables making group decisions or processing knowledge among autonomous units acting in distributed environments. Web-based systems, social networks and multi-agent systems very often need such tools for working out consistent knowledge states, resolving conflicts and making decisions.
- **Knowledge Management Systems**, referred to any kind of ISs from cluster (3) that store and retrieve knowledge, improve collaboration, locate knowledge sources, mine repositories for hidden knowledge, capture and use ubiquitous knowledge.
- **Agents and Multi-Agent Systems** related to cluster (1) for constructing autonomous, complex and intelligent systems including the specification of agent communication languages and formalisation of ontologies. Agent communication languages provide standard declarative mechanisms for agents to communicate knowledge, where-as ontologies are meant for conceptualisation of the knowledge domain.



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- **Recommendation and Personalization Methods** applied in all ERCIS clusters and several domains, such as net-news filtering, web recommender, personalised newspaper, sharing news, movie recommender, e-commerce, travel recommender, e-mail filtering, music recommender, user interface recommendation, negotiation systems, etc.
  - **Ensemble and Hybrid Models** resulted in all ERCIS clusters that combined linear and non-linear features of existing models of Computational Intelligence. To the methods of ensemble learning, we classify bagging, boosting, stacking, subsampling, random subspaces, mixture of experts, and others.
  - **Semantic Information Retrieval** ranged from link structure analysis to using social network relationship semantics and come up in cluster (3). We use and research paradigms and technologies like Semantic Web, linked data, Web ontologies, and Web data aggregation.
  - **Multimedia Information Processing** covering clusters (1), (3) with the following aspects: audio signal processing, image recognition and video clustering, loss and lossless compression.
  - **System Performance Analysis** merges clusters (2), (4), and (5) with content caching techniques, usability testing, content indexing algorithms, and Web-based optimization techniques.
  - **E-Learning Methodologies** focused on applications from cluster (3) of online collaboration paradigms, like wiki and video conferencing, Learning Management Systems and Learning Content Management Systems, digital documentation techniques.
- CURRENT RESEARCH PROJECTS**  
The Department of Applied Informatics, as in the previous year, was involved in two international and two national projects.

1) Joint Polish-Vietnamese research agreement led by the Ho Chi Minh City International University and the Department of Applied Informatics at the Wrocław University of Science and Technology. Duration: 2020–2022.

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2) Polish-Norwegian research project on “Highly accurate and autonomous programmable platform for providing data services on air pollution to drivers and public entities” (HAPADS) funded by the National Center for Research and Development. Duration: 2020–2022.

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3) Mozart project on “Development of an innovative method of matchmaking business and scientific partners based on the deep learning model” funded by the City of Wrocław. Duration: 2020–2021.

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4) Sonata project on “Methods of managing the evolution of ontologies and their alignments” funded by National Science Centre. Duration: 2018–2021.

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### AWARDS

Prof. Dariusz Król was instituted for the Vice-Dean for General Affairs position in the Faculty of Information and Communication Technology at the Wrocław University of Science and Technology for a term of three years.

The results of the PRIMUS programme for top-tier publications and the SECUNDUS programme for the best track record among young scientists have been announced at the WUST. Many employees of our Department have been recognised: Dr. Rafał Kern, Dr. Michał Kędziora, Dr. Adrianna Kozierkiewicz, Prof. Ngoc Thanh Nguyen, Dr. Marcin Pietranik.

Prof. Dariusz Król was elected to the position of Vice-Chairman of the Polish Chapter of the IEEE SMC Society SMC-28 for a term of two years.

The course “Introduction to Artificial Intelligence” by Krzysztof Brzostowski, Dariusz Król, Ngoc Thanh Nguyen, Maciej Piasecki, Olgierd Unold, Maciej Zięba was qualified for funding under NAWA’s STER Programme: Internationalisation of Doctoral Schools.

### PUBLICATIONS

*Nunik Afriliana, Dariusz Król, Ford Lumban Gaol*: Computational Intelligence Techniques for Assessing Data Quality: Towards Knowledge-Driven Processing. ICCS (3) 2021: 392-405.

*Quang-Thinh Bui, Bay Vo, Václav Snášel, Witold Pedrycz, Tzung-Pei Hong, Ngoc Thanh Nguyen, Mu-Yen Chen*. SFCM: a fuzzy clustering algorithm of extracting the shape information of data. IEEE Transactions on Fuzzy Systems. 2021, vol. 29, 75–89.

*Rafał P. Palak, Krystian Wojtkiewicz*: The formal framework for collective systems. Axioms. 2021, vol. 10, nr 2, art. 91, s. 1–13.

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*Ngoc Thanh Nguyen, Lazaros Iliadis, Ilias Maglogiannis, Bogdan Trawinski*: Computational Collective Intelligence – 13<sup>th</sup> International Conference, ICCI 2021, Rhodes, Greece, September 29 – October 1, 2021, Proceedings. Lecture Notes in Computer Science 12876, Springer 2021, ISBN 978-3-030-88080-4.

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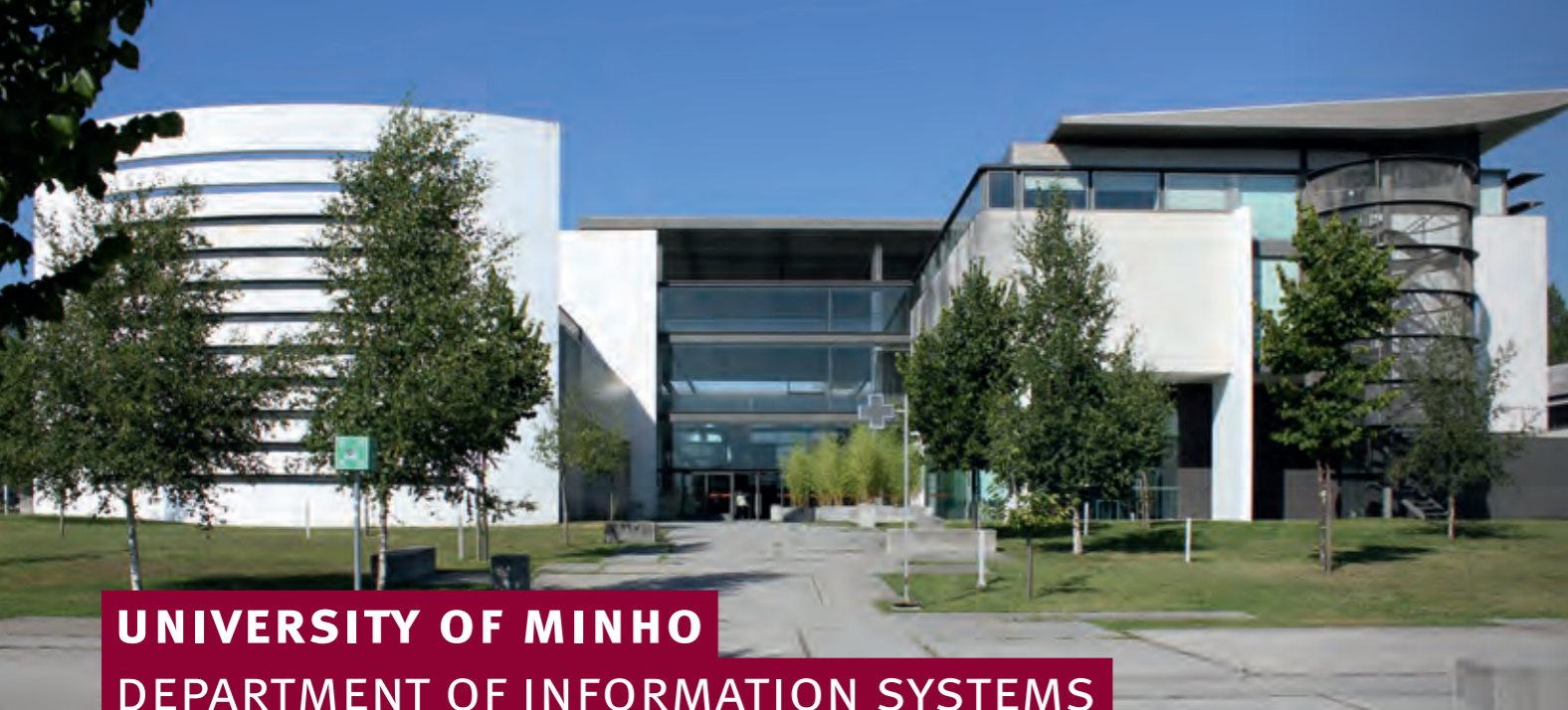
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## UNIVERSITY OF MINHO DEPARTMENT OF INFORMATION SYSTEMS



University of Minho  
School of Engineering

### ABOUT THE INSTITUTION

The Department of Information Systems is located in the Campus de Azurém of the University of Minho, in the city of Guimarães, the cradle city of Portugal. The Department was established in the late 1990s after a graduation program in Information Systems was created. The Department of Information Systems currently offers an integrated master (5 years degree program) in Engineering and Management of Information Systems, a master in Information Systems, and a doctoral program on Information Systems and Technologies. All programs involve the collaboration between two schools of the University of Minho: School of Engineering and the School of Economics and Management.

The research done by the Department's researchers (faculty and fellows) is integrated into an R&D unit – ALGORTIMI. ALGORTIMI encompasses research activities in various areas, including information systems, computer science, computer networks and pervasive computing, industrial electronics, industrial engineering, and optimization.

The Department of Information Systems promotes academic work that focuses on themes at the intersection of information technologies, information, and human and social endeavors. Particular importance is given to design activities addressing phenomena that embrace that intersection to solve enterprise problems or seize opportunities where information technology plays a central role. Research activities combine engineering and technology research methods with those used in organizational studies, management, economics, and social sciences. Therefore, within the departments' research projects, it is possible to find interpretive, positivist, and design science perspectives and a wide range of research methods and techniques appropriate to the study of the particular Information Systems phenomena being addressed.

### RESEARCH TOPICS

The research performed by the Department's faculty is consolidated in the IST (Information Systems and Technologies) research group of ALGORTIMI. This stream includes three leading research labs:

- **Intelligent Data Systems** that deals with technologies, tools, models, and techniques related to Data Mining and Data Warehousing Systems. The main objective is the research in knowledge areas such as Adaptive Business Intelligence, Intelligent Decision Support Systems, Data Mining, Intelligent Data Analysis, Data Warehouse, and OLAP.

- **Information Systems and Technology for the Transformation of Organizations and Society.** The researchers in this lab adopt interdisciplinary approaches and research methods originated in the social sciences and engineering. The main research focus is on understanding the adoption, use, and exploration of Information Technology (IT) in organizational/social contexts and on developing grounded design knowledge (e.g., methods, techniques, tools) for the activities of Information Systems and Technologies (IST) professionals (mainly, designers of human activity systems and managers of IT-related resources). The final goal is to ensure that IT resources contribute to the well-being of the embracing human activity systems.

- **Software Engineering and Management group** is devoted to the development of state-of-the-art software-based information systems. This group focuses on both the engineering and management dimensions of the following research topics: (I) analysis and design of information systems; (II) business and location-enhanced database systems; (III) metadata and ontologies for the semantic Web; and (IV) process and project management life-cycles.

### CURRENT RESEARCH PROJECTS

In 2021, the IST research was funded by new projects, including:

- **VOIL** – Virtual Open Lab ([www.voil.eu](http://www.voil.eu));

- **AugmentedWearEdu** – Integrating virtual and AUGMENTED reality with WEARable technology into engineering EDUcation (<https://augmentedwearedu.uia.no/>);

- **IVISSEM** – 6.849,32 Journal Articles Everyday: Visualize or Perish! (<http://www.ivissem.net/>);

- **IntVIS4Insp** – Intelligent and Flexible Computer Vision System for Automatic Inspection (<http://www.ccg.pt/my-product/intvis4insp/>);

- **Empreende Makers:** De eMakers a Empreendedores (<https://algoritmi.uminho.pt/projects/empreende-makers-de-emakers-a-empreendedores/>);

- **ICDS4IM** – Intelligent Clinical Decision Support for Intensive Medicine (<https://algoritmi.uminho.pt/projects/icds4im-intelligent-clinical-decision-support-for-intensive-medicine/>);

- **POESIC** – Panel for the Strategic Observation of the Information and Knowledge Society (<https://algoritmi.uminho.pt/projects/poesic-painel-para-a-observacao-estrategica-da-sociedade-da-informacao-e-do-conhecimento/>);

- **EMPOWER SSE** – A Semantic and Linked Data Based Framework for Empowerment of the Social and Solidarity Economy (<https://algoritmi.uminho.pt/projects/empower-sse-a-semantic-and-linked-data-based-framework-for-empowerment-of-the-social-and-solidarity-economy/>);

- **FISHY** – A coordinated framework for cyber resilient supply chain systems over complex ICT infrastructures (<https://fishy-project.eu/>);

- **TSIM** – Test System Intelligent Machines (<http://www.ccg.pt/my-product/tsim-test-system-intelligent-machines/>).

### PUBLICATIONS

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Ramos, I., Mackrell, D., Merwe, A. V. D., Pries-Heje, J., Ralyté, J., Stirna, J., ... & Xu, L. D. (2021). The Future of Information Systems in a Post-COVID World by TC8 (*Information Systems*). In *Advancing Research in Information and Communication Technology* (pp. 333–360). Springer, Cham.

Ramos, I., North, K., Thalmann, S., Aramburu, N., Hermann, A., Gräslund, K. and Barros, V. (forthcoming). Using simulation to leverage digital transformation of SMEs: an European Perspective, HICSS 2021.

Moraes, C., Cunha, P. & Ramos, I. (forthcoming). Designing digital workplaces for employee engagement: Practical guidelines from a systematic literature review, HICSS 2021.

Qutaishat, A. and Ramos, I. (2021). "Knowledge Management Research Trends in the Context of SMART Governments: A Literature Review". In *Proceedings of the KM Conference*, 30 June to 2 July 2021, Leipzig, Germany.

Veloso, A. and Ramos, I. (2021). "Preventing Dating Violence: The GoodVibes Project". In *Proceedings of the 4<sup>th</sup> International Conference on Gender Research (ICGR)*: 21–22 Jun 2021, Aveiro, Portugal.



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Reis, J. L., Ferreira, R., & Sousa, R. D. (2021, June). Information Systems Function and Governance in Portuguese Organizations. In *2021 16<sup>th</sup> Iberian Conference on Information Systems and Technologies (CISTI)* (pp. 1–8). IEEE.

### DISSERTATIONS/HABILITATIONS

Maria Isabel Mendes Pereira (24/03/2021), "Definition of a model for creating specialized knowledge systems with content self-regulation". Supervisor: Henrique Manuel Dinis dos Santos.

João Pedro Gomes Ferreira (20/09/2021), "Let's be sensitive: Social Signals in Human-Computer Interaction". Supervisor: Pedro Sérgio Oliveira Branco.



# NATIONAL RESEARCH UNIVERSITY HIGHER SCHOOL OF ECONOMICS – MOSCOW

## ABOUT THE INSTITUTION

National Research University Higher School of Economics consistently ranked as one of Russia's top universities. HSE University is ranked among the top 100 institutions worldwide in Politics & International Studies, Sociology, History, Economics & Econometrics in the QS – World University Rankings by Subject.

HSE University a leader in combining Russian education traditions with the best international teaching and research practices and has over 400 partnerships with international universities and research organizations. HSE University attracts a large number of international students from across the world who study both on-campus and remotely.

HSE is composed of more than 15 faculties in four campuses.

Moscow Institute of Electronics and Mathematics (HSE MIEM) is an engineering subdivision of the HSE University in Moscow campus. Established in 1962 as a higher education institution focused on training of engineers for the electronic industry, MIEM was incorporated into HSE University in 2011. Today MIEM includes three departments: Department of Applied Mathematics, Department of Computer Engineering, Department of Electronic Engineering and more than 15 scientific and educational laboratories. In 2021, two satellites “Cube SX-HSE” and “Cube SX Sirius HSE” were launched by MIEM HSE Laboratory for Functional Safety of Spacecraft and Systems and a private space company.

## RESEARCH TOPICS

Following topics are the particular focus of the research agenda of MIEM: Internet of things, nanoelectronics and photonics, cyber-physical systems, wireless technologies, cybersecurity, modeling of systems and processes, industrial artificial intelligence.

The activities of the laboratories are associated both with basic research and with the implementation of applied projects. The basic research is supported by grants from Russian scientific foundations, as well as supported by grants within the framework of government funding. As part of the HSE grant, MIEM, together with other departments, will begin to work on the creation of a research center in the field of artificial intelligence on the development of new AI technologies that allow expanding its applications to various sectors of the economy.

Research in the field of wireless technologies and communication systems is focused on the scientific problems related to next generation of communication systems, 6G systems.

Quantum hardware components and photonics is a rapidly developing research area of MIEM. The research activity is focused on the scientific and technological issues related to the creation of quantum hardware components for electronics manufacturing.

Advanced research in the field of computer security is aimed at special solutions for cloud storage protection, safe computing, post-quantum cryptography.

Computer simulation of radio-electronic equipment is a well-established area of our research. Now the field has widened, thanks to its merging with digital synthesis of microelectronics.

Certain fields, that are closely linked with major topics, are developed. These include aerospace technologies, technologies for remote Earth sounding and geospatial data processing, supercomputer simulations of physical processes, new materials, and engineering systems.

## CURRENT RESEARCH PROJECTS

- **Methods of providing ultra-reliable communication with low latency in wireless networks of the fifth and subsequent generations**
- **Algebraic and analytical methods of the theory of nonlinear ordinary differential equations and their applications to the study of finite-dimensional dynamic systems**
- **Development of a methodology for numerical modeling of a double electric layer at the electrode-electrolyte interface**
- **Development of methods for studying the historical structure of a population from genome-wide sequences using deep machine learning**
- **Methods of embedding additional information in digital objects resistant to digital-analog and analog-to-digital transformations**
- **Theoretical and experimental studies of electronic and photonic processes in promising heterogeneous structures intended for polymer photo-converters, in order to increase the efficiency of these devices**
- **Mathematical modeling of transport processes in complex physical systems, including quantum ones**
- **Study of population structure by modern and ancient genomes, study of evolution-**

**ary mechanisms from the point of view of population genetics**

- **Development of routing algorithms in on-chip networks**

## EVENTS

In 2021 MIEM hosted and co-organized the following coming soon international events:

**International Scientific Forum FIT-M 2021**, 16–18 December 2021, <https://fit-m.org/eng/>, Information technologies and computer simulation in scientific research and industrial engineering.

**XVII International Symposium Problems of Redundancy in Information and Control Systems**, 25–29 October 2021, <https://miem.hse.ru/redundancy2021>, The covered topics of the Symposium include but not limited to information and coding theory, mobile and wireless communications, telecommunication protocols, internet of things systems, data security, blockchain.

**VII International Scientific and Practical Conference – Actual Problems of Systems and Software Engineering (APSSE-2021)**, 16–18 November 2021, <https://apspe.hse.ru/en/2021/>, The conference is devoted to the analysis of the status, current trends, research issues and practical results obtained in the systems and software engineering area, including those obtained using Big Data.

## SELECTED PUBLICATIONS

*Virtanen, P, et.al.*, SciPy 1.0: Fundamental algorithms for scientific computing in Python, (2020) Nature Methods, 17 (3), pp. 261–272.

*Bodrova, A.S., Sokolov, I.M.*, Resetting processes with noninstantaneous return, (2020) Physical Review E, 101 (5), paper № 052130.

*Korneeva, Y.P., et.al.*, Different Single-Photon Response of Wide and Narrow Superconducting MoxSi1-x Strips, (2020) Physical Review Applied, 13 (2), paper № 024011.

*Kavuri, S., Moltchanov, D., Ometov, A., Andreev, S., Koucheryavy, Y.*, Performance Analysis of Onshore NB-IoT for Container Tracking During Near-the-Shore Vessel Navigation, (2020) IEEE Internet of Things Journal, 7 (4), paper № 8950122, pp. 2928–2943.

*Abudinén, F., et.al.*, Search for Axionlike Particles Produced in e+e- Collisions at Belle II, (2020) Physical Review Letters, 125 (16).

*Gayduchenko, I., et.al.*, Tunnel field-effect transistors for sensitive terahertz detection, (2021) Nature Communications, 12 (1), paper № 543.

*Komissarov, A.B., et.al.*, Genomic epidemiology of the early stages of the SARS-CoV-2 outbreak in Russia, (2021) Nature Communications, 12 (1), paper № 649.

*Iakobson, O.D., Gribkova, O.L., Tameev, A.R., Nunzi, J.-M.*, A common optical approach to thickness optimization in polymer and perovskite solar cells, (2021) Scientific Reports, 11 (1), paper № 5005.

*Yang, M., Zhu, H., Qian, H., Koucheryavy, Y., Samouylov, K., Wang, H.*, Peer Offloading with Delayed Feedback in Fog Networks, (2021) IEEE Internet of Things Journal, 8 (17), paper № 9383090.

*Kagan, M.Y., Kugel, K.I., Rakhmanov, A.L.*, Electronic phase separation: Recent progress in the old problem, (2021) Physics Reports, 916, pp. 1–105.

## DISSERTATIONS/HABILITATIONS

*Elena A. Shelemekh.* Minimax pricing method for Exotic and American options in an incomplete market with a finite horizon (the case of discrete-time).

*Elena R. Loubenets.* Investigating nonlocality of a multipartite nonlocality of a multipartite quantum state on the basis of the local probabilistic model.

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NATIONAL RESEARCH  
UNIVERSITY



# NATIONAL RESEARCH UNIVERSITY HIGHER SCHOOL OF ECONOMICS – NIZHNY NOVGOROD



NATIONAL RESEARCH  
UNIVERSITY

## ABOUT THE INSTITUTION

The Higher School of Economics in Nizhny Novgorod (*HSE NN*) was founded in 1996. The main educational activities of the Faculty of Informatics, Mathematics and Computer Science (*IMCS*) of the HSE NN are related to modern enterprise organization, enterprise architecture, business mathematical and computer modeling. Three laboratories TAPRADESS (*Theory and Practice of Decision Support Systems*), LATNA (*Laboratory of Algorithms and Technologies for Networks Analysis*), and TMD (*Topological Methods in Dynamics*) are the research units of the Faculty IMCS. In 2014 the Department of Fundamental Mathematics was opened.

## RESEARCH TOPICS

The research of the Faculty IMCS focuses on the following directions:

- **Cognitive science** – the development of methods and techniques of receiving, processing, storage, use and management of professional knowledge.

- **Situational Modeling** – multidimensional modeling of the behavior and decision making processes of individual and collective agents in complex distributed systems.
- Original ways of formalizing the knowledge, which are based on ontological engineering, and are supplemented by practical methods of integration and verification of complex corporate service oriented systems.
- New mathematical models and multi-agent optimization algorithms in distributed service-oriented systems applicable to different domains (*transport, planning, training activities*); the result defines new approaches to the creation and use of intelligent decision support systems in the modern service-oriented economy.
- Axiomatic approach to non-compensatory aggregation (*decision making rules*) and axiomatic approach to general measure of power (*power indices*) in a voting body.

## CURRENT RESEARCH PROJECTS

- Development and analysis of new methods of sub-symbol distributed computing for the aggregation of linguistic estimates in multi-criteria choice problems.
- Study of rogue waves in the World Ocean based on observational data and modeling of real events.

## AWARDS

Professor Dmitriy Malyshev (*LATNA laboratory*) was awarded a Moscow Government Prize for Young Scientists in the category "Mathematics, Mechanics and Computer Science" on the topic of research: Algorithmic issues of topical hereditary sub-problems of discrete extremal problems on graphs.

## EVENTS

XIII Summer School on Operations Research, Data, and Decision Making, ORA 2021, May 27–29, 2021.

Workshop "Organizations Engineering Days", September 8–22, 2021.

Model-Driven Organizational and Business Agility workshop in the frame of CAiSE conference (*University of Melbourne, Australia*), 28–29 June, 2021.

## SELECTED PUBLICATIONS

*Demidovskij A., Babkin E.*, Integrated neurosymbolic decision support systems: problems and prospects, "Business Informatics", n.3, 2021.

*Nadezhda Blazhchuk, Pavel Malyzhenkov and Maurizio Masi* "Organizational Structure Reengineering Based on The Transaction Approach: Case of Construction Business" CAiSE 2021 International Workshops Melbourne, VIC, Lecture Notes in Business Information Processing, vol. 423, June 28 – July 2, 2021 Proceedings, Springer, 2021.

*P. M. Pardalos, M. Y. Khachay, A. Kazakov* Mathematical Optimization Theory and Operations Research. 20<sup>th</sup> International Conference, MOTOR 2021, Irkutsk, Russia, July 5–10, 2021, Proceedings, Vol. 12755: Lecture Notes in Computer Science. Springer, 2021.

*Churaev E., Savchenko A.* Touching the Limits of a Dataset in Video-Based Facial Expression Recognition, in International Russian Automation Conference (*RusAutoCon*). IEEE, 2021. P. 633–638.

*Mikhail V. Batsyn, Ekaterina K. Batsyna, Ilya S. Bychkov, Panos Pardalos,* Vehicle assignment in site-dependent vehicle routing problems with split deliveries, Operational Research. 2021. Vol. 21. P. 399–423.

*Medvedev T. V., Pochinka O., Zinina S. K.* On existence of Morse energy function for topological flow, Advances in Mathematics. 2021. Vol. 378. P. 1–15.



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## DISSERTATIONS/HABILITATIONS

*Olga Razvenskaya's dissertation* "Some Hereditary Cases of Polynomial and Pseudo-Polynomial Solvability of the Vertex Coloring Problem on Graphs".



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## UNIVERSITY OF MARIBOR FACULTY OF ORGANIZATIONAL SCIENCES



Faculty of Organizational Sciences

### ABOUT THE INSTITUTION

The Faculty of Organizational Sciences is a founding member of the University of Maribor and has more than 60 years of tradition in the field of organizational and information systems science. The faculty provides three main study programs related to the management of information systems, human resource and educational systems, and business and work systems. During this period, the faculty provided more than 20,000 graduates. The research area of the faculty covers complex dynamic management systems, covering aspects from human resources, information systems, business processes, and general management. Research is organized in many laboratories and in the eCenter. All are involved in research projects, prototyping, consulting, education, and training at national and international levels. Their activities have been organized and are run following the LivingLab approach, with strong involvement of business and government organizations, IT providers, and universities. The resulting eLivingLab is the Slo-

venian founding member of the European Network of Living Labs (ENoLL). The Faculty has a wide range of experiences from many EU, national, and industry projects. The faculty has established connections with numerous institutes, faculties, and universities around the world and strives to enhance its internationally renowned reputation.

### RESEARCH TOPICS

The research area of the faculty of Organizational Sciences is focused on the investigation of complex dynamic management systems, covering various aspects from human resources, information systems, business processes, and general management. The significant focus is on digital transformation of organizations and society. In particular, we investigate the implementation of the newest ICT and their impact on the evolution and design of (digital) business models achieving sustainable performance from an economic, social, and environmental perspective.

The majority of our research and development activities are carried out within the following research topics:

- Business models and business model innovation
- Digital business and digital transformation
- Data science

- eHealth
- Social media and social CRM
- Cloud computing and HPC
- Internet of things
- Decision support systems
- Management of information systems
- Business processes management
- Simulation systems and models
- Organisational learning
- Quality and asset management
- Enterprise sustainability and sustainable development

### CURRENT RESEARCH PROJECTS

#### EU projects and Bilateral projects:

- Business Informatics Programme Re-engineering
- Development of a cyberphysical system for stress control for individuals and groups at-risk – Bilateral Project
- Building next generation competencies for logisticians and supply chain managers
- Impact of COVID-19 pandemic on digital transformation of SMEs
- Hospitals and faculties together for prosperous and scientific based healthcare (ProCare), Erasmus +
- Remote working management skills for HR professionals

### National Research programme:

- Decision support systems in digital business, Research programme, P5-0018
- Impact of management, organizational learning and knowledge management in modern organizations, Research programme, P5-0364-0586



### EVENTS

#### 34<sup>th</sup> Bled eConference:

Digital support from crisis to progressive change, June 27–30, 2021 (online event) <https://bledconference.org>

#### 40<sup>th</sup> International Conference on Organizational Science Development:

Values, competencies, and changes in organizations, March 17–19, 2021 (online event) <https://konferenca.fov.um.si/en/homepage/>

#### 16<sup>th</sup> International Symposium on Operations Research,

September 22–24, 2021 (online event) <https://sor.fov.um.si/>

#### Education in Information Society,

October 8, 2021 (online event) <http://vivid.fov.uni-mb.si/>

### SELECTED PUBLICATIONS

KLJAJIČ BORŠTNAR, Mirjana, PUCIHAR, Andreja. Multi-attribute assessment of digital maturity of SMEs. *Electronics*, ISSN 2079-9292, 2021, vol. 10, iss. 8 (885).

FERENCEK, Aljaž, KOJJAČ, Davorin, ŠKRABA, Andrej, SAŠEK, Blaž, KLJAJIČ BORŠTNAR, Mirjana. Deep learning predictive models for terminal call rate prediction during

the warranty period. *Business systems research*, ISSN 1847-9375, 2020, vol. 11, no.2.

TIJAN, Edvard, JOVIČ, Marija, AKSENTIJEVIČ, Saša, PUCIHAR, Andreja. Digital transformation in the maritime transport sector. Technological forecasting and social change, ISSN 1873-5509. [Online ed.], Sep. 2021, vol. 170.

VIDMAR, Doroteja, MAROLT, Marjeta, PUCIHAR, Andreja. Information technology for business sustainability: a literature review with automated content analysis. *Sustainability*, ISSN 2071-1050, 2021, vol. 13, iss. 3 (1192).

ŽIBERT, Maja, PREVOLŠEK, Boris, PAŽEK, Karmen, ROZMAN, Črtomir, ŠKRABA, Andrej. Developing a diversification strategy of non-agricultural activities on farms using system dynamics modelling : a case study of Slovenia. *Kybernetes : the international journal of systems & cybernetics*, ISSN 0368-492X, 2021.

KRHAČ ANDRAŠEC, Eva, SENEGAČNIK, Marjan, URH, Benjamin, KERN, Tomaž. Implementation of the digital sales channel in the coatings industry. *Processes*, ISSN 2227-9717.

MALETIČ, Matjaž, GOMIŠČEK, Boštjan, MALETIČ, Damjan. The missing link : sustainability innovation practices, non-financial performance outcomes and economic performance. *Management research review*, ISSN 2040-8277, 2021.

### DISSERTATIONS/HABILITATIONS

#### Finished dissertations:

Doroteja Vidmar: Effects of Information Technologies on Sustainability Performance of Organizations.

Matjaž Kragelj: Development of methodology for automatic classification of electronic publications in Universal Decimal Classification – UDK.

Andrej Koložvari: Design of a wheelchair as a cyber-physical system and analysis of



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the impact of its use on the organization of the rehabilitation process.

#### Dissertations in progress:

Aleš Levstek: Development of a flexible model for strategic IT management in medium-sized enterprises.

Hrčica Rok: Development of maturity model for evaluation of readiness of public administration for co-creation of public services.

Tatjana Kitič Jaklič: Key factors in the design of effective and efficient organizational model of emergency medical services in Slovenia.



# POHANG UNIVERSITY OF SCIENCE AND TECHNOLOGY (POSTECH)



## ABOUT THE INSTITUTION

Industrial and Management Engineering is an academic discipline that involves the study of the design, development, and the management of integrated systems of people, material, equipment, and information in a variety of sectors. Therefore, Industrial and Management Engineering provides excellent opportunities to create new values and innovations in today's dynamic global environment.

We are pursuing an understanding of engineering technology and management by combining the contents of business administration with the existing industrial engineering field. While Industrial Engineering deals with the systematic planning, design, and optimization of complex industrial systems, Industrial and Management Engineering extends its coverage to more comprehensive fields, including the service industry, information industry, and management science.

The mission of the Department of Industrial and Management Engineering is to cultivate creative leaders in the era of convergence and innovation based on the core competencies of Pohang University

of Science and Technology (POSTECH). To achieve this mission, we focus on providing specialized education and research programs based on the unique strengths of the Department; conducting research that significantly contributes to the academia and to the industry; and fostering the development of young talents with systems thinking capability, passion, and humanity.

## POSTECH

### RESEARCH TOPICS

There are three research groups and two research centers at the department.

**The Business Analytics (BA) research group** studies quantitative analysis techniques based on statistical techniques and optimization techniques to support corporate decision making and strategy formulation. BA research group extracts information from data and uses it to derive insights and finally knowledge. The main research topics are (1) data mining and graphical modeling techniques, (2) process mining and social network analysis techniques, and (3) large-scale sustainable system analysis.

**The Smart Service System research group** studies technologies that optimize the architecture, processes, and operations of the service system to meet the needs and context of stakeholders. Examples of smart service systems include smart home, smart health care, smart transportation system, and smart factory. Their main research topics are (1) human-centered system UI / UX design, (2) smart healthcare service system, and (3) smart transportation / energy / information network system.

**The SRM research group** conducts research on systemic risk management that takes into account the interdependencies of risk factors, from a more diverse perspective on risks at the national, social, and enterprise levels that may arise in modern society. SRM research group's major research topics include (1) management of future forecast responses and disaster responses to various crisis situations at the national level, (2) enterprise-wide risk management measures, and (3) desirable financial systems for the aging society.

**The Future City Open Innovation Center (FOIC)** focuses on the development of innovative future and smart city technologies, including retrofitting existing infrastructures with the latest technological advances for the efficient establishment and proliferation of a smart city.

**The Open Innovation Big Data Center (OIBC)** focuses on developing platform technologies from big data gathered from the implementation of FOIC-led initiatives. Both centers are based on a foundation of open cooperation: the Open Innovation Centers aim to create socioeconomic value by attracting companies and startups to foster their growth through collaboration with the University's advanced research infrastructures.

### CURRENT RESEARCH PROJECTS

- Blockchain platform with business models towards cross-domain interoperability (*Ministry of Science and ICT, Jun. 2018 – Dec. 2021*): The objective of the project is developing a blockchain platform that supports cross-domain interoperability. The platform will be applied in three industries such as healthcare, insurance, and automotive.
- Industrial AI Professional Master and Ph.D Program (*Ministry of Trade, Industry and Energy, March. 2019 – Feb. 2024*).
- Context-aware Process and Organization Analytics: Extending Business Analytics towards more effective and flexible organization (*National Research Foundation of Korea, Mar. 2017 – Feb. 2020*).
- Development of AI-based Recommendation System for Curated Retailing Services (*Samsung C&T, Jan. 2021 – Nov. 2021*).
- The revolutionary athlete data integration technology for national football performance innovation (Korea Football Association, Dec. 2018 – Dec. 2022).

- Clinical Digital Twin Model Mining and Process Redesign Method based on the OMOP Common Data Model (*National Research Foundation of Korea, Mar. 2021 – Feb. 2025*).

### AWARDS

Dr. Minseok Song won Mooeunjae Chair Professorship at POSTECH, 2021.

Mr. Minchul Jung won SPIK Young Investigator Award at the Science & Football International Conference, 2021.

Shinyum Park, won Minister of MTIE (*Ministry of Trade, Industry and Energy*) award (*the 1st prize*) at the First Korea Industrial Research Project Challenge, Dec. 2020.

### SELECTED PUBLICATIONS

He, Y., He, Z., Kim, K., Jeong, I., and Lee, D., "A Robust Interactive Desirability Function Approach for Multiple Response Optimization Considering Model Uncertainty," *IEEE Transactions on Reliability*, Vol. 70, No. 1, 175–187, 2021.

Cho, M., Park, G., Song, M., Lee, J., Kum, E., "Quality-Aware Resource Model Discovery," *Applied Sciences*, Vol. 21, No. 12, 5730, 2021.

Cho H, Ryu H, Song M. Pass2vec: Analyzing soccer players' passing style using deep learning. *International Journal of Sports Science & Coaching*. August 2021. doi:10.1177/17479541211033078.

Cho, M., Park, G., Song, M., Lee, J., Lee, B., Kim, E., "Discovery of Resource-oriented Transition Systems for Yield Enhancement in Semiconductor Manufacturing." *IEEE Transactions on Semiconductor Manufacturing*, Vol. 34, No. 1, pp. 17–24, 2021.

### DISSERTATIONS/HABILITATIONS

Bongjoon Ji, Machine Learning-based Brand Positioning Analytics by Vectorizing Visual User-Generated Content.



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"The hand of coexistence" at Homigot Beach.

Dongyoun Jung, Missing Value Imputation and Forecasting algorithms for electric load data with multi-cluster and mixture time series models.

Jinki Kim, Two Essays on Optimal Asset Allocation with Correlation Risk.



## UNIVERSIDAD DE SEVILLA ISA RESEARCH GROUP

### ABOUT THE INSTITUTION

The Universidad de Sevilla (US) was established in 1505 and, with more than 70,000 students and 6,800 staff, is the third-largest university in Spain. US embraces academia, industry, engineering and science and, with a relevant educational and technological infrastructure, is an intellectual reference in the South of Europe. More than 10,000 students are following post-graduate courses, enrolled into 86 master programs and 152 doctoral programs. US holds academic partnerships with 850 institutions throughout the world.

US is also devoted to research and innovation; therefore, in addition to its 4,300 academic staff, there are 1,600 researchers and over 470 scientific groups associated with the university who research in economic, social and human sciences, law, technological activities, life sciences, physics, chemistry, mathematics, and the environment. Research is carried out within academic departments, in 8 research centers and 9 university research institutes.

The Applied Software Engineering (ISA) Group at US is led by Antonio Ruiz-Cortés and composed by 21 members. Its research has always aimed at finding ways to automate activities that are usually performed by hand. Currently, it spans six ar-

reas of interest including Business Process Management (BPM), Service Governance, Metaheuristics, Experiments Support, Search-based Software Engineering, and Software Testing. The research on BPM aspects is led by Manuel Resinas, and it occupies 9 group members including 1 Professor, 3 Associate Professors, 4 Assistant Professors, and 1 Post-doc Researcher.

### RESEARCH TOPICS

In the field of performance management, the group has strong experience in the monitoring of business processes based on process performance indicators (PPIs). The current interests involve improving the modelling, monitoring, and prediction of PPIs. Regarding modelling, the research is focused on making the definition of PPIs and the whole process to develop a PPI dashboard easier for non-expert users. Concerning monitoring, new techniques and methodologies for the definition and monitoring of decisions and unstructured processes are being devised. Finally, in the area of predictive monitoring of PPIs, the research targets problems that appear when a predictive model is deployed in a production system, such as the reliability of the models or the evolution of the predictive model.

The research on human resources covers several different angles. One stream of research focuses on the application of methodologies to improve personal productivity. This includes the analysis of the effect of techniques like mindfulness to perform cognitive-intensive tasks like conceptual modelling, and the development of novel methodologies for time management and work organization. Another research

stream is focused on the configuration and use of workstream collaboration tools and other related technologies to improve the collaboration and productivity of people in the context of digital transformation. Finally, the third research stream tackles the organizational perspective of business processes pursuing the optimization of the management of human resources along with process modelling, execution, and analysis.

Finally, we have recently started a research line focused on how to develop chatbots that can automate certain aspects of the process management or support the interaction of customers and participants with a given business process.

### CURRENT RESEARCH PROJECTS

**OPHELIA.** Optimization of Human-based Knowledge-intensive Services with Service-based Applications. RTI2018-101204-B-C22. Funded by Spanish Government. 01/01/19-31/12/21. 147.136€. Part of project HAMLET. The objective of OPHELIA is to improve the efficiency of knowledge-intensive human-based services supported by service-based applications (SBA).

**HORATIO.** Improvements in the reliability, customization and operating costs of software services regulated by user agreements. RTI2018-101204-B-C21. Funded by the Spanish Government. 01/01/19-31/12/21. 148.830€. Part of project HAMLET. The objective of HORATIO is to develop models, techniques and tools that improve the reliability, customization and operating cost of user agreement-regulated SBAs.

**CONFLEX.** Integration of context-aware resource management into flexible process-oriented organisations. RTI2018-100763-J-I00. Funded by the Spanish Government.

15/11/19 – 14/11/22. 151.008€. The aim of CONFLEX is to integrate contextual information in the tasks related to resource management in business processes and to align the solutions developed with actual needs of today's organizations.

**EKIPMENT+.** Performance improvement in Knowledge-Intensive Processes: An empirical approach based on people, teams, software and data. P18-FR-2895. Funded by the Andalusian Government (PAIDI 2020). 01/01/20 – 31/12/22. 120.625€. The aim of EKIPMENT+ is to increase the efficiency of organizations by developing models, techniques and tools that helps them improve the performance of their knowledge-intensive processes and the mechanisms to monitor and empirically validate these improvements.

### AWARDS

Adela del-Río-Ortega, Joaquín Peña, Manuel Resinas, and Antonio Ruiz-Cortés were nominated to the Best Paper Award at HICSS conference 2021 with their paper: "Productivity Challenges in Digital Transformation and its Implications for Workstream Collaboration Tools".

Antonio Ruiz-Cortés was recognized with a Distinguished Reviewer Award at ICSE conference 2021, and Adela del-Río-Ortega received the Best Reviewer Award at CAISE 2021.

### EVENTS

Cristina Cabanillas (*Universidad de Sevilla, Spain*), together with Andrea Delgado (*Universidad de la República, Uruguay*), Aurelie Montarnal (*IMT Mines Albi, France*) and Hernán Astudillo (*Universidad Técnica Federico Santa María, Chile*) organized the minitrack on "Digital Government and Business Process Management" within the HICSS 2021 conference. It was intended to be held in Hawaii, in January 2021, but due to the COVID-19 pandemic, it took place virtually.

Adela del-Río-Ortega will be chair of the Management Track of the BPM 2022 con-

ference that will take place in Münster, Germany. She together with Claudio di Ciccio, Remco Dijkman and Stefanie Rinderle-Ma will make up the PC chair team of the 20<sup>th</sup> edition of the most prestigious forum for researchers and practitioners in the field of Business Process Management.

### SELECTED PUBLICATIONS

A. del-Río-Ortega, J. Peña, M. Resinas, A. Ruiz-Cortés: Productivity Challenges in Digital Transformation and its Implications for Workstream Collaboration Tools. HICSS 2021: 1–10. <http://hdl.handle.net/10125/70668>.

Joaquín Peña, Alfonso Bravo, Adela del-Río-Ortega, Manuel Resinas, Antonio Ruiz-Cortés: Design Patterns for Board-Based Collaborative Work Management Tools. CAISE 2021: 177–192. Lecture Notes in Computer Science, vol 12751. Springer, Cham. [https://doi.org/10.1007/978-3-030-79382-1\\_11](https://doi.org/10.1007/978-3-030-79382-1_11).

Alfonso E. Márquez Chamorro, Kate Revoredo, Manuel Resinas, Adela del-Río-Ortega, Flávia Maria Santoro, Antonio Ruiz-Cortés: Context-Aware Process Performance Indicator Prediction. IEEE Access 8: 222050–222063 (2020). <https://doi.org/10.1109/ACCESS.2020.3044670>.

Carlos Müller, Antonio Manuel Gutiérrez, Pablo Fernandez, Octavio Martín-Díaz, Manuel Resinas, Antonio Ruiz-Cortés: Automated Validation of Compensable SLAs. IEEE Trans. Serv. Comput. 14(5): 1306–1319 (2021). <https://doi.org/10.1109/TSC.2018.2885766>.

Bedilia Estrada-Torres, Adela del-Río-Ortega, Manuel Resinas, Antonio Ruiz-Cortés: Modeling Variability in the Performance Perspective of Business Processes. IEEE Access 9: 111683–111703 (2021). <https://doi.org/10.1109/ACCESS.2021.3101575>.

Schahram Dustdar, Pablo Fernández, José María García, Antonio Ruiz-Cortés: Elastic Smart Contracts in Blockchains. IEEE CAA J. Autom. Sinica 8(12): 1901–1912 (2021). <https://doi.org/10.1109/JAS.2021.1004222>.

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# IE BUSINESS SCHOOL INFORMATION SYSTEMS AND TECHNOLOGY DEPARTMENT



## ABOUT THE INSTITUTION

The IE Business School is one of Europe's top providers of management education and a laboratory for new entrepreneurial ventures. IE's Information Systems and Technology Department (ISTD) is responsible of all technology-related courses and pursues research on the transformative use and impact of digital technologies in today's world.

The faculty at ISTD teaches courses on Digital Innovation and Technology Management in the MBA and the Tech MBA programs, manages the concentration on Digital Business in the Master in Management, and supervises the major on Information Systems in the PhD in Management and the Doctorate in Business Administration. Members of the Department have published in leading IS journals, including MIS Quarterly, Information Systems Research, European Journal of Information Systems, International Journal of Information Management, and Decision Support Systems, among others.

## RESEARCH TOPICS

Research work within ISTD includes several

research lines. One research line focuses on Digital Innovation, studying the interplay between organizational capabilities and digital innovation, value co-creation in digital platforms, and digital competences. A second line of research is Information Security and Privacy, investigating topics such as cybersecurity behaviour of Spanish households, hacker behaviour analysis, computational reputation applied to cybersecurity, and the interplay among trust management, security risks and compliance. Another line of research focuses on Business Intelligence, Analytics and Machine Learning; work in this line has concentrated on applying machine learning in key areas such as sustainability, Green IS, education and e-health. A final research line is Economy of Information Systems, focusing on IT outsourcing and Cloud Computing, organizational networks and the Sharing Economy, and valuation of digital innovations.

## CURRENT RESEARCH PROJECTS

**DIGYMATEX** is an EU-funded project that aims to provide evidence-based tools to assist in understanding and determining children's digital maturity. The project wishes to provide clear evidence on how

digital maturity impacts Information and communication technologies (ICT) behaviour of children at the ages of 9–16, by maximising risks (*risk factors*), minimising risks (*resilience factors*), and maximising benefits (*enhancing factors*). The main two outputs of the project are two tools: The Digital Youth Maturity Index (DYMI) and the DIGYou3 program. The DYMI is an innovative tool that will establish and implement a comprehensive understanding and taxonomy of children's digital maturity. The DYMI will precisely measure and predict harmful and beneficial ICT-related behaviour and consequences for specific user groups. The DIGYou3-program is a technology-related solution and recommendation program, which supports the application of the DYMI on three levels – individual, social and national. The program will help to improve relevant dimensions of children's digital maturity, the development of ICT-related competencies and support the more beneficial influence on components of child development.

For more information, please visit <https://digymatex.eu>



## EVENTS

IE hosted the SCECR 2021, the Sixteenth Symposium on Statistical Challenges in Electronic Commerce Research. SCECR is a leading workshop attracting researchers throughout the world in the areas of information systems, quantitative marketing, economics, statistics, machine learning, and computer science.

## SELECTED PUBLICATIONS

Arenas, Á. E., & Aparicio, F. (2020). Cloud security: Cómo migrar datos a la nube minimizando riesgos. *Harvard Deusto Marketing y Ventas*, (160), 42–50.

Esteves, J., Valogianni, K., & Greenhill, A. (2021). Online social games: The effect of social comparison elements on continuance behaviour. *Information & Management*, 58(4), 103452.

Esteves, J., Alonso-Martínez, D., & de Haro, G. (2021). Profiling Spanish Prospective Buyers of Electric Vehicles Based on Demographics. *Sustainability*, 13(16), 9223.

Herrero, J., Torres, A., Vivas, P., Arenas, Á. E., & Urueña, A. (2021). Examining the empirical links between digital social pressure, personality, psychological distress, social support, users' residential living conditions, and smartphone addiction. *Social Science Computer Review*, 0894439321998357.

Jimenez, Y. O., & Arenas, A. E. (2021). Balancing Competition and Cooperation in IT Value Cocreation: The Case of Digital Platform Ecosystems. In *Proceedings of AMCIS 2021, Americas Conference on Information Systems*.

Ostiz-Blanco, M., Bernacer, J., Garcia-Arribu, I., Diaz-Sanchez, P., Rello, L., Lallier, M., & Arrondo, G. (2021). Improving Reading Through Videogames and Digital Apps: A Systematic Review. *Frontiers in Psychology*, 3835.



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Rauschenberger, M., Baeza-Yates, R., & Rello, L. (2020, April). Screening risk of dyslexia through a web-game using language-independent content and machine learning. In *Proceedings of the 17<sup>th</sup> International Web for All Conference* (pp. 1–12).

Rello, L., Baeza-Yates, R., Ali, A., Bigham, J. P., & Serra, M. (2020). Predicting risk of dyslexia with an online gamified test. *Plos one*, 15(12), e0241687.

Valogianni, K. (2021). Retos de la movilidad eléctrica: ¿cómo puede contribuir el aprendizaje automático a una sociedad más sostenible?. *Harvard Deusto business review*, (311), 24–32.



**ABOUT THE INSTITUTION**

For 30 years, the Institute of Information Management at the University of St. Gallen (IWI-HSG) has been dedicated to applied and design-oriented research at the interface between business and IT. Founded in 1989, the institute pursues a mixed funding approach from both public and private sources. Privately funded research at IWI-HSG is usually organized in the form of research consortia (“competence centers”). These centers, each of which includes between four and eighteen corporate partners, fall under the responsibilities of different chaired professors. In addition to its research activities, IWI-HSG lecturers engage in executive education, offering degree and non-degree programs in areas such as Business Engineering or IT Business Management. Being one of the largest research units at a top business school, the IWI-HSG’s contributions focus on business innovation, including methods, reference models, and innovative prototypes.

Prof. Andrea Back, Prof. Walter Brenner, Prof. Reinhard Jung, Prof. Jan Marco Leimeister, and Prof. Robert Winter are heading five research groups comprising eleven assistant professors or postdocs, nineteen research assistants, ten research affiliates, sixteen student assistants and thirteen support staff members.

**SELECTED RESEARCH TOPICS**

The Chair of Prof. Back focuses on innovative applications of new technologies covering topics such as agile innovation, cybersecurity, digital maturity and transformation, digital strategy and transformation, new work and learning, smart IoT and mobile business as well as sports digitalisation.

The Chair of Prof. Brenner focuses on information management, industrial services and enterprise systems, and digital consumer business (e.g., *consumer and big data analytics*). Another focal field of interest is design thinking.

The Chair of Prof. Jung investigates IT-enabled service, and business innovation with a focus on health IS and wearable technology. It also covers business engineering and the use of data-driven services by individuals.

The Chair of Prof. Leimeister works on designing, implementing and managing IT-enabled means of organisation and innovation. Research activities focus particularly on the future of work, service engineering and management, digital business, data-driven organisations and digital learning.

The Chair of Prof. Winter focuses on understanding and design of enterprise-wide integration, coordination and transformation problems. Major projects in this field deploy simulation, experiments, and action design research.

**SELECTED RESEARCH PROJECTS**

A list of competence centers and current projects can be found at: <http://www.iwi.unisg.ch/?id=1202>

**Agile Transformation:** The Competence Center Agile Transformation offers a unique mix of exchange, collaboration, academic expertise, and advisory services to support the agile transformation of companies. Further information: <https://agile.iwi.unisg.ch/>

**Ambidextrous Digital Platforms:** This project is expected to provide a thorough description of the dynamics, determinants, and design configurations through which platform owners simultaneously manage and legitimate a balanced co-existence of top-down control and bottom-up emergence. Further information: <https://www.alexandria.unisg.ch/id/project/247758>

**Cognitive Automation:** The Competence Center Cognitive Automation combines academic insights from the forefront of cognitive automation research and advisory expertise in a platform of exchange and collaboration for practitioners. Members are enabled to seize the vast potential of cognitive automation to improve operational efficiency and effectiveness. Further information: <https://cognitive.iwi.unisg.ch/>

**Crowdsourcing:** The research goals of the Competence Center Crowdsourcing include the development of models and instruments for systematic design, introduction as well as usage of crowdsourcing approaches for digital work and IT-based innovations. Further information: <http://crowdsourcing.iwi.unisg.ch>

**Design Thinking:** The Design Thinking Group is focused on embedding human-centric innovation tools into corporate structures. The research team strives to improve the capability of corporate IT and to reduce costs and risks in innovation projects. Further information: <http://dthsg.com/>

**Digital Service Innovation:** Research conducted in the context of the CC Digital Service Innovation revolves around service and business innovation. It also seeks to understand the acceptance and usage of digital services by individuals and enhance their user experience through digital nudging. Further information: <https://iwi.unisg.ch/projects/dienstleistungssysteme/>

**Digital Strategy and Transformation:** The CC Digital Strategy and Transformation is developing management instruments and tools for strategy work in the digital age. A next focus area for relevant research is intrapreneurship methods. Further information: <https://iwi.unisg.ch/projects/digital-strategy-maturity-transformation/>

**PUBLICATIONS**

The following list is a limited extract of the IWI-HSG publication list in 2020 and 2021. A complete list of publications with full texts of many papers is available at: <http://www.iwi.unisg.ch/publikationen>

*Janson, A.; Söllner, M.; & Leimeister, J.M. (2020). Ladders for Learning: Is Scaffolding the Key to Teaching Problem Solving in Technology-mediated Learning Contexts? Academy of Management Learning & Education (AMLE), 19(4). 439-468.*

*Knote, R.; Janson, A.; Söllner, M.; ... & Leimeister, J.M. (2021). Value Co-Creation in Smart Services: A Functional Affordances Perspective on Smart Personal Assistants. Journal of the Association for Information Systems, 2(22), 418-458.*

*Schmid, M.; Haki, K.; Tanriverdi, H.; Aier, S. & Winter, R. (2021) Platform over Market – When Is Joining a Platform Beneficial?, Proceedings of the 29<sup>th</sup> European Conference on Information Systems (ECIS 2021).*

*Winkler, R.; Söllner, M.; & Lemeister, J.M. (2021) Enhancing Problem-Solving Skills with Smart Personal Assistants, Computers & Education.*



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**ERCIS COOPERATION**

Our long-term cooperation with our neighboring ERCIS partner in Liechtenstein was successfully continued. Jan vom Brocke is lecturing in two courses of the HSG Doctoral Programme in Business Innovation together with IWI-HSG professors. Together with Robert Winter, Jan vom Brocke also continued to offer the “Design Science” Doctoral Seminar in the VHB ProDok international Doctoral Programme.





## UNIVERSITY OF TWENTE CENTER FOR TELEMATICS AND IT – DIGITAL SOCIETY INSTITUTE

### ABOUT THE INSTITUTION

The University of Twente is a multicultural community of talented, ambitious people that offers students, scientists, and educators from around the world the best possible conditions:

**An innovative and vibrant campus** with world-class facilities for crossing boundaries and solving complex problems – including state-of-the-art facilities, such as our world-renowned NanoLab, our newly formed Designlab, and a new Technical Medical Centre currently.

**An engineering approach to societal challenges**, merging fundamental technological, and social science research with systematic solution designing.

**Core technologies**, among the world's best, in fields such as nanotechnology and biomedical engineering, IT, robotics, and geoinformation science.

**Highly personal education**, applying student-driven learning and project-based teamwork to foster synergy, (*self-*)discovery, and out-of-the-box problem-solving.

**An outstanding track record in value creation**, starting up and spinning off new businesses (*with some 1,000 successful ventures to date*), and giving shape to new expressions of social and industrial engagement.

The University of Twente has ICT and Information Systems Research among its focus areas. The Digital Society Institute is one of the three multidisciplinary research in-

stitutes of the University of Twente. At the Digital Society Institute, we strive to engineer digitalization toward systems that allow for well-informed, even accountable decision-making. We achieve this by doing scientific research that contributes to solving three challenges:

### RESEARCH TOPICS

An essential aspect of our mission is to conduct research that has an impact on society. Digitalization stretches out from creating, innovating, and developing digital technologies to adopting and crafting them to our everyday needs, desires and habits. In this way, digitalization shapes technologies by adding value and imposing what we can and are willing to adopt and use for our desires and the challenges we face. The Digital Society institute focuses on three themes:

- **Data Science and Artificial Intelligence**  
Various groups at the University of Twente conduct research on data science and artificial intelligence, including work on the fundamental understanding of machine learning, sensors, efficient realisation of artificial intelligence in hardware, to development and application of artificial intelligence in fields such as health, safety and security, the geo-spatial domain, and manufacturing, to name a few. Central unifying themes are embedded and augmented intelligence.

- **Creating Intelligent Manufacturing Systems**  
Smart innovations in manufacturing are key to securing the welfare and wellbeing of society. Smart industry is the way for-

## UNIVERSITEIT TWENTE

ward for the industry. Using Smart Industry means personalized and smart products, optimizing human-machine interaction, yielding faster, cheaper, and more sustainable production. It means adapting business models to changing industries and services. And thus of utmost importance to main at the competitive edge.

- **Improving Healthcare with E-Health**

It becomes more and more evident that the current approach to healthcare is not sustainable, especially when considering the increasing volume and demands of chronic diseases, requiring a rethinking of strategies towards innovative solutions. The use of information and communication technologies in healthcare – eHealth – is a promising strategy to improve healthcare worldwide.

Excellence is a key issue. The institute's project Living Smart Campus forms a linking pin between all research activities, and is as such profiling for 'Science for a Smart Society'. The Campus becomes a center of open innovation, to which also industry, government bodies, and citizens are committed.

Various departments are joining efforts in these centers to address research challenges in an interdisciplinary way. More information on the centers can be found via <https://www.utwente.nl/en/digital-society/>

### CURRENT RESEARCH PROJECTS

DSI is active in dozens of research projects financed at the national and European level and directly by industry. Departments directly related to ERCIS research themes are the IEBIS (*Industrial Engineering and Business Information Systems*) group and the SCS (*Services, Cybersecurity and Safety research group*).

*The IEBIS group* is concerned with studying novel ways of managing business processes and supply chains using innovative techniques such as simulation, (*social*) data mining, multi-agent coordination,

and gamification. Researchers in IEBIS use design science methods to develop Decision Support Systems and Inter-Organizational Systems connecting networks of businesses and governments.

The goal of the SCS group is to develop methods and techniques for developing IT-based services that balance service levels with safety- and security levels, and to develop methods and techniques that make existing IT-based services more secure.

### Selected research projects include:

*Data driven architecture for Predictive maintenance in the Maritime Sector* – This project focuses on the development of service logistic control towers, in a maritime setting, in which several supply chain players participate. In this joint university-industry project, we develop decision support models that integrate the planning of operations, maintenance, and resources.

*Autonomous Logistics Miners* – This new project investigates the application of AI to autonomous logistics.

*Circular Performance Management* – The new project studies the development of performance and recommender systems for circular products and processes across supply chains.

*SynchromodalIT* – this project aims at designing advanced algorithms and business-IT architectures to facilitate dynamic planning of logistics across various modalities. As part of the project, two PhD theses were completed and an educational game was developed to illustrate the synchromodal concept – see <https://www.trucksandbarges.nl/>

### AWARDS

The Dutch Science Foundation (*N.W.O*) funded several projects for PhD and post-doc positions in the IEBIS department.

### EVENTS

Due to Covid, many planned campus events went online.

In September 2021, the iccl2021.nl, International Conference on Computational Logistics took place “virtually” in Twente. Conference that brings together researchers and practitioners working at the interface of large/complex logistics systems and advanced computational methods from the fields of Operations Research, Business Analytics, and Artificial Intelligence.

### PUBLICATIONS

*Chen, X., Van Hillegersberg, J., Topan, E., Smith, S., & Roberts, M. (2021).* Application of data-driven models to predictive maintenance: Bearing wear prediction at TATA steel. *Expert Systems with Applications*, 186, 115699.

*Mukti, I. Y., Iacob, M. E., Aldea, A., Govindaraju, R., & van Hillegersberg, J. (2021).* Defining Rural Smartness and Its Impact: A Systematic Literature Review. *Journal of the Knowledge Economy*, 1–52.

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### DISSERTATIONS

A comparative study of corporate sustainability, strategic corporate social responsibility and market value creation among companies operating in India, Kumar Damodar, S., 6 May 2021, Enschede: University of Twente. 339 p., PhD Thesis.

All publications are available at [doc.utwente.nl](http://doc.utwente.nl)



# LEIDEN UNIVERSITY LEIDEN INSTITUTE OF ADVANCED COMPUTER SCIENCE (LIACS)

## ABOUT THE INSTITUTION

The Leiden Institute of Advanced Computer Science (LIACS) is a centre of excellence for multidisciplinary research and education in computer science and artificial intelligence (AI). LIACS features a wide range of research, from theory to algorithms to applications, with a strong focus on artificial intelligence and data science. Within the Dutch university landscape in computer science, LIACS has positioned itself with the motto: AI4LIFE, basically meaning that modern AI methods (from optimization, deep learning, reinforcement learning, quantum computing to machine learning) are used for solving problems in other scientific domains, predominantly from the Life Sciences. This aim is pursued by LIACS researchers in leading roles in the SAILS programme, the CCLS initiative, and the European initiative for excellence in AI research and innovation, CLAIRE. We also cooperate with knowledge institutes, governments and companies.

As a consequence of our broad and international working field, we offer a complete and outstanding education. LIACS is a major institute in education for computer science. It features BSc, Master, as well as PhD programmes and a broad variety of study tracks, some of which are in collaboration with other scientific domains such as Biology and Economics. The institute has rapidly grown in the last years and is continuing this trend. In 2021, LIACS has around 90 staff members, 95 PhD students, and 40 non-scientific personnel. For the study programme of the institute, more than 680 bachelor students, and more than 500 master students are registered.

## RESEARCH TOPICS

Artificial Intelligence has become a major focus of LIACS research recently. To accomplish a stronger momentum and to exploit synergies among fields, networking initiatives have been established across the faculty of science (center for computational life science, CCLS) and across the entire university (Society Artificial Intelligence and Life Science, SAILS). These instruments stimulate collaboration within the university on artificial intelligence topics and bring these topics to new application domains. Moreover, with its participation in European and International research networks ERCIS and CLAIRE, the research in LIACS is integrated in a wider community of researchers.

Applied Data Science Lab: exploratory projects with companies, governments and NGOs generate ample opportunities in terms of societal challenges, science strategy, valorization and research collaboration. In the LIACS Applied Data Science Lab, our master's students and graduates carry out short-term exploratory studies. The applied Data Science Labs' prime purpose is to help clients explore their opportunities in data science whilst gaining working experience for the student.

Collaboration for Smart Industry: we have a strong focus on providing Smart Computing for Science & Industry, which materializes in longstanding cooperations with industrial partners and governments. These help us to focus on the applicability of research results and at the same time generate new directions for our research in computer science. Our collaborations include partners such as Honda Research, Zorginstituut Nederland, Tata Steel, Green-



## Universiteit Leiden The Netherlands

choice, BMW, KLM, General Electrics Aviation, Young Capital, Qualogy, Ministry of Foreign Affairs, National Police, Woonconnect, Stabiplan, Naturalis Museum, and De Nederlandsche Bank.

## CURRENT RESEARCH PROJECTS

HORIZON 2020 Research and Innovation Staff Exchanges (RISE) project RISE\_SMA "RISE Social Media Analytics", with University Duisburg-Essen (ERCIS Partner), Agder University, Kristiansand (ERCIS partner), and others. The role of LIACS is to devise algorithms for complex network analysis and visualization, and support the work packages on text mining.

LIACS participates in the ERCIS competence centre (see <https://www.ercis.org/about-us/competence-centers>) on "Social Media Analytics: Identification and Analysis of Disinformation, Propaganda, and Manipulation via Online Media". Leiden is active in two different focus groups and leader of two work packages.

Center for Computational Life Science (CCLS): About 10 presentations of researchers in LIACS and external speakers took place. Two flagship projects have been defined: "Applied machine learning in drug discovery", and "Retrosynthesis and Reinforcement Learning Combined with Mode-of-Action Prediction".

The Benchmarking Network (<https://sites.google.com/view/benchmarking-network>) is supported by ERCIS members Münster (Heike Trautmann) and Leiden (Mike Preuss, Thomas Bäck, Anna Kononova, Hao Wang). Since 2019 it aims at consolidating and stimulating activities on benchmarking iterative optimization heuristics, and now has more than 30 members from all over the world.

## EVENTS

The first post-pandemic (physical) yearly LIACS institute meeting LOST on the beach was held on September 30. Meeting in person again was very relieving for many and the tablet-based information hunt in the dunes and the beach village Katwijk has been a very successful exercise in team building, taking account that due to the lockdowns, many institute members have never seen each other previously.



On Friday 3 December 2021, the SAILS Symposium "Artificial Intelligence: The Good, the Bad and the Ugly" will bring together researchers and AI stakeholders from the vicinity of Leiden University in a hybrid full day conference. The event is aimed at providing an overview of the state of research and the possibilities of practical AI use in so different fields as law, archeology, drug design, humanities, and more. <https://www.universiteitleiden.nl/en/events/2021/12/sails-symposium-ai-the-good-the-bad-and-the-ugly>

For a list of current SAIL events, e.g. the SAIL lunch time seminar talks and the AI and ethics series which both are available online, see here: <https://www.universiteitleiden.nl/en/sails/events>.



## DISSERTATIONS

The full list of recent dissertations is available at: <https://theses.liacs.nl/>. Up to October 2021, 8 graduations took place, the total number for 2021 is expected to be around 15.

## PUBLICATIONS

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Grimme, C., Kerschke, P., Aspar, P., Trautmann, H., Preuss, M., Deutz, A., Wang, H., & Emmerich, M. (2021). Peeking beyond peaks: Challenges and research potentials of continuous multimodal multi-objective optimization. *Computers & Operations Research*, 136, 105489.

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Chen, W., Wang, W., Liu, L., Lew, M.S. (2021). New Ideas and Trends in Deep Multimodal Content Understanding: A Review. *Neurocomputing* 426: 195–215.

de Boer, F.S., Bonsangue, M. (2021). Symbolic execution formally explained. *Formal Aspects Comput.* 33(4): 617–636.

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## SIMON KUZNETS KHARKIV NATIONAL UNIVERSITY OF ECONOMICS INFORMATION SYSTEMS DEPARTMENT

### ABOUT THE INSTITUTION

Simon Kuznets Kharkiv National University of Economics (*KhNUE*) is the biggest education center in the city of Kharkiv and one of the leading higher education institution of Eastern Ukraine. It provides a full range of educational services, carrying out multi-stage training, retraining, and raising the level of experts' skills in 22 specialties, such as Economics and Entrepreneurship, Management and Administration, Informatics and Computer Engineering, Publishing and Printing Business, Service and State Administration.

The education process is provided by the teaching staff of 474 lecturers, 62 Doctors of Science and 248 Ph.D.

The Information Systems Department has 31 professors, more than 300 students on Bachelor level and more than 100 on Master level. The department is an active member of the IT Ukraine Association and Kharkiv IT cluster. In addition, twelve professors are Microsoft-certified specialists. The Microsoft IT Academy has been operating since 2009, and the cooperation

with IBM within the context of the IBM Academic Initiative Program has been running since 2012.

The Master Double Diploma Program MBA "Business Informatics" with the French University Lumiere Lyon-2 was established in 2005. According to the research of SMBG Consulting Group, the Programme is included in the top ten Master Programmes in Business Intelligence in France in 2012–2020. The Programme graduated more than 280 students.

The Simon Kuznets Kharkiv National University of Economics has 7809 students (including 950 foreign students from 43 countries), 7 faculties, 700+ faculty members and offers training primarily structured around the new teaching architecture of higher education. Having considerable experience in training Ukrainian students, KhNUE influences HR, the scientific, technical, and economic policy of industrial enterprises and organisations in the country. The University trains highly skilled specialists familiar with modern information technologies and innovative model behav-

our. The University established a flexible system of quality specialists' preparation management, based on continuous monitoring of KhNUE graduates' achievements.

The University has experience in managing EU-sponsored projects (*TEMPUS, Erasmus+ CBHE – 5 projects, Erasmus + KA 107, Horizon 2020, AUF*).

### RESEARCH TOPICS

The majority of Simon Kuznets Kharkiv National University of Economics Information Systems Department research activities are carried out within the following topics:

- Mobile technologies in operative management of an enterprise
- System of monitoring in scientific researches in higher education
- Fuzzy logic and modelling in logistic and marketing
- Information security
- Distributed data warehouses
- Knowledge base and artificial intelligence
- Innovative computer technologies in higher education

### CURRENT RESEARCH PROJECTS

- ERASMUS+ CBHE EDUQAS – Implementation of Education Quality Assurance system via cooperation of University-Business-Government in HEIs. The wider objective of the project is to improve education quality assurance systems through the development of efficient internal quality standards leading to better employability of students in Partner Countries Universities. IS department of KhNUE will work on the establishment of a QA system for bachelor and master degree programs in Information Systems.

- AUF FESU "Formation à l'entrepreneuriat social dans les universités". The project aims at raising awareness about social entrepreneurship and its benefits around academic staff, students, and society, to promote the development of this business model, to update University strategy by incorporating social responsibility and following to Sustainable Development Goals, to implement an ICT tool to improve the level of entrepreneurial skills.

- Modern methods and means of analysis and development of information systems. The purpose of the research is to develop basic research in the field of intellectual and information-computer technologies in various spheres of human activity.

### EVENTS

The International Scientific and Practical Conference "Information Systems and Technologies", April 8–9, 2021.

International Scientific Conference of Young Scientists and Students "Information technology in the modern world: the research of young scientists", March 19–20, 2021.

### PUBLICATIONS

*Gryzun L.* Problems of Software Design for Training Students with Autistic Disorders // Conference Proceedings. 2<sup>nd</sup> ICSTR Rome – International Conference on Science & Technology Research, (*UWRC, Rome, Italy, 15–16 April 2021*), MATTER: International Journal of Science and Technology ISSN 2454-5880, p. 14.

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Air Force University, 2021. – Issue. 2(43).

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*Serhiy Semerikov, Illia Teplytskyi, Vladimir Soloviev, Vita Hamaniuk, Nadiia Ponomareva, Oleksandr Kolgatin.* Methodic quest: reinventing the system // Journal of Physics: Conference Series. – Vol. 1840 (*XII International Conference on Mathematics, Science and Technology Education (ICon-MaSTEd 2020) 15–17 October 2020, Kryvyi Rih, Ukraine*). 012036. Mode of Access: <https://iopscience.iop.org/article/10.1088/1742-6596/1840/1/012036/pdf>.

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*Golubnichy D.Y.* An analysis of systems for analyzing the behavior of corpus delicti / O.V. Sevierinov, O.V. Kolomitsev, D.Y. Golubnichy, G.V. Aloshin, V.F. Tretiak, A.V. Vlasov, A.O. Lisitsya // Scientific Collection «InterConf», (44): with the Proceedings of the 8<sup>th</sup> International Scientific and Practical Conference «Scientific Research in XXI Century» (*March 6–8, 2021*). Ottawa, Canada: Methuen Publishing House, 2021. – Pp. 750–759.



## LOUGHBOROUGH UNIVERSITY – CENTRE FOR INFORMATION MANAGEMENT (CIM) – SCHOOL OF BUSINESS AND ECONOMICS



### ABOUT THE INSTITUTION

The School of Business and Economics of Loughborough University is one of the most renowned business schools in the UK and has triple-accreditation of the MBA programme via AACSB, EQUIS and AMBA. The Centre for Information Management (CIM) is located within the School of Business and Economics as one of its key research hubs. CIM is concerned with the application and implications of modern IT, through digitization, the digital economy and through the development of the theory base of Information Systems.

Situated very close to East Midlands Airport (13km), Loughborough University is 182 km north of London. The campus is the largest in the UK in terms of its size, and the student population of the university is close to 20,000. The origins of the institution were in 1909 when the Loughborough Technical Institute was founded, but it was in 1966 that a university charter was granted. Since then, Loughborough University has risen in stature and is today regarded as one of the UK's top ten universities. Since 2015, Loughborough University has had a second campus at the Queen Elizabeth Olympic Park in London.

### THE DIGITALIZATION OF POLICING

Policing and criminal justice are undergoing a technological transformation. Not only has cybercrime risen greatly as a global and national threat, but the means of everyday criminal investigation are becoming digitalized. Researchers at Loughborough University are investigating the potential and issues associated with digital technology and its use for evidence gathering in the criminal justice system. Within this are the normal range of criminality endured by society, including theft, drugs, rape, and murder, and the potential digital instruments (e.g., smartphones, Internet of Things, dashcams) have in providing evidence.

Digitalization is an area of concern to stakeholders throughout the Criminal Justice system, from evidence-gathering and investigations, to trials and presentations in courtrooms. Key stakeholders and institutions are needed to debate the potential, from the state agencies to technological firms, campaign groups, and communities. There is an urgent need for knowledge-building, standards, and new solutions so that Criminal Justice enters a new era and builds standards that are relevant, secure and inter-operable across the world.

This new era is termed “Polis 4.0” by Richard Berry, PhD scholar at Loughborough. The term invites us to see that it is not just new technology that is of concern, but that there are also consequences for the whole police/ public relationship. There is much at stake. Not only do police forces need to be equipped in new ways, but society needs to make decisions about the scale and nature of data that it will allow being used in the investigation of criminal cases. Research colleague Professor John Coxhead leads the development of other themes related to leadership and innovation in policing. Recently he has been leading a study of risk management related to the policing of Covid-19 in a UK police force. This is undertaken with Professor Lisa Jackson, an expert in the study of risk, and Professor Peter Kawalek of the Centre of Information Management.

### NEW WEB3 RESEARCH

Web3 is an important new area of research. This topic area incorporates Blockchain, Cryptocurrency, Smart Contracts, Decentralized Autonomous Organizations, Decentralized Finance. We have already incorporated some Web3 topics into research studies with Midlands Engine and the Interdisciplinary Circular Economy Centre. The latter project is focused on the construction industry and is part of a broader project with University College London and the University of Leeds.

### RESEARCHER PROFILE

Dr. Kayode Odusanya is an assistant professor at Loughborough University. His research follows two main streams. In the first stream, he examines the societal impacts of IT, with currently ongoing work that looks at tackling inequalities associated with the uneven diffusion and use of technology. In his second stream, Kayode leverages micro and macro datasets to explore economic and behavioural indicators linked to sustainability and climate change policies.



Dr. Kayode Odusanya

### SELECTED PUBLICATIONS

References to Dr Kayode's recent research are below:

*Israilidis, J., Odusanya, K., & Mazhar, M. U. (2021).* Exploring knowledge management perspectives in smart city research: A review and future research agenda. *International Journal of Information Management*, 56, 101989.

*Odusanya, K., Aluko, O., & Lal, B. (2020).* Building consumers' trust in electronic retail platforms in the sub-Saharan context: an exploratory study on drivers and impact on continuance intention. *Information Systems Frontiers*, 1–15.

*Adetutu, M. O., Odusanya, K. A., Ebireri, J. E., & Murinde, V. (2020).* Oil booms, bank productivity, and natural resource curse in finance. *Economics Letters*, 186, 108517.

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### “FAST AND FRUGAL”

#### DECISION STRATEGIES

Studies have proposed the use of “fast and frugal” strategies as viable means in decision processes. Such strategies apply in cases where time or other operational constraints preclude the application of standard decision-analytic methods. While there is growing evidence of how such procedures can be highly accurate, limited research has evaluated how well decision-makers can execute the prescriptive recommendations of aids based on such strategies in practice. A new paper developed by Shashwat Pande (*Loughborough University*), Nadia Papamichail (*Manchester University*), and Peter Kawalek (*Loughborough University*), addresses this question.

Drawing on behavioural, neuropsychological and decision-analytic literatures, the study proposes that an alignment between individual, model, and task features will influence the effectiveness with which decision-makers can execute strategies that draw on prescriptive psychological heuristics – “fast and frugal” or otherwise. The findings suggest that strategy execution is highly sensitive to task characteristics. The effects of the number of alternatives and attributes on individuals' ability to deploy a given strategy differ in magnitude and direction depending on which decision strategy is prescribed. A more compensatory decision-style positively affected overall task performance. Subjects' ability to regulate inhibitory control was found to positively affect non-compensatory strategy execution while having no discernible bearing on comparable compensatory tasks.

The findings reinforce that rather than an aspect of the prescriptive model, synergies between individual, model, and task features are more instrumental in driving task performance in multi-criteria decision-making contexts. The paper discusses these findings in light of calls from Operational Research scholars to develop decision aids that draw on prescriptive “fast and frugal” principles.



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*Pande, S.M., Papamichail, K.N. and Kawalek, P., 2021.* Compatibility effects in the prescriptive application of psychological heuristics: Inhibition, Integration and Selection. *European Journal of Operational Research*.

# STEVENS INSTITUTE OF TECHNOLOGY SCHOOL OF BUSINESS

## ABOUT THE INSTITUTION

Founded in 1870, Stevens Institute of Technology is a premier private university focused on research and entrepreneurship in technology-related fields. Located across the Hudson River from Manhattan in Hoboken, New Jersey, Stevens has a population of 3,466 graduate (*master's and PhD*) students and 3,791 undergraduate students. Stevens is committed to exploring the frontiers of engineering, science, and management through integrative research and education programs. Stevens' three schools and one college support the mission of the Institute: The School of Engineering and Science, the School of Business, the School of Systems and Enterprises, as well as the College of Arts and Letters.

Stevens is regularly listed in the top 3% of US universities based on student return on investment. Notable graduates include Frederick Winslow Taylor, the father of scientific management, Henri Gantt, whose GANTT chart is a staple in most project managers' toolkits, and Alfred Fielding, the inventor of the Bubble Wrap.

The School of Business has 66 full-time faculty and 430 undergraduates, 900 MS students, 150 MBA students, 80 executive master's students, 25 PhD students, and numerous non-degree graduate and executive programs. Within the school, the Information Systems group is among the

largest graduate programs in the US, with a mix of evening and weekend classes, as well as online course offerings to students around the globe.



## RESEARCH TOPICS

Within the School of Business, two IS-related research groups operate in the areas of Business Process Innovation and Decision Technologies.

The Center for Decision Technologies (*CDT*), directed by Prof. Jeffrey Nickerson, performs funded research on topics related to decision making, combining perspectives from information systems, management science, organization science, cognitive science, social network analysis, and other computational sciences.

The Center focuses on bringing needed techniques to several areas. In the area of crowdsourcing and collective intelligence, it is now possible to quickly mobilize a crowd in minutes to address large-scale social problems. An example is ongoing research relates to the open-source sharing of designs for use with 3D printers. Re-

searchers at the CDT are interested in the role that crowds can play in sustainability – finding local solutions to energy needs that fulfill communities' objectives. In social networks and Big Data, research at the Center focuses on the intersection of transportation and communication networks. In many recent large-scale natural disasters, social media infrastructure has proven more resilient than traditional news outlets. At the same time, rumors propagate, and inaccurate ones impede rescue and recovery, which has led to a research interest in designing social media processes that will be useful during emergencies.

The Center received funding in excess of \$4 Million during the last four years from the National Science Foundation and other sources.

The Center for Business Process Innovation (*CEBPI*) studies the interplay between business processes and the organization. Under the direction of Prof. Michael zur Muehlen, the Center's research activities have been organized around several key issues.

The Center's research on Business Process Analytics examines how to advance the family of methods and tools that can be applied to event streams to support decision-making in organizations. Research is also being conducted in enterprise architecture, which contains analytical or prescriptive models of organizations, to ef-

ficiently identify organizational and technical interfaces, streamline cross-functional operations, and assert compliance to rules and regulations. Researchers at the CEBPI are also interested in understanding the dynamics of digitalized design processes and the impact of digital technology on business process innovation.

Research at the CEBPI focuses on how organizations evolve in their ability to govern and change operational work and decision-making processes. Some organizations begin by creating technical infrastructure and working out organizational adaptations. In contrast, others try to work out organizational details first before choosing appropriate technology. In either approach, the roles and responsibilities of a process support and management organization evolve over time, and little guidance exists as to how an organization can pursue operational efficiency in a repeatable and effective fashion.

## CURRENT RESEARCH PROJECTS

Recent research at the CDT focuses on the relationship between routines and innovation in design contexts, such as those with "open source-like" characteristics, to better understand the variables and phenomena such as routine variation, sequential structuring, structural evolution, and temporal modes as well as their impacts on design outcomes such as effective coordination, digital artifact innovation, and requirements computation.

Recent research at the CEBPI aims to understand the skills, positions, and organization structures of change management professionals in industries under different regulatory intensities. Additional research projects focus on the opportunities of digital technologies such as Robotic Process Automation, Cognitive Computing, and Blockchain on the design of business processes and the changing skills of workforces to survive in the age of smart business processes.

## SELECTED PUBLICATIONS

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*Cui, Z., Lee, C., Zhu, L., Zhu, Y. (2021).* Non-convex isotonic regression via the Myersonian approach. *Statistics and Probability Letters*, 179,109210.

*Ren, J., Dong, H., Padmanabhan, B., Nickerson, J.V. (2021).* How does social media sentiment impact mass media sentiment? A study of news in the financial markets. *Journal of the Association for Information Science and Technology*, 72(9), pp. 1183–1197.

*Wang, Y., Yin, S. (2021).* Hiring retirement-age CEOs. *European Financial Management*, 27(4), pp. 641–665.

*Cui, Z., Kirkby, J.L., Nguyen, D. (2021).* Efficient simulation of generalized SABR and stochastic local volatility models based on Markov chain approximations. *European Journal of Operational Research*, 290(3), pp. 1046–1062.

*Bertoni, F., Bonini, S., Capizzi, V., Colombo, M.G., Manigart, S. (2021).* Digitization in the Market for Entrepreneurial Finance: Innovative Business Models and New Financing Channels. *Entrepreneurship: Theory and Practice*.

*Arazy, O., Lindberg, A., Rezaei, M., Samorani, M. (2020).* The evolutionary trajectories of peer-produced artifacts: Group composition, the trajectories' exploration, and the quality of artifacts. *MIS Quarterly: Management Information Systems*, 44(4), pp. 2013–2054.



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*Liu, R., Mai, F., Shan, Z., Wu, Y. (2020).* Predicting shareholder litigation on insider trading from financial text: An interpretable deep learning approach. *Information and Management*, 57(8),103387.

## DISSERTATIONS/HABILITATIONS

*Taatian, Ali:* Three Essays in Public Capital Markets

# PERSONAL MEMBERS

Personal members in the ERCIS network are experts in their field of research and have strong personal connections within the network. To become a personal member, one should already have worked with partners from the network in the context of research projects, joint courses, or publications.



**ABOUT ME**

My research interests comprise service science, business process management, information modeling, and the socio-technical design of information systems. A particular focus is designing information systems that enable innovative service-oriented business models. I am an academic head of the Service Science Competence Center and a steering committee member of the Software Innovation Campus Paderborn (SICP). Besides other editorial roles, I am a member of the editorial board for Business & Information Systems Engineering (BISE), a guest editor for various journals, and a conference and program chair for the WI conference 2023.

**SELECTED PUBLICATIONS**

*Beverungen, D.; Kundisch, D.; Wunderlich, N.V. (2021): Transforming into a Platform Provider: Strategic Options for Industrial Smart Service Providers. Journal of Service Management, 32(4), pp. 507–532.*

*Weinziel, S.; Wolf, V.; Pauli, T.; Beverungen, D.; Matzner, M. (2021): Detecting Temporal Workarounds in Business Processes – A Deep Learning-Based Method for Analysing Event Log Data. Journal of Business Analytics, in press.*

*Beverungen, D., Müller, O., Matzner, M., Mendling, J., vom Brocke, J. (2019). Conceptualizing Smart Service Systems. Electronic Markets, 29(1), pp. 7–18*



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**ABOUT ME**

Patrick Delfmann is a full professor of Information Systems and head of the Research Group Corporate Communication Systems at the University of Koblenz-Landau. He holds a Diploma Degree (MSc) in Information Systems and a Ph.D. from the School of Business and Economics at the University of Münster. Patrick’s research focuses Business Process Management Technologies and covers Process Mining, Predictive Process Analytics, Business Rules Management, Process Query, Conceptual Modeling, Ontologies, and Compliance. Currently, he supervises the three research projects “Supporting Business Process Modeling with Pattern-oriented Recommender Systems”, “Social Process Mining” and “Handling Inconsistencies in Business

Process Modeling”, all funded by the German Research Foundation (DFG). Patrick’s research has been published in Journals such as Management Information Systems Quarterly, Information Systems, Communications of the Association of Information Systems, and Information Systems Frontiers, amongst others.

**SELECTED PUBLICATIONS**

*Corea, C.; Fellmann, M.; Delfmann, P.: Ontology-Based Process Modelling – Will we live to see it? In: Proceedings of the 40<sup>th</sup> International Conference on Conceptual Modeling (ER 2021). St. John’s 2021.*

*Corea, C.; Thimm, M.; Delfmann, P.: Measuring Inconsistency over Sequences of Business Rule Cases. In: Proceedings of the 18<sup>th</sup> International Conference on Principles of Knowledge Representation and Reasoning (KR 2021). Hanoi 2021.*



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**ABOUT ME**

I am a Full Professor at the University of Tuscia where I teach Organization Theory and Management of Information Systems. I am the Director of the II level Master in Artificial Intelligence for Business and Security, and a member of the board of advisors of the PhD course in Economics Management and Quantitative Methods. I coordinate a research group in digital transformation composed by two PhD students and one post-doc.

specific focus on eParticipation. I am also exploring how IoT, Cloud Computing, Big Data, Artificial Intelligence and Industry 4.0 technologies contribute to organisational sustainability from a triple bottom line perspective in manufacturing companies.

**SELECTED PUBLICATIONS**

*Margherita, E.G., Braccini, A.M.: Examining the development of a digital ecosystem in an Industry 4.0 context: a sociotechnical perspective. SN Bus. Econ. 1, 89 (2021).*

*Spasiano, A., Grimaldi, S., Braccini, A.M., Nardi, F.: Towards a Transdisciplinary Theoretical Framework of Citizen Science: Results from a Meta-Review Analysis. Sustainability, 13, 1–22 (2021).*

*Margherita, E.G., Braccini, A.M.: Managing industry 4.0 automation for fair ethical business development: A single case study. Technol. Forecast. Soc. Change. 172, 121048 (2021).*



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**ABOUT ME**

Marco De Marco is full professor of Organisation and Information Systems at Università Telematica Internazionale UNINETTUNO in Rome where he serves also as Dean of the Faculty of Economics. He is the author of several books and numerous essays and articles; mainly on the development of information systems, the impacts of technology on organisations and e-government. He is a member of the editorial board of several academic journals. In 2008 and 2009 he was a Board committee member of the Association for Information Systems, representing Europe, Africa, and the Middle East. His main research interests have included information systems development and performance measurement methodologies, while bank informa-

tion systems and their specificities were a particular study and focus. He has been serving as an officer of the major conference on information systems ICIS, ECIS, MCIS and he was cofounder of the Italian chapter of the AIS. At ICIS 2010 he was awarded the AIS Fellow Prize for his contribution to the IS discipline.

**SELECTED PUBLICATIONS**

*Veglianti E., Li Y., Magnaghi E., De Marco M. (2021). Understanding artificial intelligence: insights on China. Journal of Asia Business Studies-Emerald Publishing Limited. Vol 2. <https://doi.org/10.1108/JABS-10-2020-0391>*

*Veglianti E., Magnaghi E., De Marco M., Li Y. (2021). Smart City in China: The State of Art of Xiong an New Area. Springer LNISO.*



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## PERSONAL MEMBERS



### ABOUT ME

Since May 2021, I have been director of the Institute of Medical Informatics at Heidelberg University Hospital. From 2009 to 2021 I headed the Medical Informatics team at the ERCIS headquarter in Münster. My research and teaching focuses on informatics for personalized medicine, specifically information systems in healthcare regarding electronic health records (EHRs). Due to the digital revolution, the relevance of informatics within all fields of medicine is constantly rising. There is a wide scope of applications, ranging from molecular biology over clinical medicine to public health. My specific field of interest is data modelling in medicine. I'm the principal investigator of the MDM portal (<https://med-ical-data-models.org>), Europe's largest collection of medical data models. These data models are available in 20 download formats, in particular CDISC ODM, HL7 FHIR and openEHR ADL. Personalized medicine is built upon clinical and molecular data. Therefore I'm working on data mining and pattern recognition techniques for genomic data, in particular derived from next-generation sequencing of cancer tissue.

**SELECTED PUBLICATIONS**  
Blitz R, Dugas M. Conceptual design, implementation and evaluation of generic and standard-compliant data transfer into electronic health records. *Appl Clin Inform.* 2020 May;11(3):374-386. doi: 10.1055/s-0040-1710023



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### ABOUT ME

Jan Mendling is the Einstein-Professor of Process Science with the Department of Computer Science at Humboldt-Universität zu Berlin, Germany. His research interests include various topics in the area of business process management and information systems. He has published more than 450 research papers and articles, among others in *Management Information Systems Quarterly*, *ACM Transactions on Software Engineering and Methodology*, *IEEE Transactions on Software Engineering*, *Journal of the Association of Information Systems* and *Decision Support Systems*. He is a department editor for *Business and Information Systems Engineering*, member of the board of the Austrian Society for Process Management (<http://prozesse.at>), one of the founders of the Berlin BPM

Community of Practice (<http://www.bpmb.de>), organizer of several academic events on process management, and a member of the IEEE Task Force on Process Mining. He is co-author of the textbooks *Fundamentals of Business Process Management, Second Edition*, (<http://fundamentals-of-bpm.org/>) and *Wirtschaftsinformatik, 12<sup>th</sup> Edition*, (<https://lehrbuch-wirtschaftsinformatik.org/>), which are extensively used in information systems education.

### SELECTED PUBLICATIONS

Malinova, M., & Mendling, J. (2022). Cognitive Diagram Understanding and Task Performance in Systems Analysis and Design. *Management Information Systems Quarterly*.

vom Brocke, J., Jans, M., Mendling, J., & Reijers, H. A. (2021). A Five-Level Framework for Research on Process Mining. *Business and Information Systems Engineering*.



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### ABOUT ME

I am an associate professor in Information Systems at the University of Agder, Norway, where I am member of the Centre for digital transformation (CeDiT). My research focuses on the adoption of e-government both by government employees and by citizens. Furthermore, I analyse how governments interact with their various stakeholders via different communication channels. In my research, which deals with e-government on a national and international level, I combine my Information Systems background with insights from other disciplines such as communication and media science. Recently, I acquired funding for two international research projects where we identify what public services are actually suited for digitalisation.

### SELECTED PUBLICATIONS

Hofmann, S., Pappas, I. (2021). Understanding civic engagement on social media based on users' motivation to contribute. *International Conference on Electronic Government*, 2021.

Hofmann, S., Madsen, C., Lindgren, I., Verne, G. (2021). What public services should be digitalized? A citizen-centered analysis of what public services are suitable for digital communication channels. *International Conference on Electronic Government*, 2021.



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### ABOUT ME

Since September 2021, I am Full Professor of Socio-Technical System Design and Artificial Intelligence at Ruhr-Universität Bochum, Institute of Work Science as well as Faculty of Mechanical Engineering. Before that, I completed my doctorate at the University of Münster in 2015 and took on the coordination of the DFG graduate school "User-Centred Social Media" at University of Duisburg-Essen (2015–2017), followed by an assistant professorship of Information Systems at Freie Universität Berlin funded by the Einstein Center Digital Future (2017–2021).

My research is focused on the design and management of innovative information and communication technology (ICT), in-

cluding artificial intelligence-based decision support systems and conversational agents, and their impact on individuals, enterprises, and society as a whole. In that context, I examine the role of explainability in AI-systems and its influence, for instance, on users' (*calibrated*) trust or skill formation. Further topics refer to design and management of digital twins, the future of work and digital nudging.

### EXEMPLARY PUBLICATIONS:

Meske, C., Osmundsen, K. S. and Junglas, I. (2021). Designing and Implementing Digital Twins in the Energy Grid Sector. *MIS Quarterly Executive (MISQE)* (20:3), Article 3.

Meske, C., Bunde, E., Schneider, J. and Gersch, M. (2020). Explainable Artificial Intelligence: Objectives, Stakeholders and Future Research Opportunities. *Information Systems Management (ISM)*, doi: <https://doi.org/10.1080/10580530.2020.1849465>.



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### ABOUT ME

Oliver Müller is Professor of Management Information Systems and Data Analytics at Paderborn University. He holds a BSc and MSc in Information Systems and a Ph.D. from the University of Münster's School of Business and Economics. In his research, Oliver studies how organizations create value with (*big*) data and analytics; for example, by enhancing judgment and decision making, supporting knowledge management, or automating business processes. His research has been published in the *Journal of Management Information Systems*, *Journal of the Association of Information Systems*, *European Journal of Information Systems*, *European Journal of Operational Research*, and various others.

### SELECTED PUBLICATIONS

Caron, M., & Müller, O. (2021). To the Moon! Analyzing the Community of “Degenerates” Engaged in the Surge of the GME Stock. *International Conference on Information Systems*.

Kucklick, JP., & Müller, O. (2021). A Comparison of Multi-View Learning Strategies for Satellite Image-based Real Estate Appraisal. *Conference on Advancement of Artificial Intelligence (AAAI), Workshop on Knowledge Discovery from Unstructured Data in Financial Services*.



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### Open-Minded

### ABOUT ME

I am head of the research group „Digital Communication and Transformation“ (*digicat*) at the University of Duisburg-Essen. My research focuses on the digital transformation, especially on the effect of novel communication and collaboration technologies on enterprises and organisations as well as on society and individuals. Based on interdisciplinary research and advanced methods of data analytics me and my group perform excellent research and contribute to theory and practice. We are working with selected partners from academia and industry in several projects funded by the European Union, German

Research Foundation, Federal Ministry of Education and Research, industry, and foundations. My work has been published in reputable journals such as the *Journal of Management Information Systems*, *Journal of Information Technology*, or *European Journal of Information Systems*.

### SELECTED PUBLICATIONS

Langley, D. van Doorn, J., Ng, I., Stieglitz, S., Lazovik, A. & Boonstra, A. (2021). The Internet of Everything: Smart things and their impact on business models. *Journal of Business Research*, 122, 853–863.

Mirbabaie, M., Stieglitz, S., Brünker, F., Hofeditz, L., Ross, B. & Frick, N. (2021). Understanding Collaboration with Virtual Assistants – The Role of Social Identity and the Extended Self. *Business and Information Systems Engineering*, 63, 21–37.



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### ABOUT ME

I am head of the Chair of Industrial Sales and Service Engineering in the Mechanical Engineering Department at the Ruhr-Universität Bochum. My main research interests are in the area of digital servitization of manufacturing. For instance, my team and I investigate how enterprises can innovate with product-service systems and smart services. Amongst others, I am principal investigator of the BMBF-funded consortium projects Predictive Analytics Systems in Sales (*PASS*), Development of a Privacy Management System for Personalized Assistance Systems in Production and Service (*PersonA*), and Integrated Design of Business Model and Process Design for the International Provision and Marketing of Service Knowledge (*SerWiss*). Together

with Alessio Maria Braccini, I lead the network's Cluster Smart Manufacturing.

### SELECTED PUBLICATIONS

Ebel, M., Jaspert, D., & Poepelbuss, J. (2021). Pattern-Based Smart Service Innovation. *PACIS 2021 Proceedings*. 135. <https://aisel.aisnet.org/pacis2021/135>

Jaspert, D., Ebel, M., Eckhardt, A., & Poepelbuss, J. (2021). Smart Retrofitting in Manufacturing: A Systematic Review. *Journal of Cleaner Production*, 127555. <https://doi.org/10.1016/j.jclepro.2021.127555>

Nestler, L., Hoffmann, C., & Poepelbuss, J. (2021). Understanding and Defining the Corporate Influencer in Business-to-Business Sales—First Insights from an Interview Study. *ECIS 2021 Research-in-Progress Papers*. 26. [https://aisel.aisnet.org/ecis2021\\_rip/26](https://aisel.aisnet.org/ecis2021_rip/26)



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### ABOUT ME

I am Senior Assistant Professor at University “G. d’Annunzio” Chieti-Pescara (Italy), where I teach “Digital Business Organization” and “Digital Transformation”. I am member of the board of advisors of the PhD program in “Accounting, Management and Business Economics”. I am the Secretary of the Italian chapter of Association for Information Systems (AIS) since 2008 (<http://www.italis.org>).

My research is currently focused on digital innovations and business transformation affecting people and organizations. I am also interested in the use of social network

analysis technics applied to bibliometric data for performing literature analysis. I have also recently applied these techniques to investigate the indirect interlocking directorate phenomenon.

### SELECTED PUBLICATIONS

Rocchi, P. and Za, S. (2021). Troubled IS/IT projects: searching for the root causes, *Kybernetes*, Vol. 50 No. 9, pp. 2619–2631.

Cipriano M. and Za S. (2021). “Exploring the discourse on Digital Transformation in the domain of non-profit organisations” in *Exploring Innovation in a Digital World – Cultural and Organizational Challenges*, LNI-SO volume 51, Ceci F. et al. Eds., Springer International Publishing, Switzerland



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# ADVISORY BOARD

The ERCIS network has strong connections to local, national, and international companies working with us on various fields of expertise. Aside from sponsoring the network, the feedback of those companies during regular meetings, round tables, or during one-to-one talks, as well as their inclusion in research projects and studies, ensures that we work on practically relevant topics.



**OUR COMPANY**

Arvato Supply Chain Solutions, as part of the Bertelsmann Group is an international full service provider in the field of supply chain management and e-commerce. In addition to traditional logistics services, we develop and operate complex supply chains, global e-commerce platforms and customer-centric omnichannel solutions. We are specialists for end-customer-oriented industries such as healthcare, tech, fashion & lifestyle, beauty, entertainment, telecoms, automotive, banking and insurance.

Our vision is to be the most client focused and data/IT driven international supply chain company.

The list of our references include over 500 global market leaders, Fortune 500 companies and established brands, as well as young start-ups and expanding SMEs who rely on us to help them develop and internationalize their business models.

We believe that to develop the most efficient SCM and IT-solutions, you need to understand market demands and customer requirements. That is why we are organized in different industry segments. Our management team and their respective teams are proven experts in their fields.

The main ERCIS collaboration partner within Arvato Supply Chain Solutions is our unit Arvato SCS | DIGITAL. As mentioned before, we are organized by industries. With the digital unit, we are creating competencies that dovetail the know-how with digital expertise at all levels. The basis for

our digital solutions is the use and analysis of existing data.

We cultivate an open, non-dogmatic and entrepreneurial company spirit, with a strong business focus on realization of SCM and IT innovations – beyond simple buzzwords. Exchange at eye level promotes a culture of creativity in the workplace and strengthens teamwork within our company. This in turn helps us to act entrepreneurial and forward facing.

**JOB OPPORTUNITIES**

Bottom-up culture & entrepreneurial spirit

Are you looking for a career entry? Immerse yourself in the world of (digital) supply chain management and e-commerce. We offer countless entry opportunities across all career levels (from graduate programs to Senior positions) and exciting topics in our various IT and Data areas – from SAP, IT project management, software development or data intelligence to numerous opportunities in the area of digitalization in our Digital Unit.

Our strength is the interaction of different IT areas. Through exchange and cross-departmental cooperation, we can develop ever faster, ever better, innovative solutions for our customers.

You can actively contribute your ideas to our various IT topics and digitalization projects. We are looking for impulse generators and offer creative freedom in an open, relaxed and team-oriented culture. We are looking forward getting to know you!

At different locations (e.g. Münster, Cologne, Gütersloh, Harsewinkel, Hannover and Hamburg) we are regularly looking to fill e.g. these positions:

- (Junior) Software Developer Java/Web
- (Junior) DevOps Engineer
- Cloud Infrastructure
- (Junior) QA Engineer / Software Tester
- (Junior) Project Manager / Product Owner
- (Junior) Data Analyst
- (Junior) Data Engineer
- (Junior) Data Scientist
- UX/UI Designers
- Management Associate Trainee
- Internships / Working Students

Please visit our career webpage for current job opportunities or feel free to submit a speculative application.

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Arvato Supply Chain Solutions is Advisory Board Member since 2019.

**RESEARCH TOPICS**

AI Solutions, Data-driven Business models, Logistics innovations & enhancements, E-Commerce

**CAREER WEBSITE**

<https://arvato-supply-chain.com/en/career>

**CORPORATE WEBSITE**

<https://arvato-supply-chain.com/en>



**ABOUT THE COMPANY**

As a leading supplier of merchandise management systems, Bison offers complete solutions for retail. Bison has its headquarters in Sursee, employs approximately 300 staff and generates a turnover of over EUR 70 million. With over 30 years of market experience, Bison makes a reliable, secure contribution to the success of its customers. Each customer receives comprehensive and long-term support, with a focus on mutual trust and the protection of customers' IT investments.

Bison Smart Retail Solution was specially developed for the retail sector. This solution covers the core processes for goods management and at the point of sale in full. By integrating a solution for traceability, Bison offers a modern, up-to-date package of solutions. Based on the standard solution and individually tailored to customer preferences, considerable added value is created for the customer.

The Bison Retail expertise hub has comprehensive process knowledge and can provide and implement technical solutions, above all in all areas relating to multi-crosschannel®. Bison Process enables a crosschannel sales approach and process management, including in-store, e-commerce and m-commerce. This industry model provides retail-specific processes. These can be individually configured to meet the company's requirements, without programming and without losing the release capabilities of the software. The open architecture of Bison Process ensures the company a high level of investment protection; the software is always a step ahead of challenges in the market, both in terms of its technology and its functionality.

The product portfolio is complemented by POS solutions, electronic shelf labelling (ESL), mobile solutions for mobile end devices and digital signage solutions. Bison's modern POS solution can be perfectly integrated into existing system environments thanks to the modular structure and its exceptional flexibility. Thanks to the ESL concept, the headquarters or individual branches can respond quickly to changing market or price situations. The wireless base station simplifies internal processes and creates a direct connection between the shelf and POS. In addition, the electronic shelf labelling at the POS creates new possibilities in terms of information. This is used not only for product identification and price labelling, but also in combination with specially developed apps or with internet of things (IOT) modules which provides further useful services for the customer in terms of traceability of the product, product features, contents (allergens) etc. Thanks to the mobile solutions, normal Smartphone devices can be turned into powerful mobile hand-held devices. The scanning solutions include a barcode scanner, a magnetic card reader and an optional Bluetooth component to connect a mobile printer. The RFID option vastly expands the range of uses. Thanks to standard or individually programmed applications, the devices offer a multitude of in-store application possibilities, e.g. stocktaking, order creation, goods-in process and picking.

Bison offers innovative communication options through digital signage. The solutions can be managed efficiently by the simple user functionality and automatic interfaces. Bison is a general contractor

and covers all the processes of a modern retailer using integrated solutions, from the central ERP system to branch management to POS systems and digital signage.

**TOPICS OF INTEREST**

- Interest in European (sales) partnerships
- Development of new approaches to tackling retail-specific questions and problem areas bearing in mind the cloud approach
- Integration of Zebra Technologies, iPod, iPhone, iPad and Samsung Galaxy in operating procedures
- E-Paper integration options (e.g. Electronic Shelf Labeling)

**JOB OPPORTUNITIES**

**For students:**  
Diploma/bachelor theses in the fields of IT, software development and marketing

**For graduates:**  
Consultants, software developers, project managers and sales representatives

For further information please visit [www.bison-group.com](http://www.bison-group.com)





# CLAAS

**ABOUT THE COMPANY**

What started in 1913 with the manufacture of powerful straw binders has become one of the world leaders in the production of agricultural technology. The company is well-known for its highest quality standards, leading technologies as well as their market leaderships in combines and self-propelled harvesters. Machine to-machine communication, intelligent networking, the improvement of the harvesting process as a whole – industry 4.0 is already the company’s reality and sustainability is its principle.

CLAAS products ensure efficiency in agricultural production and they go easy on natural resources as they continuously reduce energy consumption. More than 11,000 employees are engaged in this task in 140 countries; talented people from all professions, who make their daily contribution towards feeding the world.

**TOPICS OF INTEREST**

- Connected machines
- Farming 4.0
- Omni-channel customer experience
- Precision Farming
- Data Management
- Big data & AI/ML Engineering

Today the harvest chain is seeing many innovations coming through, especially in drive technology, machine intelligence and networking. “Efficient Agriculture Systems”, abbreviated as “EASY”, is the CLAAS collective term, which encom-

passes machine control and performance optimization, steering systems, precision farming and monitoring, software solutions and services. However, digital transformation has changed much more than just the technology of our machines. New product features, different license models and data driven business models require our business unit for sales and service to reinvent our traditional way of doing business.

At CLAAS, we are striving to digitize all traditional customer touchpoints for each and every farmer. Our online and offline world is emerging into one Omni-channel customer experience. CLAAS is heavily investing in its digital future. In addition to the development center for electronics on the machines in Dissen, massive investments are being made in the customer and dealer systems. As an example CLAAS connect, as the holistic digital touchpoint, delivers integrated functionalities, services and shops to their customers in order to link the customer’s processes seamlessly with ours.

To further centralize sales processes, as well as dealer and customers systems we’ve created a new location – the CLAAS Campus Herzebrock. The well-known positive customer experience from our physical dealer touchpoints will be ensured for our digital touchpoints through the integration of state-of-the-art systems e.g. Salesforce, SAP hana, Tableau and modern IT architectures. This modern IT landscape also enables us to generate new solutions for internal processes and our customers based on data and with the use of AI. These are

intended to support us in improving our products and increasing availability. Our data analytics team works closely with all departments to find new opportunities for the use of AI.

**JOB OPPORTUNITIES**

CLAAS is special because it is a family owned enterprise with a long-term, forward-looking approach which is based on the commitment of its employees. At CLAAS, you will face the challenging task of continuously improving harvesting performance through innovative technology.

**Selected vacancies in Germany for professionals:**

- SAP Consultant
- Senior SAP BW/ HANA Specialist
- Mobile Developer Android
- Network Specialist
- Security Specialist

**Selected vacancies in Germany for students:**

- Internship: KI in product development
- Working student position: Future CRM Sales Force
- Working student position: ITSM/ Serviceautomation

Usual procedure: 3 months internship + 3 months joint thesis project. If you have any questions about our current international vacancies, our contacts at the respective locations are happy to help.



[www.claas.jobs](http://www.claas.jobs)

Instagram: @claas\_careers



**ABOUT THE COMPANY**

With a pioneer spirit and start-up attitude cronos was founded in 1991 in Münster, Germany. Our core area of consulting is IT and process optimization for utility companies. We support our customers in the process of digitization and the development of new business fields.

**TOPICS OF INTEREST**

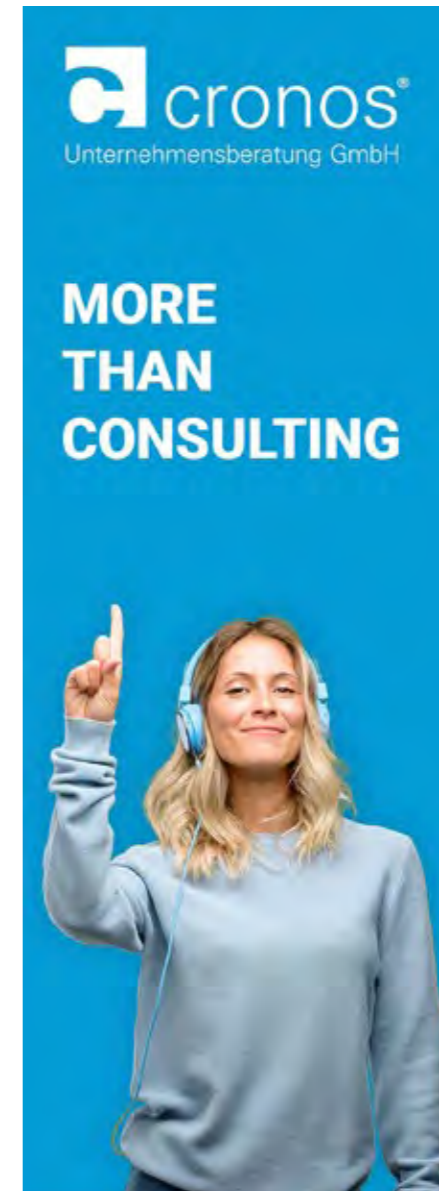
- software engineering
- project management
- portals
- app development
- SAP HANA
- process automation
- CRM
- SAP Customer Experience
- analytics
- online marketing
- HTML5, JAVA
- SAP BTP
- SAP Fiori
- Machine Learning
- strategy consulting
- AI
- SAP UI5
- celonis Process Mining
- Robotic Process Automation

cronos is an official SAP, UiPath, celonis and Microsoft partner, has long standing partnerships with universities and a combined experience of over 1000 customer projects. Drawing from this experience and based on the latest technological trends, like Blockchain, SAP S/4HANA, Robotic Process Automation, Process Mining and Machine Learning, we are able to develop innovative and approved solutions for the utilities industry.

We make an active contribution to the success of the energy transition in Germany, Austria and Switzerland. With over 300 permanent consultants in 5 locations, we are the biggest independent SAP consulting firm for the utilities industry in GSA. Our success is the result of a well-balanced team formation bringing together young and experienced IT specialists, who are among the most sought-after consultants in the industry.

**FACTS**

- market leader as biggest independent IT consultancy for the utility sector
- 300+ consultants
- 200+ active customers
- 1000+ successful projects
- 30 years of experience
- SAP partner energy of the year 2021 + 2022 Partner
- UiPath Diamond Partner
- Celonis Gold Partner



**JOB OPPORTUNITIES**

Think outside the box – especially in IT! Driven by innovative and creative young people, digitization accelerates the development of new technologies and new challenges. Granting young professionals the freedom to explore ideas and to assume more responsibilities is part of our credo. We maintain a strong academic network and offer attractive programs for students and graduates. Our regular workshops, graduate programs and extensive onboarding system jumpstart a career in IT development and consulting.

**WE ARE LOOKING FOR TALENTS**

- Junior IT consultant
- Junior RPA developer
- Junior app developer
- Junior cloud developer
- Junior ERP consultant
- Working Student
- Bachelor-/Master-Thesis

Find out more about our student and graduate programs:

[www.cronos.de/campus](http://www.cronos.de/campus)  
[www.cronos.de/cronologewerden](http://www.cronos.de/cronologewerden)

# D·M·I

**ABOUT THE COMPANY**

DMI takes responsibility for the digital archiving of patient records and provision in client software systems. Since 1966, the specialised service provider has been providing hospitals with continuous support in the optimisation of information-based processes and with fully compliant archiving throughout constant changes in technology and framework conditions. In production centres and at clients' locations, DMI staff digitise, qualify, integrate and archive every second patient record for in-patients based on certified information security and data protection guidelines and ensure seamless integration into health IT systems. Through its interface expertise with all data management HIS architectures, DMI enables the consolidation of digitised paper-based patient records with electronic documents and data, as well as medical image documentation, in audit-proof long-term archives. Interoperability (the ability of systems to interact with one another), including on a data level, is the basis for the integration and sustainability of our solutions.

DMI provides its clients with lean, secure, efficient processes through consolidated patient records.

Our relationships with our clients are shaped by commitment, respect and fairness. The quality of our service business is based on the professional and social skills of our employees.



ESB\_Professional/shutterstock.com

**TOPICS OF INTEREST**

- Consolidating medical records including electronic and digitized documents
- Interoperable IT architectures based on current standards
- Audit-proof digital archiving for compliance
- Deep integration of archived documents into administrative and clinical workflows for enabling effective clinical processes for best patient outcomes
- The link between medical informatics and medical research as well as routine practice in healthcare

**DMI AS AN EMPLOYER**

DMI is not your typical medium-sized company: it is an owner-managed organization of roughly 1,000 highly motivated staff and a flat hierarchy. Its approach is long-term and sustainable, with continuing education of employees as a key ingredient. With a focus on the German healthcare market and additional activities in banking, insurance, general business, and the public domain, DMI offers high-value services:

- digitization, qualification, consolidation, presentation, and archiving of documents
- integration into information-based processes
- analysis of documentation process landscapes and support for optimization aiming at effectiveness and compliance.

Company headquarters are situated in the pulsating university city of Münster in North Rhine-Westphalia (NRW); service centers are located in the castle town of Leisnig near Leipzig (Saxony) and Essen (the "Green Capital", NRW).

**JOB OPPORTUNITIES**

Are you up to this challenge? DMI's team members are committed to achieving results for customers in a dynamic ecosystem of evolving technologies and continuously changing customer demands. A multitude of benefits make DMI an attractive employer.

- Selected open positions in Germany for professionals: (senior) software developers for applications, information systems specialists, experts for IT infrastructures and networks.
- Selected open positions in Germany for students: thesis students (business IT, information systems, IT, software development) for innovation in documentation and archiving enabled by state-of-the-art IT and by digital transformation.

**FOR MORE INFORMATION, CONTACT:**

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viola.henke@dmi.de  
www.dmi.de



**ABOUT THE COMPANY**

flaschenpost SE has transformed the German beverage market – by making online shopping of water, soft drinks, beer, and other beverages as simple as possible. Launched in 2016 in Münster, our company has expanded into nearly all major metropolitan areas of Germany.

Online ordering of beverages and a delivery within 120 minutes, free of charge and without crate lugging or annoying deposit returns – this is the idea that lies at the heart of flaschenpost's customer promise. Following a consistent strategy based on both operational excellence as well as digital expertise, our company is part of a revolution in last-mile logistics.

flaschenpost's idea was taken up and successfully multiplied by Berlin's Durstexpress a short time later. It's owner Oetker Group took over flaschenpost by the end of 2020 to leverage growth synergies in a dynamic growth market. The merger of both companies resulted into the leading German online beverage delivery service.

Today 33 flaschenpost logistic hubs and more than 13.000 employees are serving customers in as many as 180 German cities. And the story continues: Since last year, our range of products extends beyond beverages. By now, seven flaschenpost warehouses are delivering food, fresh goods, and household goods. flaschen-

post is planning to become a nationwide full-range online grocery store soon.

To do so, we like to connect with people and institutions eager to find new solutions for e-commerce, logistics, digitalization, and sustainable mobility.

**TOPICS OF INTEREST**

Ever since being established, flaschenpost has been a data- and technology-driven company. Starting with a self-developed e-commerce platform and handhelds that guide both delivery drivers and warehouse staff, it was our goal to be able to independently implement our ideas and serve customer needs.

The connection between flaschenpost and WWU Münster is traditionally strong and has existed from the very beginnings of our company. Thus, many of our first hour employees are WWU alumni and to this day, flaschenpost actively recruits (junior) staff from WWU.

However, the close ties do not only relate to talent but also to scientific exchange. The most prominent example is flaschenpost's intelligent route planning algorithm. It calculates the best delivery routes based on many parameters and was developed together with WWU scientists.

Additionally, there are several other topics of mutual interest, e.g. analytics, pro-

cess management, digital transformation, the future of work, software development, product management, logistics and supply chain management.

**JOB OPPORTUNITIES**

We are on a journey that is exciting in many ways. Therefore, we are searching for new colleagues who are smart, curious, and like to join our diverse team. Our offices in Münster, Cologne and Berlin are places where we push forward online grocery. Therefore, just get in touch with us and let us talk!

Right now, we have several positions available, e.g.:

- Senior Data Scientist (m/w/d)
- (Senior) Business Intelligence Analyst (m/w/d)
- (Senior) Data Engineer Business Intelligence (m/w/d)
- (Senior) Inhouse Consultant Business Intelligence (m/w/d)
- Cloud Data Engineer (m/w/d)
- Senior Analyst (m/w/d)
- Product Owner Human Resources (m/w/d)
- App-Developer Android (m/w/d)
- App-Developer iOS (m/w/d)
- Backend Developer (m/w/d) – Warehouse Logistics
- Frontend Developer (m/w/d) – Recruitment Platform

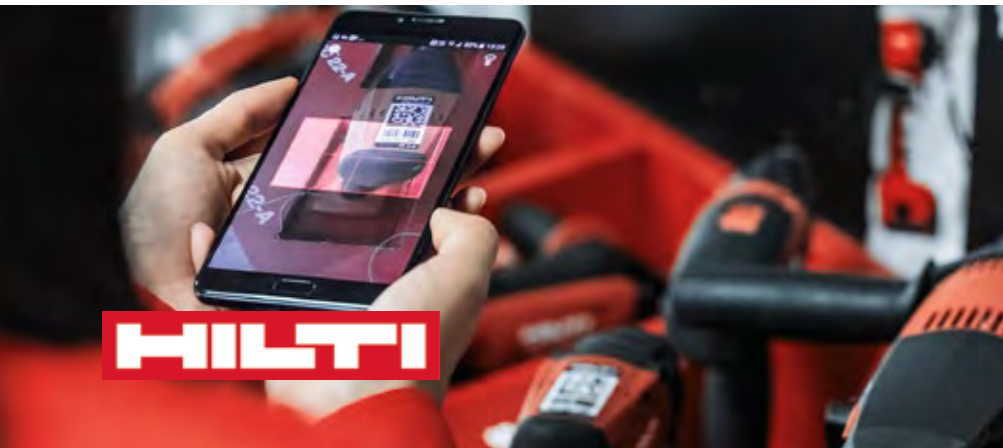
[wirsindflaschenpost.de/corporate](http://wirsindflaschenpost.de/corporate)

**CONTACT**



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## ABOUT THE COMPANY

At Hilti we create and design leading-edge technology, software and services, which power the professional construction industry. Hilti stands for quality, innovation and direct customer relationships resulting in about 250,000 individual customer contacts each day. Based in Schaan, Liechtenstein, the company has 30,000 employees in more than 120 countries around the world who contribute to making construction work simpler, faster and safer while inspiring customers every single day with technologically leading products, systems, software and services.

Many ideas for improvements are developed directly on construction sites while talking to customers. If there is an on-site challenge for which no Hilti solution exists, one will be developed. This is why the company invests approximately 6 percent of sales each year in research and development. We run our own research and design labs, working with top technical universities and partners, all over the world. We make our own products in Hilti factories and with external partners, making sure all our products match the same high quality and standards.

We are particularly motivated by the possibilities that digital technology can bring to a traditional sector like construction. Right now, we have a unique opportunity to solve real-world problems and lead the way in revolutionizing our industry. As a company whose lifeblood is innovation, we give our customers the next level of digital offerings on an impressive global scale.

For you, it means unrivalled opportunities to work in a 'start-up within' environment, develop an international career and really have an impact on the shape of things to come.

## ABOUT GLOBAL IT IN HILTI

It's an incredibly exciting time to join Hilti, especially if you work in the digital space. We've always been a company at the forefront of engineering hardware solutions, and today we're investing more than ever in software technologies as digital transformation is a big priority for us.

Hilti is a great place for you to show your worth as you learn, grow and carve-out your career in Information Technology. Global IT within Hilti is a truly global team with main hubs in Buchs (Switzerland), Kuala Lumpur (Malaysia), and Plano and Tulsa (USA). All locations have highly competent teams who work very closely together and in profound partnership with their business counterparts. Hilti's Global IT team is known for their focus on sustainable business enablement by translating latest IT innovations into value creating solutions and services.

So, have a career with the best! Become a valuable member in a highly professional and international team of IT experts and meet the challenges of a global multinational company using latest technologies.

## TOPICS OF INTEREST

- **Business applications** – where we run a fully consolidated global SAP S/4 HANA system landscape.

- **Digital workplace** – where we connect our 30,000 Hilti people and make them an information-enabled team.
- **Cloud application platform** – where we build our common platform for all digital and software offerings to our customers.
- **Enterprise computing** – where we design, build and operate our network and computing capabilities.

Our Global IT roles range from data analysts, project managers and system engineers to cyber security experts, user experience designers and enterprise architects.

## JOB OPPORTUNITIES IN OUR STRATEGIC IT OFFICE IN BUCHS, SWITZERLAND:

- Interns or thesis students
- Hilti Fellowship program (*in cooperation with University of Liechtenstein*)
- Graduate positions

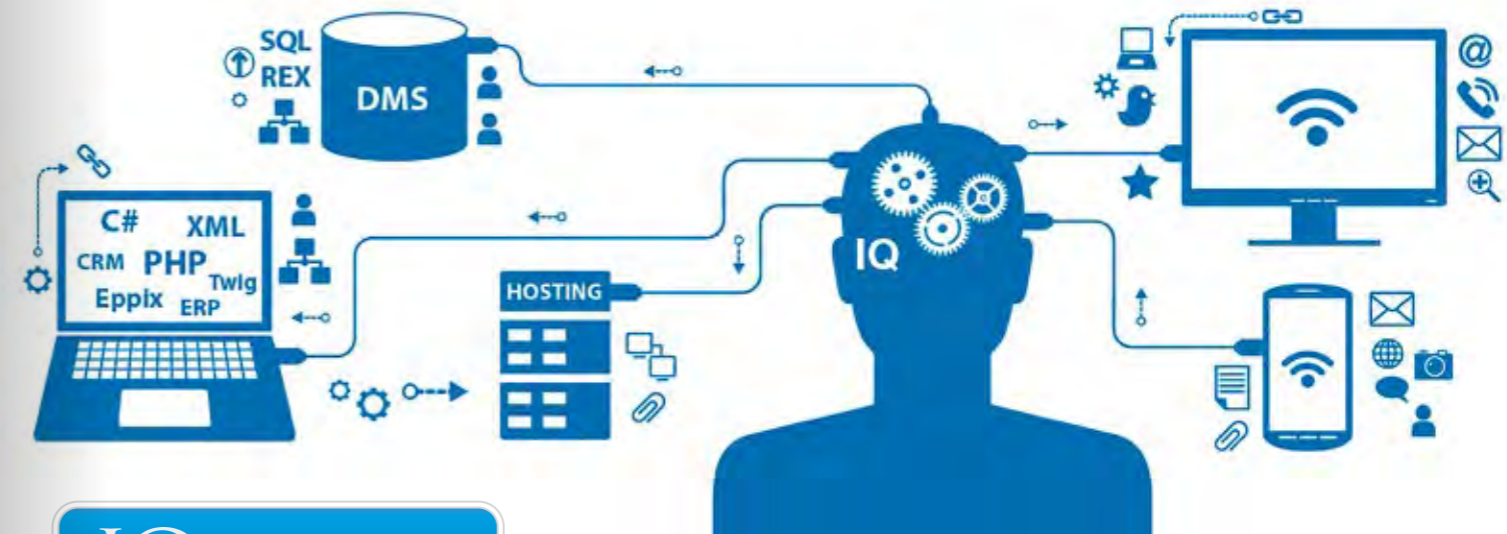
Take a look at the open positions on <https://careers.hilti.li/en-li/corporate-it> or get in touch with us directly.



## CONTACT

Tobias Zangerl  
HR Manager Interns  
[tobias.zangerl@hilti.com](mailto:tobias.zangerl@hilti.com)

We have been recognized as one of best workplaces on the 2020 Fortune 100 Best Companies to Work For® list and 2019 Best place to Work by Glassdoor, and were ranked among the top employers by the Great Place to Work® Institute multiple times. Further, the snow-draped mountains, crystal-clear lakes and marvelous landscapes in the so-called Happy Valley invite for lots of outdoor activities and allow you to work where others spend their holidays.



## IQ-OPTIMIZE

The IQ-optimize Software AG is a provider of modern, innovative software technology and offers its customers reliable and customer-oriented IT services. Since 1996 IQ-optimize develops customized applications and advanced software products. The IQ-optimize Software AG is a subsidiary of 1&1 AG. 1&1 AG is a listed public limited company and offers telecommunications services. The portfolio of the IQ-optimize Software AG is broad. The priorities are customer oriented and serve all needs of costumers.

## Main competences of IQ-optimize Software AG are:

- Software development, operation and maintenance of workflow and document management systems for business processes automation, billing and mediation, ERP and retail for web shops, stores and indirect sales including sales of subsidized goods.
- Media design for trendsetting websites.
- Implementation, hosting and operation of customized IT infrastructures and cloud solutions including service management, maintenance, security and monitoring.
- IQ Optimize is Advisory Board Member since 2004.

## RESEARCH TOPICS

Optimization; Innovation; Omnichannel; Telecommunication; Workflow Management; CRM; Web Sales; Retail; Business Intelligence; Service Management and Security; Hosting and Cloud Solutions

## JOB OPPORTUNITIES

We are offering various job opportunities within our Software Development, Billing, Operation, IT Security, Business Intelligence, Media Design and Project Management Units. Additionally to these areas we are offering job opportunities within our Cloud Technology area based on OpenStack. Please refer to <https://www.iq-optimize.de/job> for further details.

<http://www.iq-optimize.de>



### ABOUT THE COMPANY

The PICTURE GmbH intends to promote organisations in their modernisation efforts. We combine a methodical approach, technical support and considerable process expertise with a sustainable qualification approach. This integrated approach helps to achieve success in process management. The PICTURE GmbH is a spin-off of the University of Münster, founded in 2007 by Lars Algermissen and Thorsten Falk. Thereby the PICTURE GmbH stays connected with the university and still benefits from a transfer of knowledge. The core business segment of the PICTURE GmbH is process consulting, process analysis and organisational design. The PICTURE GmbH is a consulting firm as well as a software company with consultants and developers specialised on process consulting. The company is well known for the PICTURE method and the PICTURE platform, which in combination allow describing, analysing and optimising business processes within organisations.

### THE PICTURE METHOD – EASY. EFFECTIVE. EFFICIENT.

On the basis of 24 building blocks the Picture method provides the opportunity of process controlling by gathering and illustrating process data in a plain and transparent manner.

This method of process modelling lays the foundation for an extensive business assessment, as it offers a target-oriented and efficient way to analyse the coherencies of a company's organisational structure and business procedures.

The following illustration furnishes a brief overview about the Picture method:

#### Self-Explanatory

Simplified process modelling due to easy-to-use an intuitive components.

#### Standardized Process Description

Increased comparability and analysability due to a formal and contentual standardisation of the description level.

#### Instruction and Integration of Employees

Due to its simplicity it enables employees to adopt this model quickly and fosters staff acceptance.

#### Flexibility in Process Description

The PICTURE method can be personalised according to the individual requirements of organisations.

#### Efficient Process Modelling and Activity Analysis

The 24 building blocks enable to filter essential information for further analysis.

#### THE PICTURE PLATFORM

The Picture method is embedded in the web-based Picture platform. This platform serves to support process management within organisations as well as inter-site projects. The PICTURE platform is tailored to the special needs of organisations and aims to provide a vivid, precise and generally intelligible methodology to illustrate these needs through customised processes.

Visit our website [www.picture-gmbh.de](http://www.picture-gmbh.de)

Visit our website [www.picture-gmbh.de](http://www.picture-gmbh.de)

### JOB OPPORTUNITIES

Job Opportunities at the PICTURE GmbH:

- (Junior) Sales Consultant (f / m)
- (Junior) Consultant
- (Senior) Consultant
- Software Developer
- Student Assistant (f / m)

### TOPICS OF INTEREST

- Process management and optimisation
- Quality Management and Risk Management
- Organizational review
- Knowledge Management
- Task and Product Review
- Software implementation
- Process Benchmarking
- Change Management
- Process-oriented Budget Consolidation
- Implementation of Document Management Systems Reorganisation Studies Interface Analyses, Implementation of Software

# PROVINZIAL

### ABOUT THE COMPANY

The Provinzial Group is the second largest public insurance group in Germany. We insure what is dear to our customers: their belongings, their home, their vehicle, their working power, their leisure activities, partly their health and even their lives. We are also happy to help with retirement planning.

We gain our strength from the regional ties of our subsidiaries. For more than 300 years, we are where our customers are. Today, more than five million private and corporate customers place their trust in us. What makes us special is our regionality and proximity. Our advisors are at most a few minutes away from our customers and can be reached through our many digital channels at any time. Furthermore, we put great importance on sustainability and commitment to the regions that are firmly anchored in our corporate values. Whether in the field of art and culture, sports sponsorship or security: We are committed to many different areas.

As Provinzial Group we belong to the Saving Banks Finance Group, Germany's leading and most successful financial network. We are one of Germany's top 10 insurers with a premium volume of more than six billion Euros and around 5,400 employees. The Provinzial Holding AG as holding company of the whole group is headquartered in Münster. In total, there are five regional indemnity and casualty insurers as well as two life insurers operating under the holding company with headquarters in Münster, Düsseldorf, Kiel, Hamburg and Detmold.

### SELECTED PROJECTS

#### #unsereProvinzial-IT

#uP-IT is the largest IT program in Provinzial's history. Its goal is to create the common IT landscape and working environ-



© Roland Horn

ment of the future. This is realized with new ways of collaboration and innovative technology – always with a focus on users. The program runs for six years and is comparable to moving into a new home. Everything is prepared step-by-step with highest value placed on operational security and stability. The orientation towards agile development principles helps us to promote flexibility regarding current technological and market-specific trends. This enables our development teams to work independently in parallel and to deliver results continuously.



### #futureInsuranceSolutions



New, innovative insurance business models that inspire young people? Individual, flexible and attractive? Offering a noticeable added value?

21 students from the WWU Münster, the University of West Georgia and Georgia College & State University dealt with these questions intensively for one week as part of an interdisciplinary, virtual design thinking seminar. After introducing our case, the students presented their elaborated results after five days of work and continuously documented their experiences in a blog. The great results ranged from completely new business models to an app

prototype and several recommendations for website design. Always in focus: "What inspires young people?"

### TOPICS OF INTEREST

Our IT department is a full-service provider for the Provinzial Group. We focus on:

- Business Process Management and Automation
- Data Analytics and Artificial Intelligence
- IT Security and Governance
- Enterprise Architecture
- Software Engineering
- Digital Transformation and Innovation
- Insurance and Financial Services
- Risk Management

### JOB OPPORTUNITIES

Today, around 950 employees work in our IT department. Convince yourself of the innovative drive of a company rich in tradition.

We search regularly:

- Java Developers
- Business Analysts

We offer:

- Direct Entries
- Trainee Programs
- Internships
- Working Student Activities

We support:

- Bachelor and Master Theses

For more information, visit us on [www.provinzial-konzern.de/content/karriere](http://www.provinzial-konzern.de/content/karriere) [www.provinzial-konzern.de](http://www.provinzial-konzern.de)

or follow us on



SAP's purpose is to help the world run better and improve people's lives with sustainability at the core.

**ABOUT THE COMPANY**

SAP's strategy is to help every business run as an intelligent enterprise. As a market leader in enterprise application software, we help companies of all sizes and in all industries run at their best: 87% of the world's total global commerce touches an SAP® system. Our machine learning, Internet of Things (IoT), and advanced analytics technologies help turn customers' businesses into intelligent enterprises. SAP helps give people and organizations deep business insight and fosters collaboration that helps them stay ahead of their competition. We simplify technology for companies so they can consume our software the way they want – without disruption. Our end-to-end suite of applications and services enables business and public customers across 25 industries globally to operate profitably, adapt continuously, and make a difference. With a global network of customers, partners, employees, and thought leaders, SAP helps the world run better and improve people's lives.

For more information, visit [www.sap.com](http://www.sap.com)

**TOPICS OF INTEREST**

- Business Technology Platform
- Database & Data Management
- Intelligent Technologies
- Application Development
- Predictive Analytics
- Artificial Intelligence / Machine Learning
- Blockchain
- Cyber Security / Quantum Technologies

Intelligent Suite

- Digital Supply Chain
- Industrie 4.0 / IoT
- Employee Experience Management
- Sustainability Footprint Management

**JOB OPPORTUNITIES**

**Dreamers. Thinkers. Doers.**

Looking for your dream job? Find it at SAP. Bring everything you are – and become everything you want.

For more information, visit [jobs.sap.com](http://jobs.sap.com)

**SCHWARZ**



**ABOUT THE COMPANY**

The Schwarz Group is a leading international trading company with 500,000 employees in 33 countries and 12,900 stores worldwide. Based in Neckarsulm, Baden-Württemberg, Germany, the Group's pillars in food retailing are Lidl and Kaufland.

In addition to the retail business, the Schwarz Group has continuously expanded its portfolio: The Schwarz Production produces own brands in the beverages, baked goods, confectionery and ice cream sector.

The Schwarz Group has been involved in the collection, sorting and recycling of recyclable materials for many years. PreZero is the disposal and recycling service provider for the entire group.

Schwarz IT is the powerful technology partner of the entire Schwarz Group. As a central IT service provider, Schwarz IT is responsible for the selection and provision of IT infrastructure, IT platforms and business applications.

By continuously considering current technological developments, Schwarz IT identifies innovative courses of action. In close cooperation with the departments, Schwarz IT develops professional, efficient IT solutions. In total, Schwarz IT is responsible for IT at more than 12,900 locations throughout the Schwarz Group in 33 countries en-route to "Trading 4.0".



The guiding principles of the Schwarz IT are enthusiasm for innovation, proximity to people and understanding the business. As a leading technology partner, the Schwarz IT is the digital heartbeat of the Schwarz Group: **efficient, fast and flexible.**

**TOPICS OF INTEREST**

Digital Transformation and Innovations, Business Transformation, extensive service processes, IT architecture, Cloud Data, Informatics, Master Data Management, SAP HANA, Big Data, Business Intelligence, Artificial Intelligence & Analytics, SAP Retail/EWM/CAR, Salesforce, CRM, SuccessFactors, GK Software, Hybris, Solution Development, Design Thinking and Conversational Commerce (Chatbot, VoiceBot).

**JOB OPPORTUNITIES**

In a wide range of exciting tasks and global projects, employees work in a dedicated, independent and cheerful way towards providing optimum business support to Europe's largest retail company in terms of assisting global business processes, and designing, developing and rolling out systems. Furthermore, they ensure a highly-available IT system and application landscape as well as ultra-modern, high-end technologies.

Goals: The Schwarz Group is among the top retailers worldwide with annual sales over 125,3 billion euros. The digitization of the world offers many previously unimaginable possibilities for the further development of existing business models and for the establishment of completely new concepts. For this to succeed, we create the decisive technological prerequisites.

The Schwarz IT secures the diverse, global daily business of the Schwarz Group. Through the forward-looking development of innovative solutions, the Schwarz IT enables new business ideas to be put into practice.

Become part of Schwarz IT, the powerful technology partner of Schwarz Group. The Schwarz IT offers a variety of opportunities from internships to permanent positions for go getters, who want to become part of the digital heartbeat.

**Schwarz IT – more IT than you might think!** Find out about attractive job offers at

[www.it.schwarz](http://www.it.schwarz)

[www.xing.com/companies/schwarzitkg](http://www.xing.com/companies/schwarzitkg)  
[www.linkedin.com/company/schwarz-it-kg](http://www.linkedin.com/company/schwarz-it-kg)  
[www.kununu.com/de/schwarz-it](http://www.kununu.com/de/schwarz-it)





**ABOUT THE COMPANY**

viadee Unternehmensberatung AG is a German IT-Company with more than 200 employees including our interns. Our company culture is dedicated to caring for each one individually, maximizing our potential. Applying this principle, we have come a long way since 1994 to offer great individual solutions to our customers.

viadee currently has an office in Münster, as well as an office in Cologne and Dortmund. We focus a regional customer base in North-Rhine Westphalia. Projects are seldom far away from our employee's home location, which proudly makes us the chance to sleep at home. This contributes to our flexibility, family lives as well as to our CO<sub>2</sub> footprints.

The industry sectors, in which our consultants are active, include banking, electric power industry, trade, IT and service companies, logistics, public service, telecommunications, insurers, and supply plants.

**TOPICS OF INTEREST**

We share a passion of technological and methodical expertise. Keeping up to date with the ever-changing world of IT, there are various opportunities to grow within viadee.

Bringing BPMN (*business process model notation*) models to life is currently one of

our core activities. Prominent mention should be given to our Open Source contributions on GitHub, as well as our confluence BPMN-Modeler on the Atlassian Marketplace. Work often is organized in agile projects leveraging Java- or Cloud-based technologies, be it new technologies like Quarkus and Micronaut or Spring Boot, or established practices like WSDL or REST. Java and SAS have accompanied us through almost all our company history and with most customers. However, we emphasize our undogmatic view on technologies and methods and use whatever is appropriate, such as Python and R in the Data Science domain.

To keep up with the scientific discussion we enjoy cooperation, both with ERCIS, and other research institutions.

Test automation is great to ensure software quality. We feel it is even greater with a tool developed here called Mateo, the viadee test automation and RPA framework: An opportunity to create cross-platform integration tests, be it web-based, or on the level of an operating system.

Areas of expertise and consulting products, such as these, are invented and supported like internal start-ups by using lean methods.

Employees contribute their topics of interest as part of our research and devel-

opment activities. Right now, this is happening with IT-Security, Cloud Architecture, Process Mining, Agile Leadership, ML-Ops, and several other topics.

**JOB OPPORTUNITIES**

Interested in our topics and ready to take the next step? If you see yourself in a technical role, while being open and interested in the social components of everyday business life, we would love to welcome you on board.

**IT-Consultants for**

- Software Development
- Software / Cloud Architecture
- BI / Data Science
- BPM and Process Automation

To find out about our benefits and further job listings make sure to visit our website [www.viadee.de/karriere](http://www.viadee.de/karriere).

For a closer look at our field of interest, you are invited to follow along at [blog.viadee.de](http://blog.viadee.de) – a blog to which every employee can add content.

**FOR MORE INFORMATION, PLEASE CONTACT:**

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[www.viadee.de](http://www.viadee.de)



**ABOUT THE COMPANY**

The Westfalen Group is an energy sector technology company operating with numerous subsidiaries and associates in Germany, Belgium, France, the Netherlands, Austria, Poland and Switzerland. The family business, founded in 1923, has over 20 production sites located across Europe and is headquartered in Münster. Its business sectors are gases, energy supply and service stations. With almost 1,800 employees, the Westfalen Group posted sales of around 1.6 billion euros in the 2020 financial year.

**Gases**

The Westfalen Group produces and distributes approximately 300 technical gases and gas mixtures for almost every application in industry and trade, food production, laboratories, pharmaceuticals, medicine and homecare.

**Energy Supply**

Under its Westfalengas brand, the Westfalen Group is one of Germany's leading liquid gas supply companies. There are more than 2,000 possible applications for Westfalengas: as off-grid thermal energy for heating factories and agricultural buildings, for thermal processes in industry and commerce, or as an environmentally friendly propellant for passenger cars or forklift trucks.

**Service Stations**

With around 260 stations, the Westfalen Group has the largest independently-branded filling station network in Germany, primarily in North-Rhine Westphalia and Lower Saxony. In addition to conventional fuels, Westfalen and Markant stations also offer the alternative energies of LPG, charging current and hydrogen.



Corporate headquarters of the Westfalen Group at Industrieweg in Münster.

**A family owned company**

The Fritsch-Albert family ensures continuity of the family company: Since July 2018, Wolfgang Fritsch-Albert has been Chairman of the Supervisory Board at the Westfalen Group. Prior to this, he led the company as CEO from 1977 to 2018. Renate Fritsch-Albert joined the Supervisory Board in April 2017. She was previously a member of the Executive Board.

**Climate protection with hydrogen**

The Westfalen Group supports regional and nationwide environmental protection initiatives. In 2018, for example, it entered into a cooperation with Stadtteilauto Car-Sharing Münster GmbH. Both companies offer an emission-free hydrogen vehicle to rent. In October 2021, the Westfalen Group presented the mobile hydrogen filling station, a future technology that it intends to bring to the German market together with its cooperation partner NanoSun.

**Systematic energy and environmental management**

The Westfalen Group has, for many years, continued to pursue a rigorous energy and environmental management system. In 2018 the effectiveness of this system was proven once again by the company's successful certification to internationally recognized standards DIN EN ISO 14001 (*En-*

*vironmental Management Systems*) and DIN EN ISO 50001 (*Energy Management Systems*). In addition, more than 700,000 kilowatt hours of electricity have been saved over the past three years.

**TOPICS OF INTEREST**

- Industry 4.0
- IoT in Logistics
- Data Analytics and Machine Learning
- Mobile Solutions
- Business Process Excellence
- Digital business models

Westfalen is constantly on the lookout for new business fields and technologies in order to continue to establish forward-looking products on the market. By strengthening entrepreneurship, the first start-up ideas have been put into practice, including the mobile payment app fillibri and the sustainability platform Sustayn.

**JOB OPPORTUNITIES**

If you are interested to work with great people at the Westfalen Group please look at our website:

<https://westfalen.com/de/de/karriere/>



**ABOUT THE COMPANY**

zeb is the leading strategy and management consultancy specializing in financial services in Europe. We support banks, insurance companies and (tech) service providers in dealing with all the challenges and opportunities arising from transformation in the industry. As an employer, we rely on people who like to try new things, take responsibility and inspire others through their actions.

**TOPICS OF INTEREST**

As a partner for change, it is our aim to improve the performance and competitive strength of our clients. The success of our consulting services is based on wellfounded methodology, combined with indepth expertise and excellent knowledge of the sector. The focus of our work lies in strategy & organization, finance & risk and IT. We intend to continue our growth path in the future. Our thematic growth focus is on management and IT consulting.

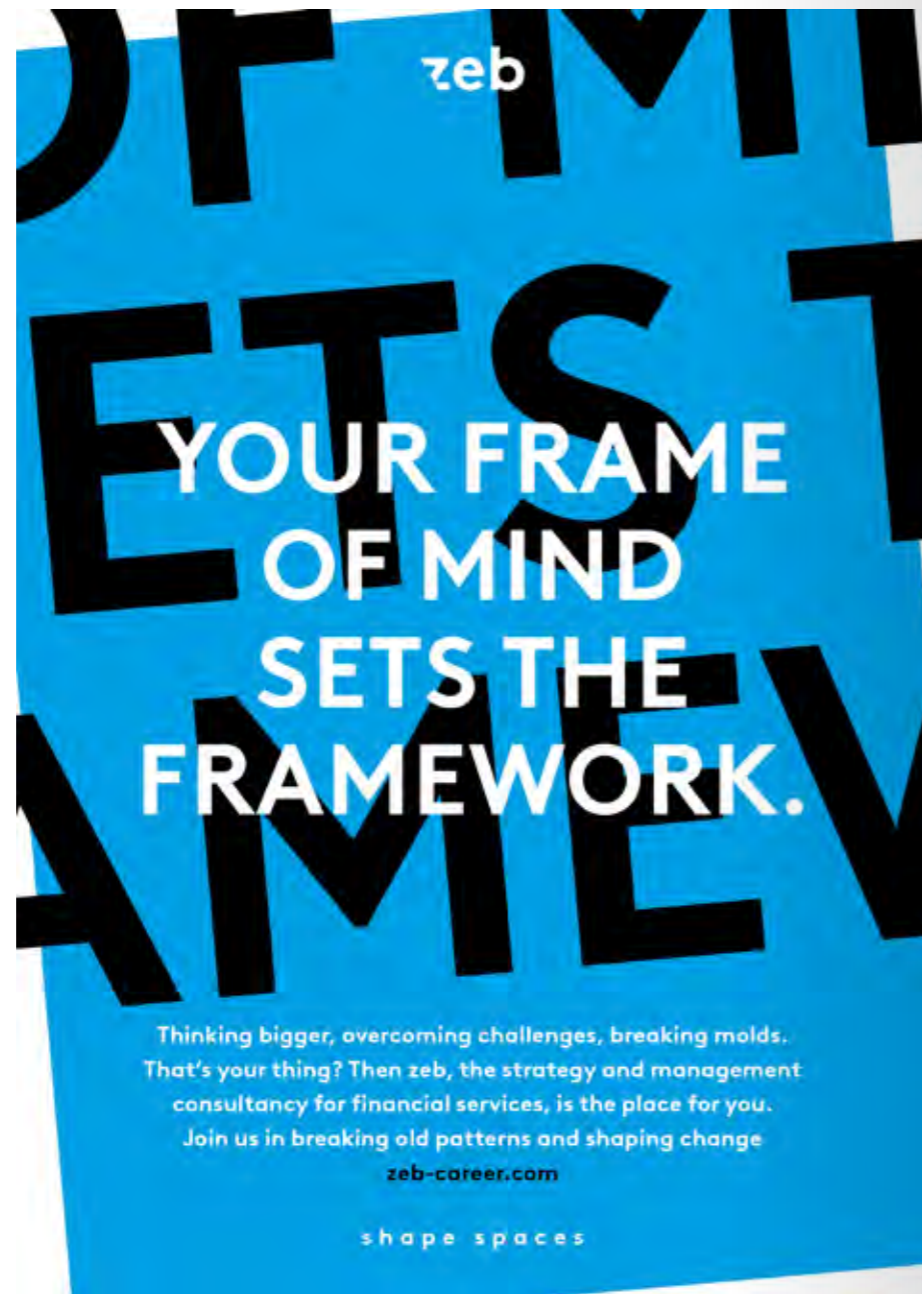
**ADDITIONAL INFORMATION**

**ABOUT THE COMPANY**

#ShapeSpaces

Entering new spaces, shaping and designing them, grasping and changing the unknown. That's our thing. We love to discover new things, try them out and develop them further—and we love to infect others with our enthusiasm for doing so.

Shape Spaces expresses the key element of the zeb culture: shaping things. With expertise, courage and creativity, we drive the transformation of the financial sector forward. We love to discover new things, try them out and develop them further. We are looking for people who overcome boundaries, shape the future and infect others with their enthusiasm.



Shape your professional future with us.

**Stay and grow**

“Stay and grow” is our motto. zeb promotes long-term careers—with a focus on your personal career path. We are looking for people with an excellent university education and team spirit. Our principle at zeb: reasoning beats hierarchy. This means that your opinion matters. Get involved in the dialog that gives rise to something new. Listening well is just as important as arguing convincingly. Question the familiar and inspire others with your ideas. Create new solutions in a team and dive deep into the topic.

**JOB OPPORTUNITIES**

**Required specializations:**

business administration, economics, (business) informatics, (business) mathematics, applied physics

**Possibilities to join the company:**

- Internship
- Student assistant
- Theses and dissertations
- zeb.bachelor.welcome
- Direct start

[www.zeb-career.com/de/](http://www.zeb-career.com/de/)  
[www.zeb-career.com/en/](http://www.zeb-career.com/en/)

# COMPETENCE CENTERS

The ERCIS network bundles certain areas of expertise in several competence centers. Competence centers are multi- and interdisciplinary consortia consisting of partner institutions from research as well as from practice to focus on distinct topics.

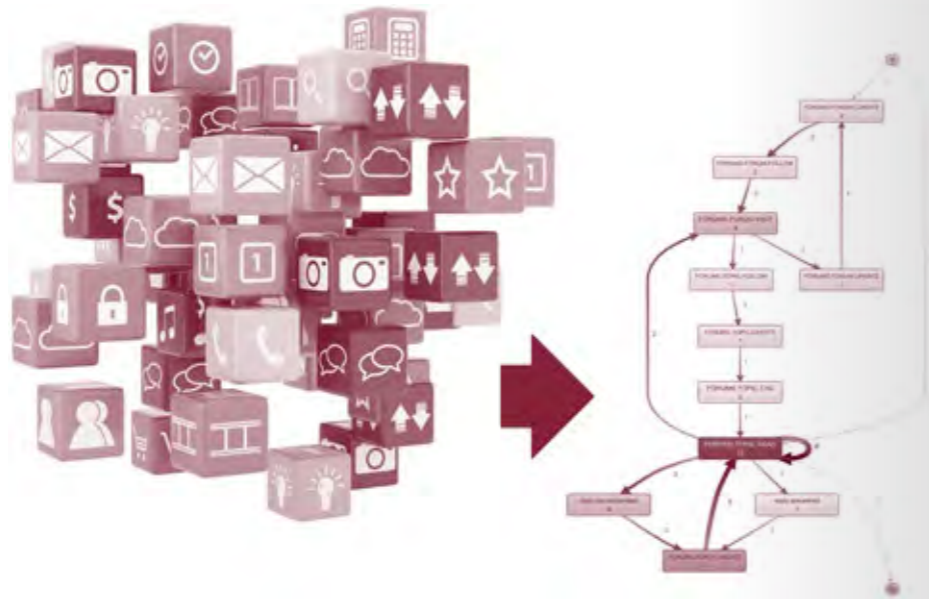
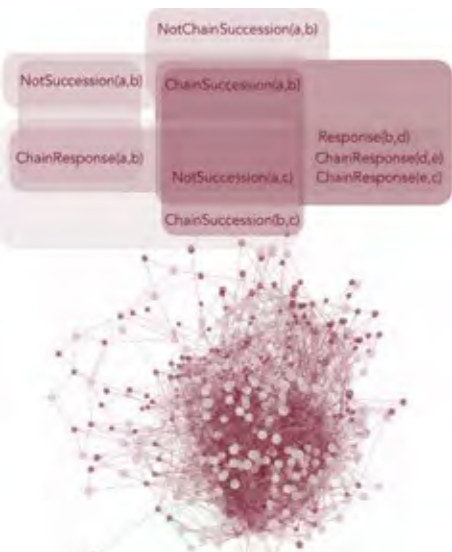
# COMPETENCE CENTERS

## CONCEPTUAL MODELING

The Competence Center for Conceptual Modeling focuses on the development of novel methodologies, providing automatic support for the design, enactment, and analysis of conceptual models (*largely process models*) in different business domains. Our research is mainly based on formalisms, models and algorithms from graph theory, machine learning, propositional logic, natural language processing, ontologies, and software engineering.

## RESEARCH

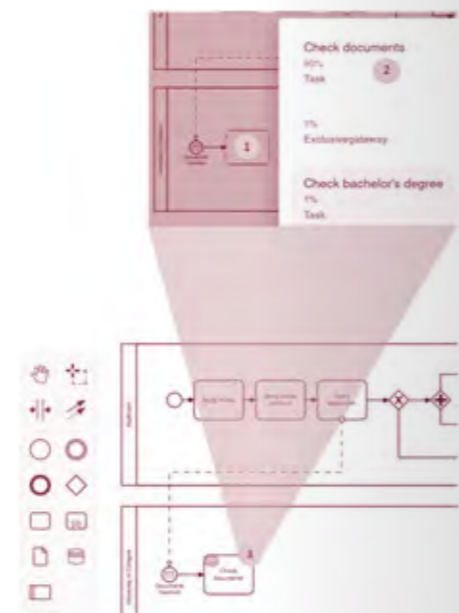
- **Business Rules Management:** Business rules are formal prescriptions that a company has to comply with in order not to face negative monetary or legal effects. Business rules are used to control the execution of business processes, and they are often maintained in business rule repositories as part of process-aware application systems such as business process management software and/or workflow management systems. An important task of Business Rules Management is to maintain said repositories in order to cope with inconsistencies, for instance. In our research project “Handling Inconsistencies in Business Process Modeling (HI<sup>2</sup>BPM)”, which is funded for two years by the German Research Foundation (DFG, DE 1983/9-1), we have developed a methodology that can identify such inconsistencies automatically and support analysts in resolving them with corresponding inconsistency measures and visualisations.



- **(Social) Process Mining:** Process Mining is a popular research stream in the realm of Business Process Management. It develops approaches to learn the structure and behavior of a business process automatically from log files of business software. Traditional Process Mining focuses on highly structured processes as they are typically executed in enterprise systems or semi-structured processes, which are supported, for instance, by case handling systems. A new research field in Process Mining, which we initiated with our research project “Social Process Mining (SPM)”, focuses on unstructured processes as we find them in Enterprise Social Software (ESS). The goal of the SPM-project, which is funded for three years by the German Research Foundation (DFG, DE 1983/12-1), is to develop Process Mining algorithms that consider the special character of unstructured ESS processes and to apply them on large ESS log data to automatically detect typical collaboration scenarios in ESS.

- **Predictive Process Monitoring:** Predictive Process Monitoring is used to learn the structure and behavior of a business process automatically from log files of business software and predict the future behavior of currently running process instances. The prediction results can be used to proactively influence process instances, for example, to assure beneficial behavior and avoid unfavorable one. We can use predictive process analytics, for instance, to support public traffic systems or tourist installations to optimise their operating rate or to avoid congestion, optimise the behavior and output of plants, or decrease fine particulate matter pollution in major cities.

- **Process Modeling Recommender Systems:** Recommender Systems provide automatic support for process modelers by recommending next and/or previous process flow and annotation elements during the modeling process. The recommendation is made based on the information found in the process modeled so far and based on a repository of process models and/or process ontologies commonly used in the domain. To calculate recommendations we make use of ML methods that were transferred from the field of Predictive Process Monitoring (*see below*). To avoid ambiguities in the naming of process elements, we use terminological standardisation based on Natural Language Processing (NLP). A corresponding research project “Supporting Business Process Modeling through Pattern-based Recommender Systems (ProPoneRe)” started in December 2021 and is funded for two years by the German Research Foundation (DFG, DE 1983/11-1).



## CONFERENCE & TEACHING ACTIVITIES

Currently, we are co-organising the new minitrack “Business Rules Management Technologies” at HICSS 2022, together with our ERCIS colleagues from KU Leuven. We are happy that we could acquire several high-class papers so that we could meet the strict acceptance rate criteria of HICSS while at the same time being able to completely fill up the minitrack time slot. Another track that we are currently organising, together with colleagues from the Universities of Kiel and Rostock, is the BPM track at the International Conference Wirtschaftsinformatik 2022.

In teaching, we offer an annual winter school, called the Ski-Seminar, for bachelor and master students, which is organised by the University of Koblenz and the ERCIS headquarters. The winter school takes place in the Austrian Alps, so we can offer skiing as a social event.

## SELECTED PUBLICATIONS

Bartmann, N.; Hill, S.; Corea, C.; Drodts, C.; Delfmann, P.: Applied Predictive Process Monitoring and Hyper Parameter Optimization in Camunda. In: Intelligent Information Systems. CAISE Forum 2021, Melbourne, VIC, Australia, June 28 – July 2, 2021, Proceedings. LNBP 424. S. 129–136.

Corea, C.; Fellmann, M.; Delfmann, P.: Ontology-Based Process Modelling – Will we live to see it? In: Proceedings of the 40<sup>th</sup> International Conference on Conceptual Modeling (ER 2021). St. John’s 2021.

Corea, C.; Nagel, S.; Mendling, J.; Delfmann, P.: Interactive and Minimal Repair of Declarative Process Models. In: Business Process Management Forum (BPM Forum 2021). Rome 2021.

Corea, C.; Thimm, M.; Delfmann, P.: Measuring Inconsistency over Sequences of Business Rule Cases. In: Proceedings of the 18<sup>th</sup> International Conference on Principles of Knowledge Representation and Reasoning (KR 2021). Hanoi 2021.

Delfmann P.; Riehle, D.; Höhenberger, S.; Corea, C.; Drodts, C.: The Diagrammed Model Query Language 2.0: Design, Implementation, and Evaluation. Erscheint in: Polyvanyy, A.: Process Querying Methods. Berlin et al. 2021.

Drodts, C., Weinzierl, S., Matzner, M., & Delfmann, P. (2021). The Recommender: A Decision Support Tool for Predictive Business Process Monitoring. In: Proceedings of the Business Process Management 2021 Demonstration Track. Rome 2021.

Grohé, C. C.; Corea, C.; Delfmann, P.: DMN 1.0 Verification Capabilities: An Analysis of current Tool Support. In: Business Process Management Forum (BPM Forum 2021). Rome 2021.

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# COMPETENCE CENTERS

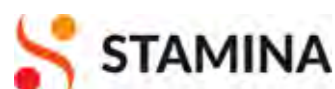


## CRISIS MANAGEMENT

The Competence Center for Crisis Management (C<sup>3</sup>M) integrates the research efforts of the ERCIS network in the domain of crisis management (CM) and humanitarian logistics. Our main objective is to identify relevant challenges in practitioner realities and to design appropriate socio-technical solutions. C<sup>3</sup>M integrates a collaborating network of different practitioner and research organisations from the CM and humanitarian logistics domain.

## CURRENT RESEARCH PROJECTS

- Our DRIVER+ project, which ended last year, was selected as one out of ten #brightsideof2020 EU projects by the European Research Executive Agency. A direct continuation of the DRIVER+ activities is realised through the H2020 funded demonstration project “**STAMINA: Demonstration of Intelligent Decision Support for Pandemic Crisis Prediction and Management within and across European Borders**”. C<sup>3</sup>M’s role covers an adaptation and application of our DRIVER+ Trial Guidance Methodology to support the methodological design and analysis of pandemic management trials in twelve European countries.



- Within the project “**BISKIT: Blood Information System for Crisis Intervention and Management**”, funded by the Federal Ministry of Education and Research, we develop a simulation-based optimisation toolkit to identify and analyse different strategies improving the blood supply chain performance. Additionally, we apply an enterprise architecture management approach to design a collaborative information system for the South African blood supply chain. The aim is to increase the overall effectiveness and resilience of blood supply chains during disasters. We are thankful for the broader interest in our approach by further blood services and enjoyed several stakeholder workshops with representatives from Ghana and Namibia.



- The third ongoing project picks up our simulation activities directly related to the COVID-19 pandemic. The project “**Epi-/CoPredict: User-oriented Extension and Automation of Agent-based Software for Pathogen-specific Modelling of Epidemics**”, funded by the Federal Ministry of Education and Research, aims at the development of a testbed to evaluate non-pharmaceutical intervention strategies for a deeper understanding of infection dynamics. Together with our domain experts from science and practice and the German COVID-19 modelling initiative, we have been engaged in researching the dynamics

of the COVID-19 pandemic and supporting public health decision-making.



## CONFERENCES

Given our current strong research focus on simulation in CM research, Bernd Hellingrath and Adam Widera chaired a session on the application of simulation in humanitarian logistics research during the Humanitarian Operations and Crisis Management Track at the **31<sup>st</sup> Annual Conference of the Production and Operations Management Society (POMS)** in April 2021. It was an honour to co-organize two virtual conferences on innovations and exercise evaluations in CM, hosted by our partners from the **Main School of Fire Service in Warsaw, Poland**. Also, we presented our work on AI-supported crisis communication at the **Hawaii International Conference on System Sciences** mini-track “Disaster Information, Resilience for Emergency and Crisis Technologies”. In the context of the BISKIT project, we gave several talks around simulation-based optimisation, e.g. during the **European Conference on Operational Research** and at the **EURO Working Group on Operational Research Applied to Health Services**. In the area of epidemics modelling, we presented our EpiPredict framework at the **Winter Simulation Conference** and we were invited to demonstrate our work at the **Autumn School hosted by the German Research Platform for Zoonoses**.

# C<sup>3</sup>M

## TEACHING AND OTHER ACTIVITIES

We offered several CM-related courses to the Münster IS students, such as the specialisation module “Quantitative Methods and Simulation in Humanitarian Logistics” or project seminars on simulation for pandemic management or enterprise architecture management in blood supply chains.

We would like to emphasise our first joint student project with the **Institute for Fire Services of North Rhine-Westphalia** as it fitted so well to the virtual setups of our lectures since the COVID-19 outbreak. Our partners were challenged by an increasing demand for more intensified and flexible work in its command chains. Our students conceptualised and prototyped a virtual command and control system for fire fighters. The applied Human-Centered-Design methodology impressively led the project team to a well-evaluated practitioner-driven solution. Besides, we again organised the course “Logistics in Humanitarian Action” offered by the **Network on Humanitarian Action (NOHA)** at the group of **Prof. Dr. Dennis Dijkzeul**, Institute for International Law of Peace and Armed Conflict (*Ruhr Universität Bochum*). Given our established collaboration, we were invited to cover now the humanitarian logistics chapter in the new edition of the NOHA International Humanitarian Action Textbook.

## WHAT’S NEXT?

We would like to close with some good news for 2022. We were granted with two new projects starting soon: (1) The project “**SpacImpact**”, funded by the German Research Foundation, investigates the utilisation of spatially resolved data sources for an agent-based model of Germany and its impact on predicted SARS-CoV-2 dynamics; (2) The project “**DigCBA**”, funded by the Research Council in Norway, contributes to the responsible use of digital cash-based assistance in refugee crises. As DigCBA is led by **Associate Prof. Hossein Baharmand** from our **ERCIS partners at the University of Agder, Norway**, we are very happy about both the growth of C<sup>3</sup>M and its stronger integration within the ERCIS

network. Last but not least, C<sup>3</sup>M has been invited to participate in the **ForAn project** led by the **Federal Agency for Technical Aid (THW)** as associate partners. ForAn brings together German CM and security practitioner organisations with experienced research institutions to intensify their active involvement in European civil security research. Big thanks to all our partners and a warm welcome to all new collaborators!

## SELECTED PUBLICATIONS

*Hansen, H., Widera, A., Ponge, J., Hellingrath, B. (2021) Machine Learning for Readability Assessment and Text Simplification in Crisis Communication: A Systematic Review. HICSS.*

*Horstkemper, D., Reuter-Oppermann, M., Middelhoff, M., Widera, A., Hellingrath, B. (2021) Improving Blood Supply Chain Crisis Management by Simulation-based Optimization. ASIM Conference.*

*Neubauer, G., Ignjatovic, D., Schimak, G., Widera, A., Middelhoff, M., Scheuer, S., Aumayr, G., Jaho, E., Rainer, K. (2021) The Benefits of Trials for Pandemic Management. IDIMT Conference.*

*Ponge, J., Enbergs, M., Schüngel, M., Hellingrath, B., Karch, A., Ludwig, S. (2021) Generating Synthetic Populations Based on German Census Data. Winter Simulation Conference.*

*Schimak, G., Ignjatovic, D., Neubauer, G., Havlik, D., Widera, A., Middelhoff, M. (2021) STAMINA – Disaster risk and crises management methodological approach. Environmental Informatics Conference.*

*Widera, A., Hellingrath, B. (2022, in print) Humanitarian Logistics and Supply Chain Management. In: Thielböcker, P. und Heintze, H.-J. (Eds) International Humanitarian Action Textbook. Springer Publishers.*

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# DT in SMEs



Figure 1 – Presentation of the VOIL-project, CeiiA, Matosinhos, Portugal, sept. 2021 (photo: COTEC)

### DIGITAL TRANSFORMATION IN SMES

Despite the obvious hurdle of the pandemic, for meetings, we have managed to uphold a decent level of activities. Here is an overview. We hope to be able to host events for CCDT associates, and other interested parties, in the year to come!

### PROJECTS

#### Project in execution in 2020-2021:

Virtual Open Innovation Lab (VOIL) – ER-ASMUS+: KA203 – Strategic Partnerships for higher education. The project aims at developing resources to support the learning of emerging technologies and assess their potential for digitally transform Micro, Small and Medium Enterprises – SMEs.

The participating ERCIS members are WWU, UMINHO, KTU, and UiA.



VOIL platform available: <https://voil.startup.ngo/>. Register, and check out the website!

Representatives from the VOIL-partners (picture, fig. 1), have met in Portugal and participated in the presentation of the VOIL platform for European businesses, sept. 29<sup>th</sup> 2021. The venue was CeiiA – Centre of Engineering and Product Development that designs, develops, and operates innovative products in the mobility industries, namely Automotive and Urban Mobility, Aeronautics, Ocean, and Space. 37 people participated on site, and 149 participated online.

VOIL is a platform assisting small and medium sized enterprises in achieving digital transformation. It has been developed as an Erasmus+ project by 9 European universities and organisations. In the picture below (fig. 2), we see Nekane Aramburu (University of Deusto, Bilbao), Niels Garmann-Johnsen (University of Agder, Kristiansand), and Isabel Ramos (University of Minho, Guimarães), who presented the different VOIL modules.

#### Submitted projects in 2021:

H2020-SwafS-2018-2020 “Open Science For the digital transformation of Circular bUSinEss models”. FOCUSED overall objective is to engage citizens in the demonstration of environmental solutions in their



Figure 2 – Presenting the different VOIL labs (Photo: UiA)

daily life and, thus, contribute to provide a rich and co-created informational environment involving citizens to inspire environmentally friendly consumer behaviours.

The ERCIS members involved are University of Minho (PT-coordinator), Tallinn University of Technology (EE), Alessio Braccini – Università Degli Studi Della Tuscia (IT), University of Agder (NO), University of Twente (NL), University of Turku (FI).

Evaluation: 8/10 – not approved but ideas from this proposal may be reused later!

### PUBLICATIONS

Additions (to Isabel Ramos presentation of CCDT in ERCIS WS, sept. 21); articles and events related to DT in SMEs, by CCDT associates:

North, K., Hermann, A., Ramos, I., Aramburu, N., & Gudoniene, D. (2020, October). The VOIL Digital Transformation Competence Framework. Evaluation and Design of Higher Education Curricula. In International Conference on Information and Software Technologies (pp. 283–296). Springer, Cham.

Ramos, I., North, K., Thalmann, S., Aramburu, N., Hermann, A., Gräslund, K. & Barros, V. (conditionally accepted). Using simulation to leverage digital transformation of SMEs: an European Perspective, HICSS 2021.

Hermann, A., Gollhardt, T., Cordes, A. K., & Kruse, P. (2021). PlanDigital: A Software Tool Supporting the Digital Transformation. In International Conference on Design Science Research in Information Systems and Technology (pp. 356–361). Springer, Cham. (Presented at DESRIST 2021 Conference at UiA, see Publication at DESRIST 2021 in Agder | Virtual Open Innovation Lab (voil.eu)).

Acilar, A., Olsen, D. H., Garmann-Johnsen & Eikebrokk, T. R. (2021): Factors contributing to the business digital divide: a systematic literature review. 34<sup>th</sup> Bled eConference, 2021.

Garmann-Johnsen, N. F., Olsen, D. H. & Eikebrokk, T. R. (2021): The Co-Creation Canvas, In: Proceedings of CENTERIS 2020.

Eikebrokk, T. R., Garmann-Johnsen, N. F. & Olsen, D. H. (2021): Co-creation in networks of SMEs: a conceptual model of the co-creation process, In: Proceedings of CENTERIS 2020.

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### GET IN TOUCH!

If you are interested in our work, have ideas, or you would like to collaborate with us, please do not hesitate to get in touch with us!

## eGov

### E-GOVERNMENT

The E-Government Competence Center brings together members in the ERCIS network working on digitalisation in the public domain. Our research covers a broad range from individuals' use of e-government technology to e-participation to process management.

### eGov-Campus at the University of Münster

Public service delivery becomes increasingly digital making e-government endeavors more and more important. However, the public sector still faces a lack of personnel with sufficient IT competence to master this enormous challenge. To overcome this problem, the research project "eGov-Campus" started in 2020 intending to build up a nationwide e-learning platform for e-government so that public officials can join the platform for digital upskilling by attending MOOCs. The first course to go online in 2021 was about process management in the public sector held and managed by Prof. Jörg Becker and the CC eGov. More than 1.100 participants from all over Germany participated in the online course and also rated it very positively. The number of courses offered on the eGov-Campus platform (<https://egov-campus.org/>) is continuously increasing such that we will reach a massive impact on public sector digitalisation in Germany. The CC eGov also takes over a coordinating role in the project which is funded by the German IT planning council with two million Euros and lasts until 12/2021. The Hessian State Chancellery serves as the project coordinator.



Prof. Jörg Becker and Michael Koddebusch are recording the lectures for the MOOC on process management

### International Project on Public Service digitalisation

Researchers from the University of Agder, Norway, together with colleagues from IT University in Copenhagen, Linköping University, and University of Oslo, are working on two research projects that identify what public services are suitable for digitalisation. The first project, funded by the Norwegian welfare agency, focuses on the citizens' perspective on digital public services. The second project, which is funded by the Norwegian research council, also considers the organisational perspective for giving recommendations on what public services should be digitalised.

### NEGZ-Study

The German National E-Government Competence Centre (NEGZ) has funded a joint research effort between the CC eGov and the Lorenz-von-Stein Institut für Verwaltungswissenschaften (*institute for administrative sciences*), Kiel. The study investigates opportunities and implementation challenges of a digitalisation check in the legislative process in Germany. Such check would test novel legislative initiatives towards their digital enforceability, executability and their meaningfulness. The study sheds a light on the subject from a central perspective (*i.e. in the course of implementing new laws*) as well as from a decentral perspective (*relevant aspects for norm-executing authorities*) and helps politicians and lawmakers to better understand

the impact and implications of new laws in a digitised world and society. The research process has been very fruitful as the ERCIS researchers could contemplate the topic from an IS-point of view, whereas the LvS-colleagues brought in the legal expertise. The publication is expected in Q1 2022.

### CLAIRE & ERCIS Partnership

ERCIS has partnered with the CLAIRE network in 2021. In September 2021, ERCIS took a leading role in CLAIRE-organised so-called Theme Development Workshops, in which researchers from different fields, AI experts and domain experts came together to build visions and high-level research agendas. In this case, members of the ERCIS CC eGov led sessions to carve out, how AI can help in public service delivery and along the way to a No-Stop-Shop public administration. We elaborated and set up a list of open research questions, which we will now further develop into potential research and research collaboration roadmap. Thus, the workshops have been very promising in becoming a fruitful partnership in the future and ERCIS is looking forward to deepen the relationship.

### Master's Program Public Sector Innovation and E-Governance (PIONEER)

PIONEER is a joint master programme organised by the KU Leuven, the University of Münster, and TalTech University Tallinn providing the students with interdisciplinary

expertise. The fourth cohort has attended the summer term in Münster. Due to the COVID19 pandemic, it was again a completely virtual semester. While missing the personal discussions in the lecture rooms we of course got more and more used to the online-only formats. While the fourth cohort has moved to Tallinn now – having its first physical semester – the fifth cohort with 18 students started in Leuven, and Muenster is awaiting them in April 2022.

### Study on process management in the public sector

It is widely accepted that business process management is an important building block for the digitalisation and modernisation of the public sector. Nevertheless, process management is applied to very different extents in public administration. Therefore, based on a survey of over 700 participants, the CC eGov examined the current state of process management in Germany's public administration. The study provides insights into the application, spread, and extent of process management across all federal levels and uncovers, for instance, a BPM competence gap. Although, the participants rated BPM competence as very important for executives but also usual public officials they simultaneously state that this competence is not widely spread among public administrations. The full text is accessible under <https://doi.org/10.17879/58009602234>.

### E-Government and Smart City Tracks at the Wirtschaftsinformatik Conference and dg.o

As in previous years, the CC eGov was again involved in the community with conference tracks. Under the leadership of Robert Krimmer, Hendrik Scholta, and Bettina Distel, the track "Digital Sovereignty in the Era of Smart Cities" was organised at this year's (*virtual*) dg.o conference, and together with Moreen Heine of the University of Lübeck, Bettina Distel organised the track E-Government for this year's Wirtschaftsinformatik Conference, which was also held fully virtual. CC eGov will

be participating in community activities again next year: Together with Nils Urbach, Frankfurt University of Applied Sciences, and Moreen Heine, Bettina Distel again organises an e-government track for the upcoming Wirtschaftsinformatik Conference to be held in Nuremberg-Erlangen – hopefully in person again!

### SELECTED PUBLICATIONS

*Halsbenning, S., & Niemann, M. (2021).* Sustainable MOOC Platforms – Searching for Business Models of the Future. In Proceedings of the 29<sup>th</sup> European Conference on Information Systems (*ECIS 2021*), Marrakech, Morocco.

*Halsbenning, S., Niemann, M., Distel, B., & Becker, J. (2021).* Playing (Government) Seriously: Design Principles for E-Government Simulation Game Platforms. In Proceedings of the 16. Internationale Tagung Wirtschaftsinformatik (*WI 2021*), Essen, Deutschland.

*Hofmann, S., Pappas, I. (2021)* Understanding civic engagement on social media based on users' motivation to contribute. International Conference on Electronic Government, 2021.

*Hofmann, S., Madsen, C., Lindgren, I., Verne, G. (2021).* What public services should be digitalized? A citizen-centered analysis of what public services are suitable for digital communication channels. International Conference on Electronic Government, 2021.

*Becker, J., Distel, B., Grundmann, M., Hupperich, T., Kersting, N., Lösche, A., Parreira, d. A. M., & Scholta, H. (2021).* Challenges and Potentials of Digitalisation for Small and Mid-sized Towns: Proposition of a Transdisciplinary Research Agenda. In Becker, J., Dugas, M., Gieseke, F., Hellingrath, B., Hoeren, T., Klein, S., Kuchen, H., Trautmann, H., & Vossen, G. (Eds.), ERCIS Working Papers: Vol. 36. Münster: European Research Center for Information Systems.

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# COMPETENCE CENTERS



BPM-I4.0-Projektteam

## SERVICE SCIENCE

The Service Science Competence Center is ERCIS' primary unit for conducting research and industry projects in the area of service management and service engineering. The team currently consists of two professors, one executive, and 17 research assistants. The proliferation of the Service Economy has changed the way in which the creation of value is perceived throughout various industry sectors and societies. Selling products is increasingly replaced by customized service offerings and alternative revenue streams (e.g., *power-by-the-hour*). Research in the academic discipline of Service Science, Management and Engineering is focused on understanding and facilitating the creation of value in service systems, involving interactions of service providers and service customers. The mission of the ERCIS Service Science Competence Center is twofold. On the one hand, we strive to understand the nature and impact of service orientation on commercial businesses, the public sector, and society in general. On the other hand, we contribute to further shaping the course of the service economy by designing new business solutions and software artefacts. Our research is equally dedicated to research excellence and to providing results that companies can utilise to further shape their businesses in the service society. We achieve this goal based on a network of excellent researchers in the ERCIS network.

## SELECTED RESEARCH PROJECTS

### RISE\_SMA

RISE\_SMA forms an interdisciplinary, international network combining excellent

## Service Science at the European Research Center for Information Systems

scholars and practitioners to enable vigorous knowledge sharing and to develop solutions for contemporary challenges for Social Media Analytics (SMA).

Advanced theoretical approaches and methods of analysing social media data are especially relevant for two domains addressed in RISE\_SMA: society and crisis communication. Recently, social media communication gained immense impact on society and decision-making at all levels. It offers potential for new forms of public discourses but also challenges societal cohesion phenomena like fake news and vicious social bots.

During uncertain events such as natural disasters or human-made crises, social media communication plays an increasingly important role for citizens and emergency service agencies. RISE\_SMA attempts to uncover communication patterns and suggest best practices to seek and share information in precarious situations.

Business Process Mining for Industry 4.0 (BPM-I4.0)



Business processes are the organisational core of companies, which can be analysed with Process Mining. Process Mining is established for mass transaction processes. However, it has rarely been applied to analyse knowledge-intensive processes such as product development. Knowledge-intensive processes leave fewer data traces in event logs, while they also exhibit more process variants than standardised processes. The objective of the BPM-I4.0 project, which is funded by the state of NRW, is to extend the applicability of process mining for knowledge-intensive processes in industry by designing and implementing innovative tools. We prototype our solutions at two companies (*Weidmüller Interface GmbH & Co KG*; *GEA Westfalia Separator Group GmbH*) and cooperate with a software vendor (*CONTACT Software GmbH*) of a Product-Lifecycle-Management system. Also, we will explore the business value and feasibility of predictive and prescriptive process mining approaches in these settings.

## ACADEMIC ACTIVITIES

Martin Matzner and the Chair of Digital Industrial Service Systems at FAU are co-organising the 17<sup>th</sup> Internationale Tagung Wirtschaftsinformatik in 2022 in Nurem-

berg. He is an editor for the Journal of Service Management Research. Additionally, he served as an Associate Editor for the 2020 BPM conference, the 2020 and 2021 ECIS and DESRIST conferences, and for ICIS 2021.

Daniel Beverungen serves as an Associate Editor of Business & Information Systems Engineering (BISE) and as a Guest Editor for a Special Issue on Digital Transformation in Electronic Markets. He also served as a track chair for WI 2021 and as a program committee member for various other conferences. At WI 2022, he will co-chair a track on digital innovation and entrepreneurship, a workshop on service science, and serve as a mentor for the WI Doctoral Consortium. He is a conference chair and a program chair for the 18<sup>th</sup> Internationale Tagung Wirtschaftsinformatik in 2023, to be hosted in Paderborn.

Christian Bartelheimer serves as a treasurer and secretary for the AIS Special Interest Group on Services (SIGSVC). He will co-organize a workshop on Service Science and Information Systems Research regarding ecological goals at ICIS 2021.

## SELECTED PUBLICATIONS

*Beverungen, D., Buijs, J.C.A.M., Becker, J., Di Ciccio, C., van der Aalst, W.M.P., Bartelheimer, C., vom Brocke, J., Comuzzi, M., Kraume, K., Leopold, H., Matzner, M., Mendling, J., Ogonek, N., Post, T., Resinas, M., Revoredo, K., del-Río-Ortega, A., La Rosa, M., Santoro, F.M., Solti, A., Song, M., Stein, A., Stierle, M., Wolf, V. (2021). Seven Paradoxes of Business Process Management in a Hyper-Connected World. Business & Information Systems Engineering, 63(2), pp. 145–156.*

*Beverungen, D.; Kundisch, D.; Wunderlich, N.V. (2021): Transforming into a Platform Provider: Strategic Options for Industrial Smart Service Providers. Journal of Service Management, 32(4), pp. 507–532.*

*Leimeister, J.M., Stieglitz, S., Matzner, M., Kundisch, D., Flath, C., Röglinger, M. (2021).*

Quo Vadis Conferences in the Business and Information Systems Engineering (BISE) Community After Covid. Business & Information Systems Engineering.

*Matzner, M., Pauli, T., Marx, E., Anke, J., Poppelbuss, J., Fielt, E., Gregor, S., Sun, R., Hyde, K.M., Aas, T.H., Aanestad, M., Gordijn, J., Kaya, F., Wieringa, R. (2021). Transitioning to Platform-based Services and Business Models in a B2B Environment. Journal of Service Management Research, 5(3), pp. 163–175.*

*Pauli, T., Fielt, E., Matzner, M. (2021). Digital Industrial Platforms. Business & Information Systems Engineering, 63(2), pp. 181–190.*

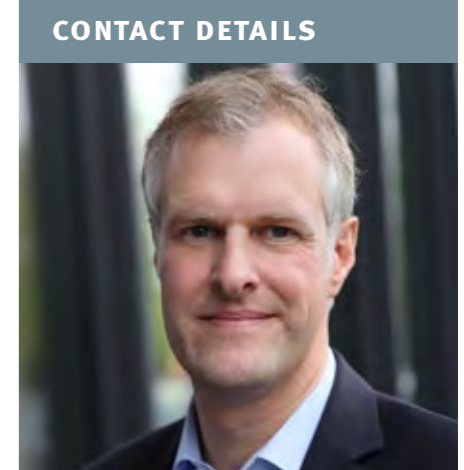
*Weinzierl, S., Wolf, V., Pauli, T., Beverungen, D., Matzner, M. (2021). Detecting Temporal Workarounds in Business Processes – A Deep Learning-based Method for Analysing Event Log Data. Journal of Business Analytics (forthcoming).*



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## SMARTER WORK

New technologies are increasingly used in dynamic organisations and change how work is organised and performed. The COVID-19 pandemic accelerates the development of hybrid work arrangements, integrating distributed and collocated work. While such arrangements increase employees' flexibility in terms of work hours and work locations, they also add to the complexity of organisational structures. "Smarter Work" describes an approach of designing these new ways of working, supported by communication and collaboration systems, with a strong emphasis on the well-being and productivity of all actors involved. We help to exploit the potentials of new working modes by means of conscious and coordinated use of technologies, aligning digital and analogous work.

The **Competence Center Smarter Work** supports organisations with the introduction, use, and management of new communication and collaboration systems. We build on years of experience with transformation processes. We integrate individual and organisational perspectives in our research, which is characterised by the pursuit of long-term improvements. To this end, we seek a nuanced understanding of underlying organisational problems as a basis for actionable suggestions. We combine a broad repertoire of methods (e.g., surveys, interviews, physiological measurements, digital forensics) with traditional and innovative theories, enabled by our interdisciplinary team of scientists from business, computer science, psychology, sociology, as well as practitioners from industry.

## SELECTED RESEARCH PROJECTS

- **From Enforced WFH to Hybrid Work**  
(Pls J. Mattern, S. Lansmann, S. Krebber)



"Reflect on your experiences during the working from home (WFH) phase. What worked well? What worked not so well?" These and more questions were answered by the global IT department from Hilti to

give insights into how knowledge workers perceived the sudden shift to 'enforced WFH' due to COVID-19. Our goal is to understand the particularities while working fully remote and the effects for individual conceptions as well as organisational designs of the future (hybrid) work. A large share of participants stated that they perceived themselves as being (far) more productive. Taking into account their specific task structures and job profiles, we analyse the factors that influence employees' perceived productivity and how these affect their desired extent of working from home in the future.

- **Interplay between Individual and Collaborative Work**  
(Pls S. Lansmann, L. Strahringer, R. Haines)



Building on the experience gained during the COVID-19 pandemic, we investigate how multi-project knowledge workers engage in individual work. Our participants work in a hybrid work setting, that is, they work at least one day per week from home. We are interested in (a) the role individual work plays in their job, (b) how they plan for individual work, and (c) how periods of individual work interact with collaborative work. Based on this, we conceptualize individual work patterns and their interplay with collaborative work in order to understand how they complement or conflict each other. Secondly, we explore how knowledge workers choose to work from home or the office in light of the complementarity of individual and collaborative work.

- **Influence Mechanisms in Bitcoin**  
(Pls R. Thapa, J. Hüllmann)



Research on the Bitcoin blockchain suggests that the inner-working of Bitcoin is not decentralised. Building on these findings, we examine the mediated communication of the Bitcoin members and identify

Bitcoin influencers who are central to the activities in Bitcoin. While enacting new Bitcoin network rule changes, the influencers use different tactics and persuade other members to agree to their desired Bitcoin network rule changes. As such, Bitcoin influencers impact the Bitcoin network governance and ultimately influence the community governance. Specifically, we identify the way key members exert influence in permissionless blockchain communities.

- **People Analytics**  
(Pls J. Hüllmann, S. Krebber)

People analytics is a trending topic that depicts data-driven decision-making by the human resources function to improve organisational procedures such as hiring, employee development, or staffing. Driven by commercial software vendors and service providers, the market segment of people analytics' tools and services can be characterised as opaque with respect to the collected data and employed algorithms. To shed light on this market segment, we conducted two studies looking at people analytics tools and consultancy services. We provide a novel classification of people analytics, contributing to our understanding of how vendors and consultancies vary in goals, collected data, and underlying mechanisms. The studies further elaborate on the novelty and implications, e.g., privacy, performance, and validity, of these new people analytics' classes.

- **AI in Farming**  
(Pl J. Hüllmann)

Understanding the integration of artificial intelligence (AI) systems into joint human-AI decision-making requires research that looks beyond AI in laboratory settings and into the application of AI in practice. Targeting the empirical context of agriculture in North Rhine-Westphalia, our research inquires the joint figurations of human and AI decision-making through interviews and observations. This research is in its early stages, and the data collection is upcoming. It will take place at a demo farm, a living

laboratory facilitating a real-world setting for the co-production of knowledge. Implications of the research include more accessible AI systems, easing transfer into practice, as well as increasing human control. The research results will lead to improved AI-based decisions in farming. Through co-development on the farms, we contribute to improving the usability and integration of AI systems into the farming practice.

## SELECTED PUBLICATIONS

Thapa, R., Sharma, P., Hüllmann, J. A., & Savarimuthu, B. T. R. (2021). Identifying Influence Mechanisms in Permissionless Blockchain Communities: The Bitcoin Case. In Proceedings of the 42<sup>nd</sup> International Conference on Information Systems (ICIS), Austin, Texas, United States.

Mattern, J., Lansmann, S., & Hüllmann, J. A. (2021). It's not that bad! Perceived stress of knowledge workers during enforced working from home due to COVID-19. In Proceedings of the 16<sup>th</sup> International Conference on Wirtschaftsinformatik (WI), Duisburg-Essen, Germany.

Hüllmann, J. A., Krebber, S., & Troglauer, P. (2021). The IT Artifact in People Analytics: Reviewing Tools to Understand a Nascent Field. In Proceedings of the 16<sup>th</sup> International Conference on Wirtschaftsinformatik (WI), Duisburg-Essen, Germany.

Mattern, J. (2021). Extensive Use of Work-Related Mobile Information and Communication Technology – Conceptualizing Extensive Connectivity to Work and Coping Strategies. Dissertation at the University of Münster.

Hüllmann, J. A. (2021). Smarter Work? Promises and Perils of Algorithmic Management in the Workplace Using Digital Traces. Dissertation at the University of Münster.

Krebber, S. (2021). The Post-Pandemic Workplace: The Best of Office and Home Office Work? Exploring Employees' Motivations to Work From Home. Master Thesis at the University of Münster.



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Strahringer, L. (2021). The Home as the Place to be (Productive)? Investigating the Role of Individual Work while Working from Home. Bachelor Thesis at the University of Münster.

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## COMPETENCE CENTERS



### SOCIAL MEDIA ANALYTICS

The Competence Center Social Media Analytics (CC SMA) continues – and since this year in close collaboration with the Topical Programme on Algorithmization and Social Interaction as well as the AI4Media project – to deal with challenges due to the rapid and often disruptive evolution of social media technology. The main research focus of the CC SMA is the misuse of social media technology for disinformation, propaganda, and fake news distribution. The (*international*) partners approach the topic from the different angles of their respective disciplines: computer science, psychology, statistics, journalism and media, communication science, as well as mathematics.

### EXTENDING THE NETWORK AND COLLABORATION

The Topical Programme Algorithmization and Social Interaction (<https://algorithmization.org/>) has been established with funding by the University of Münster and with support of existing and new partners of the CC SMA. It provides a networking platform for international exchange on the broader topics of how algorithms affect humankind on an individual and global level as well as on how the increasing algorithmization of society can be regulated in the future. Together the CC-SMA and the Topical Programme have initiated a talk series and invited seven international speakers from different domains: law science, journalism, information systems, and computer science. During winter, this series continues with further exciting speakers and topics. In addition to this series, members of the CC-SMA and the Topical Programme proposed a first DAAD (*German Academic Exchange Service*) project in order to establish a joint course on “AI, Human Rights, and Ethics”. Information systems and law science Master and PhD students of the Universities of Münster, Twente (NL), and Leiden (NL) can take this course. This teaching project receives funding for offering the course during winter term 2021 and during summer term 2022.

Since September 2021, the CC-SMA is an associated partner of the European AI4Media project (<https://www.ai4media.eu/>). The AI4Media project is a new Center of Excellence, which supports next-generation AI research with a special focus on media, society, and democracy. Besides being a platform of research, application, and exchange on the European level, AI4Media is also a hub for European AI research and application funding. Members of the CC-SMA will participate in the first open call for research project proposals.

### RESEARCH ON SMA: METHODOLOGY, PROJECTS, AND APPLICATION

Led by ERCIS colleagues from Loughborough, the CC-SMA contributed in a position paper (*published in the International Journal of Information Management*) on the European perspective on AI and Humanity. The paper emerged from a discussion and workshop at the ERCIS Annual Meeting 2019. Further, members of the CC-SMA collaborated with other outstanding representatives of the SMA-community to highlight the problem of data quality and benchmarking in this research domain (*published in Social Science Computer Review*). During the German federal election (Sept. 2021), members of the CC-SMA worked as research partners of the Federal Ministry of the Interior and transferred newly developed methods for monitoring social media to discover and prevent automated attacks (*i.e., Social Bots*). In October 2021, the federally funded collaborative project HybriD, involving three CC-SMA partners, will begin investigating the detection and classification of disinformation strategies.

### CONTINUING THE MISDOOM SUCCESS STORY

Members of the CC SMA supported the Oxford Internet Institute in organising the now third edition of the Multidisciplinary International Symposium on Disinformation in Open Online Media (<https://www.oii.ox.ac.uk/misdoom-2021/>). MISDOOM was organised as a virtual event again (*due to COVID-19 regulations*). The symposium still follows the initial idea of a multidisciplinary joint conference on disinformation research bringing together computer science, social science, political science, journalism, and public services. And it is still growing compared to the previous editions: during September 21–22, there were more than 20 sessions, more than 80 talks, and three prominent keynotes. Papers could (*for the first time*) be published either in a proceedings or a journal track.

### PUBLICATIONS

Many members of the CC SMA have published multiple papers on disinformation identification, algorithmization as well as on methodological issues:

Assenmacher, D., Weber, D., Preuss, M., Calero, V. A., Bradshaw, A., Ross, B., Cresci, S., Trautmann, H., Neumann, F., & Grimme, C. (2021). Benchmarking Crisis in Social Media Analytics: A Solution for the Data-Sharing Problem. *Social Science Computer Review*, online first.

Coombs, C., Stacey, P., Kawalek, P., Simonova, B., Becker, J., Bergener, K., Carvalho, J. Á., Fantinato, M., Garmann-Johnsen, N. F., Grimme, C., Stein, A., & Trautmann, H. (2021). What Is It About Humanity That We



Can't Give Away To Intelligent Machines? A European Perspective. *International Journal of Information Management*, 58.

Markmann, S., & Grimme, C. (2021). Is YouTube Still a Radicalizer? An Exploratory Study on Autoplay and Recommendation. In *Proceedings of the Multidisciplinary International Symposium on Disinformation in Open Online Media (MISDOOM)*, Oxford, UK, 50–65.

Niemann, M., Müller, K., Kelm, C., Assenmacher, D., & Becker, J. (2021). The German Comment Landscape: A Structured Overview of the Opportunities for Participatory Discourse on News Websites. In *Proceedings of the 3<sup>rd</sup> Multidisciplinary International Symposium on Disinformation in Open Online Media (MISDOOM)*, Oxford, UK.

Winterlin, F., Langmann, K., Boberg, S., Frischlich, L., Schatto-Eckrodt, T., Quandt, T. (2021). Lost in the stream? Professional efficacy perceptions of journalists in the context of dark participation. *Journalism*, online first. doi: <https://doi.org/10.1177%2F14648849211016984>.

Clever, L., Schatto-Eckrodt, T., Clever, N., & Frischlich, L. (2021). Extremism on the Second Glance: Automated Content Analysis of Covert Propaganda on Instagram. In *Proceedings of the The 3<sup>rd</sup> Multidisciplinary International Symposium on Disinformation in Open Online Media*, Oxford, United Kingdom.

Frischlich, L., Schatto-Eckrodt, T., Kuhfeldt, L., & Clever, L. (2021). Fueling the information disorder? Alternative news media in the COVID-19 crisis. In *Proceedings of the 71<sup>st</sup> Annual ICA Conference*, Virtual.

Schatto-Eckrodt, T., Clever, L., & Frischlich, L. (2021). The Seed of Doubt: The Role of Alternative and Established News Media in the Early Moments of a New Conspiracy Theory. In *Proceedings of the 71<sup>st</sup> Annual ICA Conference*, Virtual.

### ACTIVITIES

- The CC SMA organised together with the Topical Programme Algorithmization and Social Interaction a talk series comprising talks by seven international speakers. Further information: [https://algorithmization.org/?page\\_id=453](https://algorithmization.org/?page_id=453).

- Guest Lecture at University of Twente by Christian Grimme: Disinformation via Social Media: Social Bots, Campaigns, and Computer Science Approaches to Foster Resilience.

- Brown Bag Talk at the Marketing Center Münster by Heike Trautmann, Armin Stein, and Crispin Coombs: What is it about humanity that we can't give away to intelligent machines? A European perspective.

- The CC SMA supported the organisation of the MISDOOM 2021 in Oxford, United Kingdom.

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# ERCIS



Robert Krimmer now holds the ERA-Chair of E-Governance at the University of Tartu



## CHANGES IN INSTITUTIONAL PARTNERSHIPS IN ITALY AND ESTONIA

The network always evolves and this, of course, includes changes. Thus, from 2022 on, the institutional member in Italy will be the University of Viterbo with Prof. Alessio Maria Braccini. We thank Prof. Paolo Spagnoletti from LUISS in Rome for his engagement in the network over the last years and he will stay connected as personal member. In Estonia, Prof. Robert Krimmer moved from the Tallinn University of Technology to the University of Tartu and took the ERCIS membership with him. Thus, the University of Tartu is now the ERCIS partner in Estonia.

## NEW COLLEAGUES AT THE UNIVERSITY OF TWENTE

Information systems is expanding and we have welcomed several new faculty in Information systems research at our university: Dr. Daniel Braun and Jan Willem Bullee joined in 2021.

## RESEARCH STAYS AT THE UNIVERSITY OF TWENTE

In 2022, positions are again available for Visiting Researchers in the area of Business Information Systems – University of Twente – short visits (*2–12 weeks*): ERCIS members are especially invited to spend a research visit in Twente. We are happy to offer furnished accommodation on our wonderful campus. Research visits open for junior and senior IS faculty.



Univ.-Prof. Dr. Julian Varghese, MD – new member of the ERCIS Headquarters

## JULIAN VARGHESE SUCCEEDS MARTIN DUGAS AS ERCIS DIRECTOR

Prof. Dr. Martin Dugas left the University of Münster in 2021 and heads a new Institute for Medical Informatics at Heidelberg University Hospital. Univ.-Prof. Dr. Julian Varghese, MD, is his successor in Münster and, thus, our new member at the ERCIS Headquarters. Martin Dugas stays connected to the ERCIS network as a personal member.



Daniel and Levi

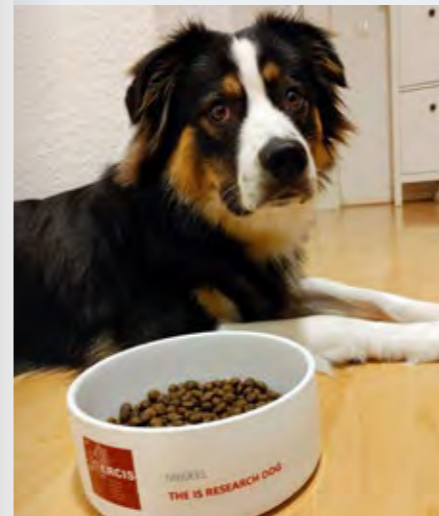


Mio

Vito

## NEW MEMBERS IN THE NETWORK

We are always delighted to welcome our youngest members in the network: Daniel and Levi (2021), Mio (2020), Vito (2020). Great to have you with us and we are looking forward to meeting you all in person! Furthermore, Mikkel joined the network (*in 2020 already*), making everyone feel just a bit better! 😊



Mikkel



ERCIS and CLAIRE signed a joint Memorandum of Understanding

## ERCIS – CLAIRE: MEMORANDUM OF UNDERSTANDING

2021, the European Research Center of Information Systems (ERCIS) joined forces with CLAIRE (*Confederation of Laboratories for Artificial Intelligence Research in Europe*) in terms of a Memorandum of Understanding. The collaboration will specifically bundle and foster application-oriented AI research and related activities.

First joint activities took place already, for example in the context of the upcoming Joint Theme Development Workshops, organized by CLAIRE together with the EU ICT-48 Networks of Excellence. Especially the planned Theme Development Workshop for the public sector was a successful event, once more emphasizing that digitization of public administration is a prominent field of research in Information Systems (IS), and this sector is highly relevant for addressing some of CLAIRE's top priorities: Contributing to AI for Good and AI for All.

The parties strive to furthermore encourage direct contact between the members of their organizations. Possible forms of cooperation include joint research activities, specifically in the context of the European Commission's Framework Programmes; application-oriented research, aimed at bridging the gap between academia and industry; joint involvement of respective members in consortia, commissions, or panels; co-organization and participation in lectures, seminars, workshops, and conferences; and the exchange of academic materials, academic publications, and information. A further focus is the inclusion of highly skilled PhD students in network activities for young AI researchers.







# ERCIS

## STRATEGIC PARTNERSHIP BETWEEN THE UNIVERSITY OF TWENTE AND THE UNIVERSITY OF MÜNSTER

A strategic partnership between the University of Twente and the University of Münster has been established and the executive boards of the two universities have expressed their mutual interest in stimulating strategic joint research initiatives to enhance opportunities for collaboration. Annual grants are available for e.g. a (joint) position, special equipment, or networking events for the gathering of new consortia, or to secure the participation of industrial parties/companies in a joint, third-party funding application.



### 'RISE\_SMA' PROJECT

The 'RISE\_SMA' project (funded by the EU Horizon 2020 research and innovation program), coordinated by Stefan Stieglitz, aims at developing solutions for contemporary challenges for Social Media Analytics in the context of society and crisis communication. The international and interdisciplinary network involves partners from the University of Duisburg-Essen (Stefan Stieglitz), University of Agder (Tim A. Majchrzak), the Queensland University of Technology (Axel Bruns, Jean Burgess), University of Leiden (Michael Emmerich, Suzan Verberne, Frank Takes) and from the municipality of Kristiansand, Norway (Sigurd Paulsen). The COVID-19 pandemic posed a challenge for the project which thrives from sharing knowledge during research stays at the respective locations. At the same time, the pandemic illustrated the relevance of understanding social media communication during crises as many used social media to share and receive information about the disease. With a special focus on investigating COVID-19-related misinformation on social media, an international focus group was initiated by Tim Majchrzak within the RISE\_SMA network.

### PUBLICATIONS

Shahi, G. K., Dirkson, A., & Majchrzak, T. A. (2021). An exploratory study of covid-19 misinformation on twitter. *Online social networks and media*, 22, 100104.



### SCIENTIFIC COLLABORATION BETWEEN LEIDEN UNIVERSITY AND WWU MÜNSTER

Leiden University and WWU Münster continued their successful collaboration within the ERCIS on topics of social media, artificial intelligence, and multicriteria decision making. Several joint publications emerged from this collaboration also in 2021:

Grimme, C., Kerschke, P., Aspar, P., Trautmann, H., Preuss, M., Deutz, A., Wang, H., & Emmerich, M. (2021). Peeking beyond peaks: Challenges and research potentials of continuous multimodal multi-objective optimization. *Computers & Operations Research*, 136, 105489.

Aspar, P., Kerschke, P., Steinhoff, V., Trautmann, H., & Grimme, C. (2021). Multi<sup>3</sup>: Optimizing Multimodal Single-Objective Continuous Problems in the Multi-Objective Space by Means of Multiobjective Activation. In *Proceedings of the 11th International Conference on Evolutionary Multi-Criterion Optimization (EMO)*, Shenzhen, China, 311–322.

Assenmacher, D., Weber, D., Preuss, M., Calero, V. A., Bradshaw, A., Ross, B., Cresci, S., Trautmann, H., Neumann, F., & Grimme, C. (2021). Benchmarking Crisis in Social Media Analytics: A Solution for the Data-Sharing Problem. *Social Science Computer Review*, online first.

### JOINT RESEARCH ON AUTOMATED ALGORITHM SELECTION AND CONFIGURATION WITH THE UNIVERSITY OF TWENTE (UT), THE NETHERLANDS

Heike Trautmann was appointed Adjunct Professor for five years within the DMB Group at the University of Twente in March, 2021. In September, Jeroen Rook started his PhD at UT under her supervision focusing on multiobjective aspects of Automated Algorithm Selection and Configuration.

### LIECHTENSTEIN RESEARCH FUND – TOWARDS A SCIENCE OF PROCESSES. CONCEPTUAL AND METHODOLOGICAL FOUNDATION

Since the only constant in our today's world, is change, the University of Liechtenstein proposed the establishment of process science, a field that studies processes. The partner universities are as follows: RWTH Aachen, Radboud University, Humboldt University, Michigan State University, University of Hamburg, University of Bayreuth, QUT Brisbane, University of St. Gallen. Process science is concerned with understanding and influencing change. It entails discovering and understanding processes as well as designing interventions to shape them into desired directions. Process science is based on four key principles; it (1) puts processes at the center of attention, (2) investigates processes scientifically, (3) embraces perspectives of multiple disciplines, and (4) aims to create impact by actively shaping the unfolding of processes. The ubiquitous availability of digital trace data, combined with advanced data analytics capabilities, offer new and unprecedented opportunities to study processes through multiple data sources, which makes process science very timely.

### JOINT HORIZON EUROPE PROPOSAL

The Department of Information Systems at the University of Minho led the effort to reshape a previously submitted H2020 project proposal – Open Science For the digital transformation of Circular business models (FOCUSED) submitted to the Green Deal call, TOPIC ID: LC-GD-10-3-2020. The main objective of this project is to engage citizens in the innovation of circular business models and, thus, contribute to: (1) promoting the sustainable development of the economy through the participation of brainpower of European citizens to make a difference in the development of competitive models, (2) provide a rich and co-created informational environment involving citizens to inspire environmentally friendly consumer behaviors, and (3) provide opportunities for collaboration between entrepreneurs, young citizens and researchers that encourage a hands-on education for the circular economy and the co-design of policies that leverage the success of circular businesses. 18 institutions participated in the development of the proposal. The members of ERCIS involved are University of Minho (PT-coordinator), Tallinn University of Technology (EE), Alessio Braccini – Università Degli Studi Della Toscana (IT), University of Agder (NO), University of Twente (NL), University of Turku (FI). The proposal was positively evaluated (8 out of 10) but not funded.

### JOINT PROJECT OF UNIVERSITY OF MINHO, UNIVERSITÀ DEGLI STUDI DELLA TUSCIA AND TALTECH

The University of Minho participates in the project SMEs: Be Prepared For Supply Chain Risks! (<https://beprepared-project.eu/>) aiming at developing a VET training intended to better prepare SMEs for identifying and handling supply chain risks. This project has the participation of other ERCIS members, namely Università Degli Studi Della Toscana and TalTech.

Submissions to the ERASMUS+ Alliances for Innovation program by the University of Minho

- Fostering dynamic education processes through dynamic matching of skills and competence needs in work and education (Work42Edu). The Work42Edu project aims at (1) Improving the internal processes of education institutions and achieve more flexibility in the design of education offers; (2) empowering students defining their study paths, therefore changing their mindset from passive adherents to active designers of their competencies; and (3) improving cooperation between Industry and Education.
- Business School for women in the CCI (BCCI). The objective of the project is the enhancement of digital and entrepreneurial skills for women who study in Cultural and Creative Industry related fields.





# NETWORK RESEARCH ACTIVITIES



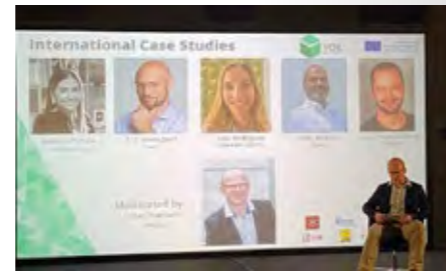
The companies that participated by videoconference are:

- **Estudios Durero** ([www.estudiosdurero.com](http://www.estudiosdurero.com), Spain), represented by Begõna Portela.
- **AVL List GmbH** ([www.avl.com](http://www.avl.com), Austria), represented by Eric Amengaud.
- **Schneider Electric Portugal** ([www.se.com](http://www.se.com)), represented by Inês Rodrigues.
- **Wakaru Consulting** ([www.wakaru.eu](http://www.wakaru.eu), Portugal), represented by João Mugeiro.
- **PeekMed** ([www.peekmed.com](http://www.peekmed.com), Portugal), represented by João Pedro Ribeiro.

## TRANSNATIONAL PROJECT MEETING OF THE VIRTUAL OPEN INNOVATION LAB (VOIL) PROJECT IN PORTUGAL

The last meeting of the VOIL ([www.voil.eu](http://www.voil.eu)) project took place from the 27<sup>th</sup> to September 29, in the city of Matosinhos, Portugal. On September 27, the project's closing activities were discussed. Then, on the 28<sup>th</sup>, an event was held in CEiIA ([www.ceiia.com](http://www.ceiia.com)) to disseminate the project's results to companies and higher education students. Finally, on September 29, the consortium. The dissemination event was attended by 5 SMEs that presented the transformation initiatives they are responsible for.

Marcus Cramer from Edyoucated (<https://edyoucated.org/>) addressed the development of digital skills assisted by intelligent algorithms. At the end of the day, those present in the room were challenged to a brief dynamic ideation session based on the Lotus Blossom technique. The audience in the room was around 40 participants. Virtually, the number of participants varied between 50 and 130 throughout the day.



## ERASMUS+ PROJECT: EXPLORATIVE BUSINESS PROCESS MANAGEMENT

The University of Liechtenstein is leading an Erasmus+ funded project on explorative business process management (BPM). In cooperation with the Vienna University of Economics and Business and the University of Bayreuth, a reference module is developed that covers different aspects of explorative BPM. This is important because BPM activities are mostly concerned with operational efficiency and overlook opportunities for innovation. Particular focus is placed on the role of digital technologies. The project will result in a reference module including a set of various lectures and recommendations on how explorative BPM can be taught in Europe and beyond.

## EEA GRANT: ADVANCING HUMAN PERFORMANCE IN CYBERSECURITY, ADVANCES

Together with (ERCIS) partners from Lithuania, Norway, Latvia, Estonia, the University of Liechtenstein is part of the project, which aims to develop a comprehensive, science-based interdisciplinary framework to develop and assess generic and subject-related competencies of the current and future cybersecurity workforce. The project will result in the creation of a set of methodologies and tools that will include specific software components to gather and analyse data, self-report tools to collect factual data on social behavioural patterns, recommendations to consider specific biological marker information, a custom genotyping array, a methodology to develop and assess competencies, and the risk assessment process based on the joint interdisciplinary data.



## ERASMUS+ PROJECT: DEVELOPING PROCESS MINING CAPABILITIES AT THE ENTERPRISE LEVEL

Together with the University of Bayreuth, and the Vienna University of Economics and Business, the University of Liechtenstein is working together on the Erasmus+ funded project "Developing Process Mining Capabilities at the Enterprise Level". Digital technologies affect all areas of contemporary work. They support, replace or augment human work, and they require special skills and competencies by those who use them. Process mining is a fast-growing technology concerned with managing and improving business processes. The potentials associated with process mining are vast and the market is estimated to grow tenfold over the next ten years. Yet, there is little knowledge about how to adopt, use and manage this digital technology. This is important, however, because despite its potentials, it is often reported that process mining leads to misuse or discontinuance of use altogether. Hence, our work intends to support practitioners, and future students, in understanding, estimating, and managing the implications of process mining.

## ERASMUS+ PROJECT: VIRTUAL REALITY IN HIGHER EDUCATION APPLICATION SCENARIOS AND RECOMMENDATIONS

The University of Liechtenstein, University of Essen-Duisburg and University of Agder are working together on the Erasmus+ funded project "Virtual Reality in Higher Education Application Scenarios and Recommendations". Virtual reality (VR) has become a popular and versatile technology that has recently attracted interest from researchers and practitioners. The technology offers potential for all kinds of disciplines and industries, and higher education in particular may also benefit from VR-enhanced education practices. Educators are challenged to make thoughtful investments into VR equipment that is suitable for their target lessons. Accordingly, the main objective of this project is to come up and evaluate recommendations in order to motivate educators, particularly in higher education, to use innovative and digital education practices.

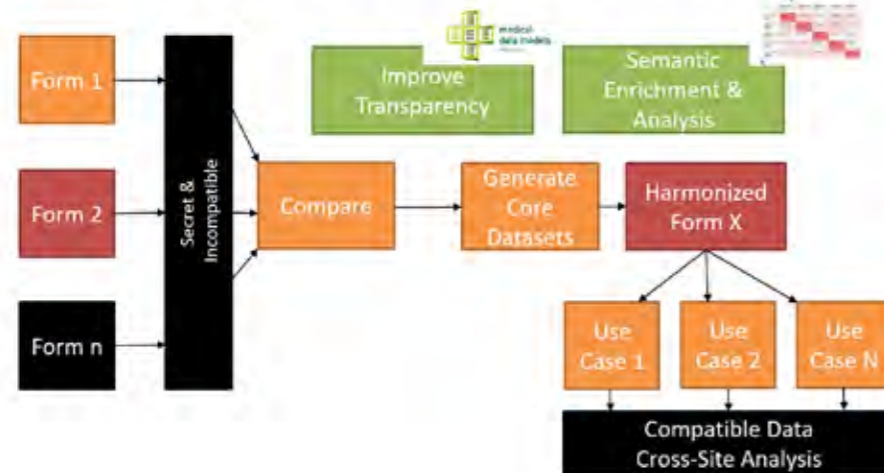
## ERASMUS+ PROJECT: BUSINESS PROCESS MANAGEMENT AND ORGANIZATIONAL THEORY

The University of Liechtenstein, the Vienna University of Economics and Business, the University of Cologne and Radboud University have acquired an Erasmus+ funded project on Business Process Management (BPM) and Organizational Theory. Led by Dr. Thomas Grisold (*University of Liechtenstein*), the project integrates theories and methods from the organizational studies into BPM. It will result in a transdisciplinary curriculum which enables aspiring business process managers to become "reflective process practitioners" and take a more holistic view on business process work.



# ERCIS

## Semantic Analyses of Medical Data Models



**MASTER SEMINAR:  
SEMANTIC ANALYSES OF MEDICAL DATA  
MODELS AT THE UNIVERSITY OF MÜNSTER**

This eLearning seminar is a joint teaching module by the Institute of Medical Informatics and the Department of Information Systems of University of Münster. It is an online course with intense supervision (24 supervisors, 5 students from the Department of Information Systems, 7 external students or medical informaticians from the HiGHmed partners of the Medical Informatics Initiative) including lectures, writing and presenting a scientific seminar thesis. It facilitates practical skills for semantic analyses of medical data models and the generation of common data elements in different disease domains. The module will cover the concepts of semantic interoperability, research data standards such as the Operational Data Model by the Clinical Data Interchange Standards Consortium (CDISC ODM), metadata standards such as the ISO 11179. Based on the FAIR (Findable, Accessible, Interoperable, Reusable) guiding principles for scientific data management, the participants will be familiarized with a metadata platform for finding, accessing, creating interoperable and reusable medical data models to generate harmonized data elements.

**COURSES AT THE UNIVERSITY OF  
ST. GALLEN AND LUCERNE**

Prof. Dr. Jan vom Brocke gave several courses and modules at the University of St. Gallen: Since 2007 he has been giving courses in Design Science Research, Information Management in the PhD study program in Management. Since 2012, he has offered a 5-days course on Business Process Management in the Executive MBA in Business Engineering. Also, he provided a 3-days module in Process Management (“IT Business Manager”). At the University of Lucerne, he also gave courses in Business Process Management in the Master’s degree program.

**PHD PROGRAM OF UNIVERSITY OF  
LIECHTENSTEIN AND HILTI**

The University of Liechtenstein and Hilti have developed a joint PhD program that provides a unique opportunity for students to drive their academic ambitions while setting a cornerstone for a professional career. Students in the program will work on innovative and impactful projects in Hilti, from which they will be able to draw valuable inputs for their research. The program is designed to challenge and support the students to grow their professional talents and to succeed in completing the doctorate requirements. MSc graduates that are fulfilling the general admission criteria for a PhD program at the University of Liechtenstein and that are interested in building a foundation for a career at Hilti. Master’s students from ERCIS member institutions are welcome to apply for this program.

**VIRTUAL BPM WINTER SCHOOL 2021**

In February 2021, information systems students from different European countries had the opportunity to attend a virtual version of the BPM Winter School. This event was a joint event of the Hilti Chair of Business Process Management at the Institute of Information Systems of the University of Liechtenstein with chairs in the ERCIS network. It was open to students from ERCIS member institutions. Besides lectures on advanced and state-of-the-art BPM topics, virtual networking sessions, and fun events were included in the agenda. This event addressed many aspects of Digital Transformation via BPM: For example, Prof. Dr. Jan vom Brocke gave a course on Process Science, Prof. Dr. Daniel Beverungen talked about Organizational Routines, and Prof. Dr. Martin Matzner presented the topic Process Mining.

**VIRTUAL PHD SEMINAR  
ON “DESIGN SCIENCE RESEARCH”**

Since 2017, Prof. Dr. Jan vom Brocke (University of Liechtenstein) and Prof. Dr. Robert Winter (University of St. Gallen) have been offering a joint PhD course on “Design Science” as part of the VHB-ProDok course program. Being forced to virtualize the course because of the COVID-19 restrictions, Jan vom Brocke and Robert Winter redesigned the course syllabus so as to be compatible with distance learning. While in previous years about 15 PhD students could take part in the on-site physical course, the online format attracted about 60 participants from Europe (many of them from the ERCIS network), the United States, and New Zealand and it has been offered three times in 2020 and three times in 2021. Born out of necessity, the virtual format allowed more interested students to participate and helped to increase the visibility and reach of the course.



**HILTI FELLOWSHIP PROGRAM**

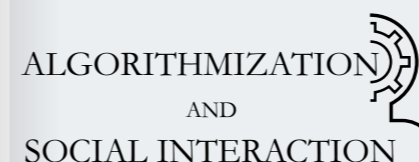
The Hilti Fellowship offers excellent students the opportunity to be part of an international project team at Hilti while they attend lectures and seminars in the Master’s program in Information Systems at the University of Liechtenstein. The Hilti Fellowship is primarily aimed at Master’s students from fields like information systems, business, and management; however, doctoral students and Bachelor’s students who will complete their studies in the near future and plan to pursue a Master’s degree in the following semester can also apply. Because of visa regulations in Liechtenstein, the program is open to EU/EEA and Swiss citizens. Therefore, this program is of great interest for students of ERCIS member institutions. Participants work on real projects at Hilti three days a week and attend the Master’s program in Information Systems on the other two days.

**SERIES OF LECTURES BY  
INTERNATIONAL PROFESSORS AT  
THE UNIVERSITY OF GDANSK**

Professors Marite Kirikova, University of Riga and Jozse Zupancic, University of Maribor gave a series of videoconference lectures for the students of the new specialization Informatic Applications in Business.

**DAAD FUNDED MASTER / PHD LECTURE  
ON “AI, HUMAN RIGHTS AND ETHICS” –  
COOPERATION OF THE UNIVERSITY OF  
MÜNSTER, THE UNIVERSITY OF TWENTE,  
AND THE UNIVERSITY OF LEIDEN**

The course ([https://algorithmization.org/?page\\_id=578](https://algorithmization.org/?page_id=578)) is offered virtually and investigates the role of AI from the perspectives of economy, ethics, computer science and law. Students from various disciplines, and coming from different countries, at the level of MA and PhD are invited to take part in this format.



Course offering within the topical program “algorithmization and social interaction”.



# ERCIS

## EVENTS IN THE ERCIS NETWORK



### 16<sup>TH</sup> INTERNATIONAL CONFERENCE ON DESIGN SCIENCE RESEARCH IN INFORMATION SYSTEMS AND TECHNOLOGY (DESRIST 2021)

4–6 August 2021, University of Agder, Kristiansand, Norway  
<https://desrist2021.org/>

The University of Agder hosted the 16<sup>th</sup> DESRIST conference which was a hybrid conference with both physical present- and online participants. The aim of the conference this year was to support the DSR community in finding its role in the next wave of sociotechnical design. It is a need for taking the context of social and technological advances into account with blurring organizational boundaries, platformization, and the use of artificial intelligence. The conference brings together researchers and practitioners engaged in all aspects of design science research, with a special emphasis on sociotechnical design aspects.

### COLLABORATION WITH SAP SIGNAVIO: THE BPM BILLBOARD

In collaboration with SAP Signavio, Prof. Dr. Jan vom Brocke and his colleagues Prof. Dr. Jan Mendling, and Prof. Dr. Michael Rosemann, presented the BPM Billboard in several webinars, hosted by SAP Signavio. In addition to presenting the BPM Billboard, company representatives were invited to report on its use and share best practices with a broad audience. The BPM Billboard is a tool for planning, communicating and coordinating process initiatives and provides practitioners with a clear representation of all the important aspects that should be taken into account for the planning and further development of their BPM initiative.



### 13<sup>TH</sup> INTERNATIONAL CONFERENCE ON COMPUTATIONAL COLLECTIVE INTELLIGENCE (HYBRID ICCI 2021)

29 September – 1 October 2021, Rhodes, Greece

The 13<sup>th</sup> International Conference on Computational Collective Intelligence (ICCI 2021), was held in Rhodes, Greece, during September 29 – October 1, 2021. Due to the COVID-19 pandemic the conference was organized in a hybrid mode which allowed for both on-site and on-line paper presentations. The conference was hosted by the Democritus University of Thrace, Greece, and jointly organized by Wrocław University of Science and Technology, Poland, in cooperation with the IEEE SMC Technical Committee on Computational Collective Intelligence, the European Research Center for Information Systems (ERCIS), the University of Piraeus, Greece, and the International University-VNU-HCM, Vietnam.

We received over 230 papers submitted by authors coming from 45 countries around the world. Each paper was reviewed by at least three members of the international Program Committee (PC) of either the main track or one of the special sessions. Finally, we selected 60 best papers for oral presentation and publication in one volume of the Lecture Notes in Artificial Intelligence series and 58 papers for oral presentation and publication in one volume of the Communications in Computer and Information Science series.

### WORKSHOP SERIES ON DIGITALIZATION

For the first time, the University of Liechtenstein is organizing the workshop series “Digitalization” starting on October 2021 until February 2022. This series is open to academics, practitioners, and stakeholders from public organizations, supporting the transformation of their organizations, their country and beyond. The lecturers will present basics of digitalization, fundamental concepts of digital innovation, the explanation and benefits of artificial intelligence, the transformation of organizations through business process management, and cyber security including aspects of cybercrime.

### 8<sup>TH</sup> INTERNATIONAL CONFERENCE ON INFRASTRUCTURES IN HEALTHCARE (INFRAHEALTH 2021)

23–24 September 2021, University of Agder, Kristiansand, Norway  
<https://infrahealth.eusset.eu/index.html>

University of Agder hosted the 8<sup>th</sup> InfraHealth conference. The main theme of the conference this year was Digitalization and Personal Health Data. The focus was on personal health data and their use through new types of applications including artificial intelligence. The increased availability of personal health data requires new ways of organizing health services. The conference brings together international researchers, healthcare professionals, IT professionals, administrators, and IT enterprises. Keynote presentations focused on Digital Transformation of the health care sector, and Digital transformation and change during crisis: from Telemedicine to Medicine.

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ICIST  
 2021



### ICIST 2021 – 27<sup>TH</sup> INTERNATIONAL CONFERENCE ON INFORMATION AND SOFTWARE TECHNOLOGIES

October 14–16, 2021, Kaunas, Lithuania  
<https://icist.ktu.edu/>

ICIST is organised by Kaunas University of Technology and is one of the longest running IT research conferences in Lithuania. Building on the positive experience from the 2020 iteration, ICIST 2021 focussed on the four research areas, namely:

- Intelligent Methods for Data Analysis and Computer Aided Software Engineering
- Intelligent Systems and Software Engineering Advances
- Smart e-Learning Technologies and Applications
- Language Technologies

The conference featured 2 keynote speeches and 30 paper presentations. The proceedings were published by Springer as a part of Communications in Computer and Information Science (CCIS) series. Traditionally, ICIST includes a special session on relevant topics, and this year was no exception with 11 additional talks and demos being presented by the KTU educators and practitioners from the major local IT companies on the topic on Creating Talents in Software Engineering.

### CAPSI2021 – CONFERENCE OF THE PORTUGUESE ASSOCIATION FOR INFORMATION SYSTEMS

<http://capsi2021.apsi.pt/index.php/en/>

The 21<sup>st</sup> edition of the Portuguese Association of Information Systems Conference was held online on October 13<sup>th</sup> and 16<sup>th</sup>, 2021, in a joint effort by Polytechnic Institute of Viseu (<https://www.ipv.pt/>) and University of Trás-os-Montes and Alto Douro (<https://www.utad.pt/en/>). The conference’s main theme is “Society 5.0: The Challenger and Opportunities for Informations Systems”. The proceedings are published in the eLibrary of AIS.

# EVENTS IN THE ERCIS NETWORK



## MOBA 2021 – MODEL-DRIVEN ORGANIZATIONAL AND BUSINESS AGILITY WORKSHOP DURING THE CAISE CONFERENCE (UNIVERSITY OF MELBOURNE, AUSTRALIA) IN JUNE 2021

The MOBA workshop continues the traditions and approaches of a scientific seminar with a fifteen-year history of EOMAS, focusing on modern methods of modeling new digital forms of flexible organizational structure and business models. Eduard Babkin, an Ordinary Professor at the National Research University Higher School of Economics, Head of the Theory and Practice of Decision Support Systems, became the chairman of the new MOBA workshop. Pavel Malyzhenkov, Associate Professor of the Department of Information Systems and Technologies and Academic Supervisor of the Master's Program "Business Informatics", will lead the doctoral consortium – a platform for discussing research results for young researchers.

With many years of experience in participating in the EOMAS seminar, the leaders of the new MOBA scientific seminar are confident that it will bring together leading researchers and practitioners in Business Informatics and become an active platform for discussing the results of modern research at the international level. The list of seminar organizers includes leading scientists and practitioners in the field of modern Business Informatics: Joseph Barjis (*Lecturer at the University of San Jose and Senior Director of CNO, USA*), Robert Pergl and Vojtech Merunka (*Technical University of Prague, Czech Republic*), Russell Lock (*University Loughborough, UK*). The fruitful joint work in the organizing committee is based on the long-standing acquaintance of Business Informatics from HSE with these specialists: Joseph Barjis attended HSE Nizhny Novgorod with lectures for students and participated in the "Days of Organizational Engineering", Robert Pergl and Vojtech Merunka are colleagues of Nizhny Novgorod Business-Informatics on the international workshop EOMAS.

## CO-ORGANIZATION OF THE STUDENT TRACK AT THE 16<sup>TH</sup> INTERNATIONALE TAGUNG WIRTSCHAFTSINFORMATIK

For about 10 years, the University of Liechtenstein has supported the Student Track at the 16<sup>th</sup> Internationale Tagung Wirtschaftsinformatik. The goal of the Student Track is to give students – especially from the ERCIS network and beyond – the opportunity to actively participate in this conference and submit research papers. The Student Track provides a platform through which students, researchers and practitioners can get to know each other in professional discourse. The best student paper will also receive the Best Student Paper Award from the Liechtenstein Chapter of the Association for Information Systems (AIS) and Hilti.

## 8<sup>TH</sup> INTERNATIONAL CONFERENCE ON INFRASTRUCTURES IN HEALTHCARE (InfraHealth 2021)

23–24 September 2021, University of Agder, Kristiansand, Norway  
<https://infrahealth.eusset.eu/index.html>

University of Agder hosted the 8<sup>th</sup> InfraHealth conference. The main theme of the conference this year was Digitalization and Personal Health Data. The focus was on personal health data and their use through new types of applications including artificial intelligence. The increased availability of personal health data requires new ways of organizing health services. The conference brings together international researchers, healthcare professionals, IT professionals, administrators, and IT enterprises. Keynote presentations focused on Digital Transformation of the health care sector, and Digital transformation and change during crisis: from Telemedicine to Medicine.



## 13<sup>th</sup> Asian Conference on Intelligent Information and Database Systems



### Our Team runs OnLine ACIIDS 2021



## 13<sup>TH</sup> ASIAN CONFERENCE ON INTELLIGENT INFORMATION AND DATABASE SYSTEMS (ONLINE ACIIDS 2021)

7–10 April 2021

ACIIDS 2021 was the 13<sup>th</sup> edition of the Asian Conference on Intelligent Information and Database Systems. The aim of ACIIDS 2021 was to provide an international forum for research workers with scientific backgrounds on the technology of intelligent information and database systems and its various applications. The ACIIDS 2021 conference was co-organized by King Mongkut's Institute of Technology Ladkrabang (*Thailand*) and Wrocław University of Science and Technology (*Poland*) in cooperation with the IEEE SMC Technical Committee on Computational Collective Intelligence, the European Research Center for Information Systems (ERCIS), The University of Newcastle (*Australia*), Yeungnam University (*South Korea*), Leiden University (*The Netherlands*), Universiti Teknologi Malaysia (*Malaysia*), BINUS University (*Indonesia*), Quang Binh University (*Vietnam*), Nguyen Tat Thanh University (*Vietnam*), and the "Collective Intelligence" section of the Committee on Informatics of the Polish Academy of Sciences. ACIIDS 2021 was at first scheduled to be held in Phuket, Thailand during April 7–10, 2021. However, due to the COVID-19 pandemic, the conference was moved to the virtual space and conducted online using the ZOOM videoconferencing system.

The proceedings of ACIIDS 2021 were published by Springer in series Lecture Notes in Artificial Intelligence LNCS/LNAI. We received in total 291 papers whose authors came from 40 countries around the world. Each paper was peer reviewed by at least two members of the international Program Committee and one member of the international board of reviewers. Only 69 papers of the highest quality were selected for oral presentation and publication in this LNAI volume of the ACIIDS 2021 proceedings.

## PROJMAN 2020 – PROJMAN – INTERNATIONAL CONFERENCE ON PROJECT MANAGEMENT

(<http://projman.scika.org>),  
 October 13–15, 2021, Braga, Portugal.

During this 3-day conference, under the leitmotiv of Project Management, academics, scientists, project managers and solution providers from all over the world will have the opportunity to share experiences, bring new ideas, debate issues, and introduce the latest developments in this largely multidisciplinary field.

## WI2021 – INTERNATIONAL CONFERENCE ON BUSINESS AND INFORMATION SYSTEMS ENGINEERING

In March 2021 the largest IS-related conference of Germany, Switzerland and Austria was hosted at University of Duisburg-Essen. ERCIS member Stefan Stieglitz served as a conference chair and many other ERCIS members from different institutions such as Münster, Paderborn and Liechtenstein were involved as track chairs, associate editors, authors, and reviewers. Due to the pandemic, the event had to be organized as a purely virtual event. Even though this limited the possibilities for social events and network activities, new ways of virtual collaboration and get togethers offered space for personal exchange. E.g. Gather.town was used as a platform for the welcome reception, the poster sessions and the social events. Therefore, the conference became an innovative virtual space for research-related discussions as well as thought exchange about how the future of IS conferences should look like.

*Leimeister, J.M., Stieglitz, S., Matzner, M., Kundisch, D., Flath, C. & Röglinger, M. (2021). Quo Vadis Conferences in the Business and Information Systems Engineering (BISE) Community After Covid. Business and Information Systems Engineering (BISE).*





# EXERCIS

# OUTLOOK FOR 2022

## JANUARY 2022

**ERCIS BPM WINTER SCHOOL 2022**, 10–14 January, University of Liechtenstein, <https://www.ercis.org/education/ercis-bpm-winter-school>

## MARCH 2022

**START AND KICK-OFF HILTI FELLOWSHIP PROGRAM** (Summer term 2022), <https://careers.hilti.li>, <https://www.uni.li>

## APRIL 2022

**DAGSTUHL PERSPECTIVES WORKSHOP ON “AI VS BIG DATA, DATA SCIENCE AND ROBOTICS: Synergies and Distinguishing Elements”**, 3–8 April, Schloss Dagstuhl, Wadern, Germany, <https://www.dagstuhl.de/22142>

**DEADLINE FOR APPLICATION FOR THE HILTI FELLOWSHIP** (Winter term 2022/23), April 30, <https://careers.hilti.li>, <https://www.uni.li>

## MAY 2022

**ERCIS DOCTORAL CONSORTIUM**, 28 May–4 June, Pto. Pollensa, Spain, <https://www.ercis.org/dc>

## JUNE 2022

**14<sup>TH</sup> ASIAN CONFERENCE ON INTELLIGENT INFORMATION AND DATABASE SYSTEMS (ACIIDS 2022)**, 6–9 June, Almaty, Kazakhstan, <https://aciids.pwr.edu.pl/2022/>

**NEURO IS RETREAT 2022**, 14–16 June, Schlosshotel Wilhelminenberg, Vienna, Austria, <http://www.neurois.org/neurois-retreat-2022/>

## JULY 2022

**GENETIC AND EVOLUTIONARY COMPUTATION CONFERENCE (GECCO 2022)**, 9–13 July, Boston, <https://gecco-2022.sigev.org>

## AUGUST 2022

**FINANCECOM 2022**, 23–24 August, Enschede, The Netherlands

**13<sup>TH</sup> INTERNATIONAL CONFERENCE ON MULTIMEDIA & NETWORK INFORMATION SYSTEMS (MISSI 2022)**, 31 August–2 September, Paris, France, <https://missi.pwr.edu.pl/2022/>

## SEPTEMBER 2022

**ERCIS ANNUAL WORKSHOP**, 12 September, Münster, Germany, <https://www.ercis.org>

**20<sup>TH</sup> INTERNATIONAL CONFERENCE ON BUSINESS PROCESS MANAGEMENT (BPM)**, 13–15 September, Münster, Germany, <https://bpm2022.uni-muenster.de>

**14<sup>TH</sup> INTERNATIONAL CONFERENCE ON COMPUTATIONAL COLLECTIVE INTELLIGENCE (ICCI 2022)**, Hammamet, Tunisia, <https://icci.pwr.edu.pl/2022/>

**PARALLEL PROBLEM SOLVING FROM NATURE (PPSN) CONFERENCE**, Münster, Germany

**14<sup>TH</sup> EUROSYMPOSIUM ON DIGITAL TRANSFORMATION**, Gdansk, Poland, [www.eurosymposium.eu](http://www.eurosymposium.eu)

**START AND KICK-OFF HILTI FELLOWSHIP PROGRAM** (Winter term 2022/23), <https://careers.hilti.li>, <https://www.uni.li>

## OCTOBER 2022

**28<sup>TH</sup> INTERNATIONAL CONFERENCE ON INFORMATION AND SOFTWARE TECHNOLOGIES (ICIST 2022)**, 13–15 October, Kaunas, Lithuania, <https://icist.ktu.edu>

**CAPSI2022 – CONFERENCE OF THE PORTUGUESE ASSOCIATION FOR INFORMATION SYSTEMS**, (possibly in Cape Verde)

**DEADLINE FOR APPLICATION FOR THE HILTI FELLOWSHIP** (Summer term 2023), 31 October, <https://careers.hilti.li>, <https://www.uni.li>

## NOVEMBER 2022

**PROJMAN 2022 – INTERNATIONAL CONFERENCE ON PROJECT MANAGEMENT**, <https://projman.scika.org>



## ERCIS TEAM

For everything that concerns the ERCIS network simply write us an email. You will for sure get an answer from one of our team members. The team consists of **Dr. Armin Stein**, who is the managing director of the ERCIS network and is being supported by **Dr. Katrin Bergener**, who works part-time for the team and furthermore as Coordinator for the WWU Centre for Europe, and **Julia Seither** as team assistant.

Besides answering emails, the team helps organising events, maintains the website, organises the network communication, and supports project applications.

If you are interested in the network, get in touch with them!

[info@ercis.org](mailto:info@ercis.org)



# THE IS RESEARCH NETWORK



## IMPRINT

**PUBLISHER** ERCIS – EUROPEAN RESEARCH CENTER FOR INFORMATION SYSTEMS  
UNIVERSITY OF MÜNSTER

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