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Faculty of Economics and Business Administration

The Faculty of Economics and Business Administration at the University of Duisburg-Essen analyses the topics of its disciplines from an economic and information technology perspective. It focuses on business structures and processes, the information and communication systems of companies, and the products they manufacture.

The structure of the Faculty of Economics and Business Administration is designed to meet the interdisciplinary requirements of current research issues. It comprises four disciplines: business administration, computer science, economics and business information systems. This network of disciplines allows the Faculty's researchers systematically to process information that are necessary to plan business structures and processes efficiently. Information and communication technology increasingly facilitate innovative business models and company structures. The Faculty analyses and plans these from a variety of perspectives

Key research areas

Health economics and medical management

This research area focuses on health as human capital and the healthcare sector as a system. The National Research Center for Health Economics, CINCH (Competence in Competition and Health) is its linchpin. Within the scope of their collaboration with the RWI Leibniz Institute for Economic Research, the researchers of this group have established the Leibniz Science Campus Ruhr at the Faculty. It focuses on healthcare challenges in regions with declining and ageing populations, and its funding has recently been extended until 2024. The research in health economics and medical management is characterised by a particularly broad methodological approach. The team of the Essen Laboratory for Experimental Economics (elfe), which participates in this research area, is an international pioneer in establishing experimental methods in health economics.

Energy markets and finance

In recent years, climate and energy goals established at the international, European and national level have rapidly and profoundly transformed economies and societies around the world. Energy suppliers, financial institutions, regulators and, as of late, even central banks have been facing unprecedented challenges related to energy markets and finance. This research area tackles the complex issues resulting from these environments. Besides specialist expertise, they particularly require interdisciplinary groups of researchers. The foundation of the House of Energy Markets and Finance (HEMF) in 2015 institutionalised this research area. In addition to its scientific prestige, it has gained a remarkable international reputation by organising high-profile conferences and seminars on a regular basis. The research area excellently represents the Faculty's strategic efforts to establish a local, regional and international academic network that promotes interdisciplinarity in research and teaching.

Software engineering

Software systems have become omnipresent: they permeate nearly all aspects of our lives. Developments in information technology, such as the Internet of Things (IoT) and cloud computing, produce innovative, software-based systems that rapidly achieve mass adoption and significantly influence our daily routines. Engineering such new systems (i.e., their scoping, development and operation) continuously poses new challenges for computer science, in general, and software engineering, in particular. These systems offer immense potential for disruptive automation, new business models and software-based services. They are the driving force behind the digital transformation. That is why research in software engineering focuses on the very challenges raised by the digital transformation itself, including its role in restructuring industries that have already digitised most of their operations and those that are still in the process of doing so. Particular difficulties emerge at the interface of complexity, security and user-friendliness. In order to pool and institutionalise its research in software engineering, the Faculty founded paluno – The Ruhr Institute for Software Technology in 2010.

New key research area: digital transformation

The new key research area of digital transformation will comprise the Faculty's research into modern and 'disruptive' information and communication technologies and their economic impact. This includes edge computing, big data analytics, blockchain and artificial intelligence. Taking the intended economic effects of these technologies as a point of departure, this research group seeks to determine which technical artefacts are suitable for achieving them. It also examines existing artefacts in terms of their economic consequences. Its research focus makes the new key area of digital transformation inherently transdisciplinary, as it utilises methods and theories from informatics, business information systems, business administration and economics. The business information systems research group has taken on a leading role and actively advances the development of this key research area together with its adjacent disciplines.

Business administration (IBES)

Methodological and theoretical pluralism is an important characteristic of the research and teaching conducted in the field of business

administration at the Faculty. The empirical ('positive') and design-based ('constructive') analyses of microeconomic processes and structures utilise a variety of market and company theories. For the sake of epistemological pluralism, the researchers avoid limiting themselves to individual, dominant methods and theories preferred in mainstream research. Instead, they deliberately cultivate the academically charged relationship between different methodological and theoretical approaches. Research in business administration at the Essen campus does not focus solely on its inherent object of inquiry. It answers current research issues from a range of perspectives and, in doing so, establishes connections with many disciplines, such as sociology, psychology, philosophy, mathematics, computer science, the engineering sciences, medicine, law and economics. Due to these close links with other fields, research results are featured in renowned publications in all those disciplines. The business administration arm of the IBES has secured a large volume of external funding for its research (e.g., from the Federal Ministry of Education and Research, Federal Ministry for Economic Affairs and Energy, German Research Foundation, EU, Fritz Thyssen Foundation, Hans Böckler Foundation etc.). It is one of the most successful of its kind in Germany.

Economics (IBES)

The economics part of the IBES focuses on empirical economics research. Its activities and studies cover a wide spectrum of topics, including labour market economics, educational economics, monetary and currency policy, health economics, macroeconomics, econometrics of international trade and experimental economics research. There is enormous potential in its collaboration with the RWI Leibniz Institute for Economic Research, especially in the key research areas of the Ruhr Graduate School in Economics (RGS ECon) and in the healthcare sector. The members of the economics research group regularly publish articles in specialist journals, such as Demography, Econometrics Reviews, Econometric Theory, Economica, European Economic Review, Health Economics, International Economic Review, Journal of Banking and Finance, Journal of Business & Economic Statistics, Journal of Common Market Studies, Journal of Economic Behavior & Organization, Journal of Environmental Economics and Management, Journal of Financial Econometrics, Journal of Health Economics, Journal of International Money and Finance, Journal of the European Economic Association, Labour Economics, Oxford Bulletin of Economics and Statistics and PLOS ONE. Their output consistently earns the Faculty excellent positions in scientific rankings. According to the latest Handelsblatt Ranking of 2019, the University of Duisburg-Essen is one of the top 25 universities in Germany and the German-speaking region in the field of economics. This corresponds to rank 12 in Germany. Its economics researchers are highly successful in acquiring competitive external funding for its projects on a regular basis. While the Federal Ministry of Education and Research is the most frequent sponsor, the German Research Foundation (DFG) and the European Commission are also important contributors.

Computer science (ICB)

The Faculty has expanded its sphere of academic competence in computer science. Its software engineering group continues to be an important player in international top-level research, focusing on the main fields that attract public funding. The research expertise in this field is pooled in paluno – The Ruhr Institute for Software Technology. The Faculty's various departments carry out outstanding research in important sub-disciplines of network engineering, such as communication networks, modelling, network security and application security. They were also able to expand their empirical research activities in computer science education. In the field of software engineering, the departments of the ICB have developed a range of construction and analysis processes that allow engineers to develop complex software for sophisticated applications, manage its deployment and achieve the quality required. The international renown of the software-based work is reflected in the large number of international and national conferences organised by professors of the ICB. Large volumes of competitive external funding have been awarded to the software engineering research, in particular. Members of the ICB have also won several best-paper awards.

Business information systems (ICB)

The study of business information systems is a particularly interdisciplinary field. It combines the application-oriented approach of computer science with the development of applications systems while exploring the utilisation of IT systems in organisations from the perspective of business administration, even incorporating sociological aspects into its work. At its core, it studies phenomena of the digital transformation in a business context. The business information systems research group at the Essen campus particularly focuses on the issues inherent to transforming institutions, which only become clear through an integrative understanding of the technical artefact (from the creators' and users' perspective) and the related economic, social and individual (and, as such, sociological) implications. The digital-transformation process is more than the mere utilisation of information technology to increase the efficiency of existing processes. Rather, it requires a comprehensive transformation entailing not just the reorganisation of business processes but the development of whole new digital products, services and business models. Market-oriented digital innovations, supporting innovation systems, IT infrastructures and organisational handling systems must be designed in a closely interlinked structure, and corresponding management concepts must be developed in parallel. Although the dominance of design-based study of business information systems (design science) is considered one of the strengths of German business informatics, the research conducted at the Essen campus promotes methodological pluralism by incorporating empirical (behavioural science) and construction-oriented approaches.

Junior Professorship of Environmental Economics (with a focus on the economy of renewable energies)

Junior Professor Florian Ziel has led the research group of environmental economics (with a focus on the economy of renewable energies) since 2017. Research in his group is centred on modelling and forecasting energy markets. Thanks to his excellent background as a mathematician and statistician, he primarily uses modern data processing methods of high-dimensional statistics and machine learning. Florian Ziel's specialist expertise has earned him a variety of sought-after awards, such as the 2016 GEE Prize of the Gesellschaft für Energiewissenschaft for the best dissertation in its field and the Award of Excellence in the Global Energy Forecasting Competition 2017. Over the course of his remarkably international career to date, he has researched at the Oxford Centre for Industrial and Applied Mathematics (OCIAM) of the University of Oxford and the European Center for Advanced Research in Economics and Statistics (ECARES) of the Université Libre de Bruxelles in Belgium. Between January and April 2019, he participated in the research programme 'Mathematics for Energy Systems' of the Isaac Newton Institute in Cambridge, UK, as a visiting

Prodean: Professor Dr Tobias Kollmann

Professor Dr -Ing. Lucas Vincenzo Davi

scholar. He has held the position of associate editor of 'Digital Finance' and a seat on the editorial board of 'Forecasting' since 2019. Together with Rüdiger Kiesel, he participates in the jointly acquired, German-Polish research collaboration 'IMMORTAL', a study of intraday electricity markets by the DFG and the Narodowe Centrum Nauki (NCN). He has also been awarded a range of industry projects and the 2020 Maria Weber Grant. Since the summer of 2020, he has been an appointed member of the Berlin-Brandenburg Academy of Sciences and Humanities (BBAW) and the German National Academy of Sciences Leopoldina, where he contributes to the research groups on sustainability and artificial intelligence, in particular.

Junior Professorship of Computer Science (secure software systems)

Headed by Professor Lucas Davi, the research group of Computer Science (secure software systems) researches practical issues in systems and software security. The development of innovative security technologies to prevent software attacks is a high priority. Such attacks exploit security gaps in software in order to manipulate the regular program flow and execute malware. The research groups studies a variety of computer architectures and application domains. It develops innovative update mechanisms for microcomputers used in embedded systems that can fix security gaps during the system runtime. In particular, this allows medical devices to be updated without a restart. In the field of PC software, the researchers carry out automated security analyses for trusted execution environments, such as Intel SGX and ARM TrustZone. Their analyses of software used for fingerprint sensors in Dell, HP and Lenovo laptops have detected severe security issues and helped the manufacturers safeguard their systems. In the field of blockchain technologies, the group has worked on the development of analytics systems and update mechanisms for smart contracts in partnership with NEC Laboratories Europe. Their project has shown that attacks on smart contracts (in particular, re-entrancy attacks), which have facilitated the theft of more than 50 million US dollars' worth of cryptocurrency in the past, can be prevented. Based on the analytics technology produced for this purpose, the researchers developed the first automated update mechanisms for smart-contract software, allowing blockchain developers to protect the vulnerable smart-contract code quickly and effectively. The research group is currently funded within the scope of major DFG projects. In the Collaborative Research Centre CROSSING, they develop attestation protocols that enable the use of verification mechanisms for embedded platforms. In the DFG Excellence Cluster CASA, the group studies analytics tools for secure computing environments and mechanisms to ward off software attacks on PC software, such as web browsers. A further DFG-funded project in the Nano-Security Priority Programme focuses on developing security solutions for future embedded platforms. Professor Davi has been a member of the editorial boards of ACM Transactions on Privacy and Security (TOPS) and a programme committee member of the most renowned IT security conferences: ACM CCS, USENIX Security, PETS and ISOC NDSS.

Research collaborations and transfer

The annual Essen Health Conference provides established researchers and early-career academics a platform for exchanging knowledge and presenting their research results. It is an international event that attracts participants from all over Europe and North America. Besides health economics, it covers adjacent disciplines such as education economics and labour economics.

Every September, the HEMF organises the International Ruhr Energy Conference, which features many high-profile lectures from renowned German and international researchers. Other significant (international) conferences are organised by the HEMF members at the Essen campus on a regular basis. Recently, they have included the annual conference of the German Finance Association in 2019 and the Energy Finance Christmas Workshop in 2016.

The paluno has a strong national and international research network with many high-profile companies and research institutions. It is also active in other national and international research networks. Professor Gruhn coordinated the software research group in the CPS.Hub NRW, for example. Professor Pohl's research group studies dynamically aggregated CPS in the CrESt project, funded by the Federal Ministry of Education and Research. The European technology platform NESSI (The Networked European Software and Services Initiative) aims to establish a coordinated European strategy for information and communication technologies with a focus on software, services and data to facilitate the digital transformation. Professor Pohl's department is a member of the steering committee and executive board of NESSI. The European BDVA (Big Data Value Association) is the European Commission's industrial partner in implementing the public-private partnership (PPP) on big data. Professor Pohl's research group is one of its founding members.

Selected Publications

Ahlemann, F., C. Legner, J. Lux (2020): *A resource-based perspective of value generation through enterprise architecture management. Information & Management.*

Atal, J.P., H. Fang, M. Karlsson, N. Ziebarth (2019): *Exit, Voice or Loyalty? An Investigation into Mandated Portability of Front-Loaded Private Health Plans. Journal of Risk and Insurance 86 (3).*

Dietrich, A., C. Weber (2018): *What drives profitability of grid-connected residential PV storage systems? A closer look with focus on Germany. Energy Economics 74, 399–416.*

Jacobs, H., S. Müller (2020): *Anomalies Across the Globe: Once Public, No Longer Existent?, Journal of Financial Economics, 135, 213–230.*

Massing, T., N. Schwinning, M. Striewe, C. Hanck, M Goedicke (2018): *E-Assessment Using Variable-Content Exercises in Mathematical Statistics. Journal of Statistics Education, 26 (3), 174–189.*

Metzger, A., A. Neubauer, P. Bohn, K. Pohl (2019): *Proactive process adaptation using deep learning ensembles. 31st Int'l Conference on Advanced Information Systems Engineering (CAiSE 2019), Rome, Italy, June 3–7, 2019, ser. Lecture Notes in Computer Science, P. Giorgini, and B. Weber, Springer.*

Nissen, A., C, Krampe, P. Kenning, R. Schütte (2019): *Utilizing Mobile fNIRS to Investigate Neural Correlates of the TAM in eCommerce. International Conference for Information Systems (ICIS)*

Sandoval A., P. Juan, F. Beck, A. Bergel (2019): *Performance Evolution Matrix: Visualizing Performance Variations along Software Versions. Proceedings of the 2019 Working Conference on Software Visualization. IEEE 2019. doi:10.1109/VISSOFT.2019.00009 (VISSOFT 2019 Best Paper)*

Wagner S., N. Fet, M. Handte, P. Marron (2017): *An Approach for Hybrid Indoor/Outdoor Navigation. 13th International Conference on Intelligent Environments (IE'17), Seoul, Korea, 2017. Best Paper Award.*

Ziel, F. (2019): *Quantile regression for the qualifying match of GEFCom2017 probabilistic load forecasting. International Journal of Forecasting, 35(4), 1400–1408.*

Professors

Professor Dr Frederik Ahlemann
Professor Dr Erwin Amann
Professor Dr Fabian Beck
Professor Dr Andreas Behr
Professor Dr Katharina Blankart
Professor Dr Torsten Brinda
Professor Dr Jeannette Brosig-Koch
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Professor Dr Lucas Vincenzo Davi
Professor Dr Stefan Eicker
Professor Dr Stefan Felder
Professor Dr Ulrich Frank
Professor Dr Michael Goedicke
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Professor Dr Werner Nienhüser
Professor Dr Sebastian Otten
Professor Dr Klaus Pohl
Professor Dr Erwin Rathgeb
Professor Dr Thomas Retzmann
Professor Dr Ute Schmiel
Professor Dr Reinhold Schnabel
Professor Dr Stefan Schneegaß
Professor Dr Hendrik Schröder
Professor Dr Reinhard Schütte
Professor Dr Jürgen Wasem
Professor Dr Christoph Weber
Professor Dr Stephan Zelewski
Professor Dr Florian Ziel

The department of business information systems maintains a lively exchange with its international colleagues. Besides joint research projects, such as the collaboration 'Language Engineering for Multi-Level Modelling', the Visiting Scholar Academy particularly contributes to this exchange. Every year, one renowned researcher from another country collaborates with the department within the scope of an intensive specialist exchange and a block of classes taught for students of business information systems.

Awards

- Professor Florian Ziel: Maria Weber Grant of the Hans Böckler Foundation, membership of the young academy
- Professor Martin Karlsson: 2021 Research Prize of the Riksbankens Jubileumsfond
- Professor Klaus Pohl: IEEE RE Lifetime Service Award 2020
- Professor Fabian Beck and Shivam Agarwal: Best Paper Award 2020 – Vision, Modeling, and Visualization
- Professor Michael Goedicke: Best Paper Award – ELFI 2019 – 17. Fachtagung Bildungstechnologie, German Informatics Society, Berlin
- Professor Kollmann: EURAM SIMA in Dublin 2020

Outlook

The research of the Faculty of Economics and Business Administration is characterised by international collaboration. Its collaborative projects focus on questions from a range of fields: energy economics, health, trade and services, automotive industry, IT businesses, accountancy, fiscal consultancy and business consultancy. All research groups at the Faculty are concerned with the impact of the digital transformation on forms of work and ways of like, topics which are studied from a variety of mutually complementary perspectives. The research of the Faculty aims to develop theories and methods that can help shape the transition to a more attractive, more humane society.

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