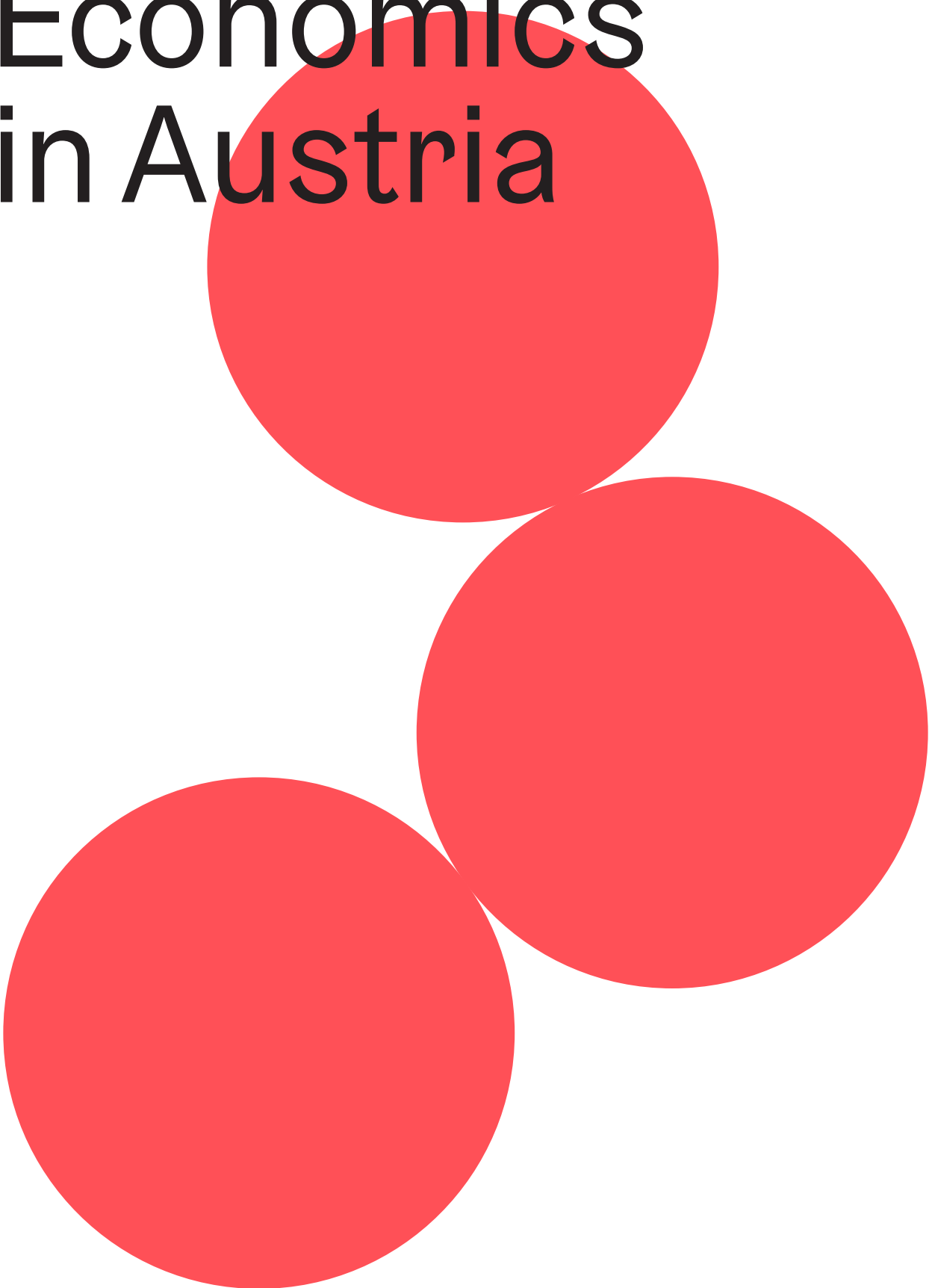
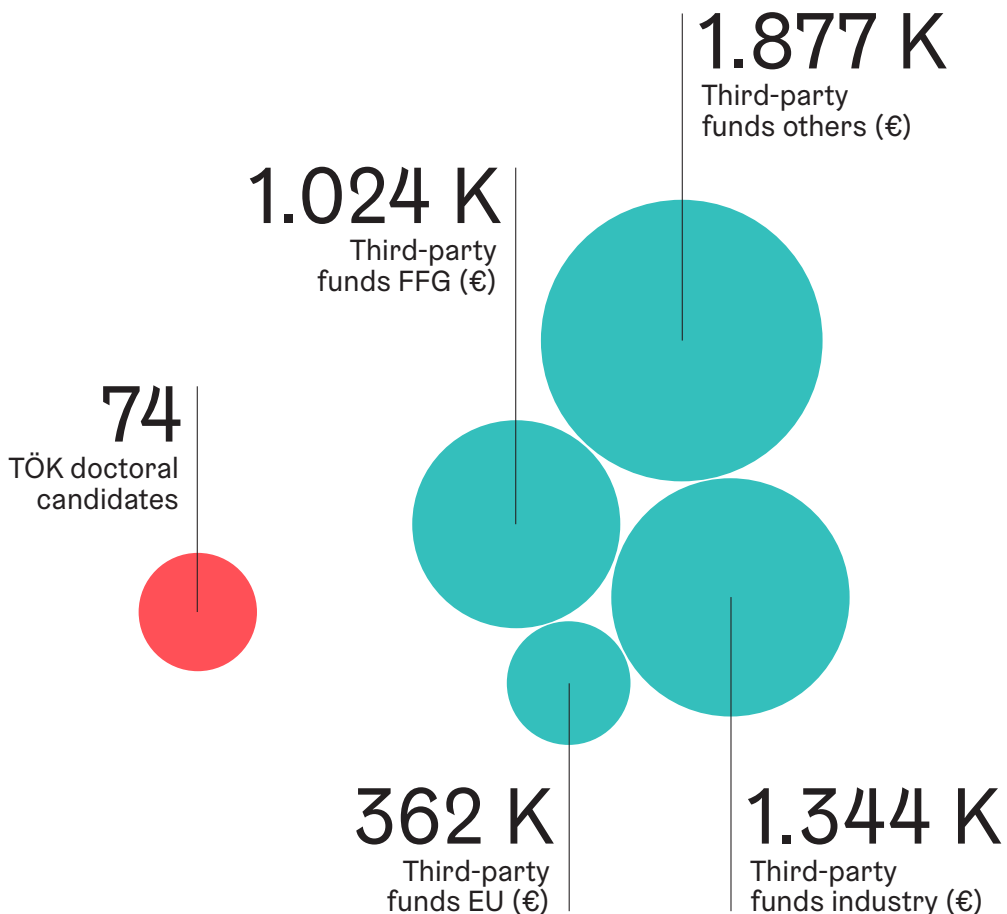
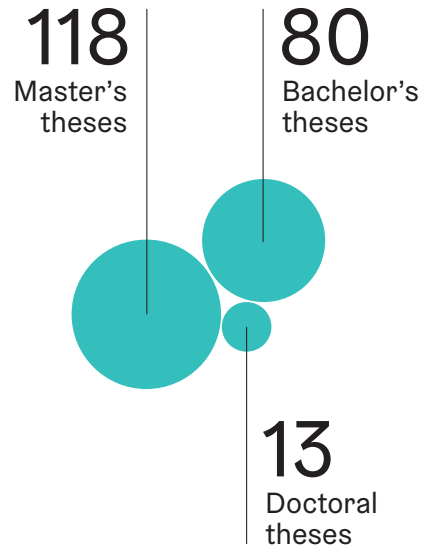
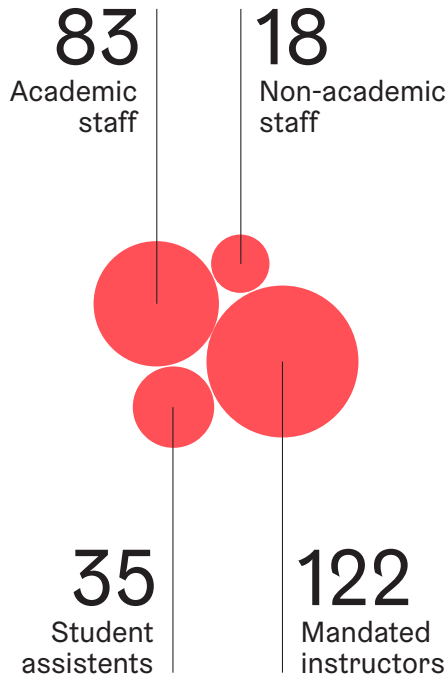


Techno- Economics in Austria



FACTS &



FIGURES

186
Publications

359
Number of
courses

24
Visiting scholars
incoming

16
Visiting scholars
outgoing

161
Academic
talks

433
Graduates
Bachelor's
programs
18/19

5.825
WING/IEM-Students
academic year 18/19

13
Graduates
Doctoral
programs
18/19

367
Graduates
Master's
programs
18/19

17,5 %
Percentage of
female students

2019

**Joining forces
for Austria's future.
Science and technology
drive innovation,
economic growth,
employment, and
prosperity. TU Austria
unites the three
Austrian universities
of technology —
TU Wien, TU Graz,
and Montanuniversität
Leoben under one
label.**



Rector Wilfried Eichlseder (Montanuniversität Leoben), Elke Standeker (Secretary General of TU Austria), Rector Harald Kainz (TU Graz), and Rector Sabine Seidler (TU Wien)

Guided by the principle “United Through Excellence” these institutions set new standards in teaching and research in science and engineering.

Established in 2010, TU Austria brings together over 46,500 students and 9,600 employees, and has become an influential, well networked and highly visible university forum over the years. Its members work together to tackle today’s important issues in research and education and contribute to setting new standards in university policy. Joint activities like summer schools, an award for young female technicians, intensive exchange with the industry, and a broad international university network complete the package.

Each of the three TU Austria universities – TU Wien, TU Graz and Montanuniversität Leoben –

takes pride in its individual profile, strengths and focus. By joining forces within this remarkable alliance, Austria’s universities of technology are strengthening synergies, increasing efficiency and managing their resources more strategically. TU Austria focuses on the research fields of energy, materials science, geosciences/geodesy, production engineering, tunneling, techno-economics as well as information and communication technologies, and on the three major faculties and study programs of mechanical engineering, electrical engineering, and civil engineering. The three TU Austria universities coordinate both their research areas and their study programs, thus avoiding unnecessary duplications. They also coordinate the planning and deployment of major infrastructure investments and projects, and

foster collaborative work to ensure that the infrastructure of each university is better utilized. By benchmarking individual performance against the performance of the partner universities, best practices are identified quickly and shared to the benefit of all. By speaking with one voice in its public and media relations, in publications and at events, TU Austria delivers a powerful message to politics, business and society.

The TU Austria universities are offering education and academic training at the highest level, they are strengthening Austria as an attractive location for business, industry and science, and are working on innovative solutions for the benefit of our society.

→
tuaustria.ac.at

Harald Kainz

Rector of
TU Graz



“The combination of technical and business know-how plays an enormous role both in partnerships between industry and universities of technology and in the professional careers of our graduates. Industrial engineers at Austrian universities of technology have the ideal educational profile for this.”

Sabine Seidler

Rector of
TU Wien



“With science and business becoming increasingly intertwined, the technical universities are making a significant contribution to cementing Austria’s place as a country of innovation. Working together across disciplines, progress is being made along the entire value chain from basic research to applied research through to implementation in the specific application.”

Wilfried Eichlseder

Rector of
Montanuniversität Leoben



“The dedication of all scientists involved at our three universities simply cannot be overstated and facilitates a comprehensive collaboration between our universities. The demand from industry for graduates with an in-depth education in management science is something we pay a great deal of attention to here.”

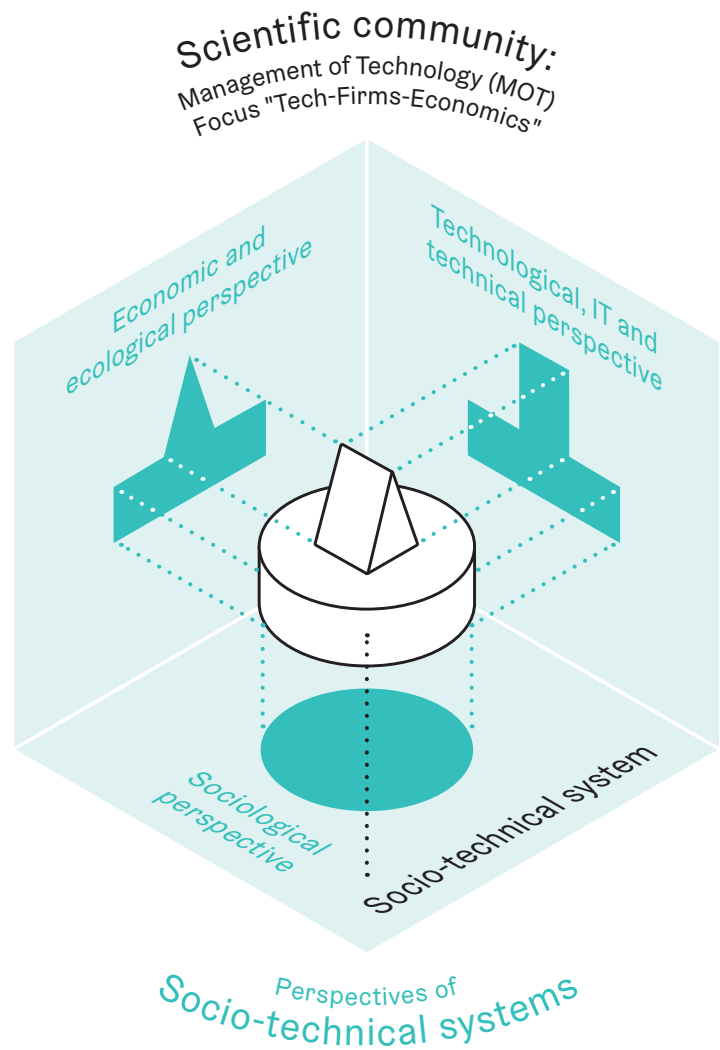
Socio-technical systems

The common research and teaching focus of TU Austria's scientific "Tech-firms Economics (Techno-Ökonomie)" community

The business and management departments of the Austrian universities of technology (TU Austria) are aligning their research and teaching activities under the "Tech-firms Economics" roof within the "Management of Technology" scientific community. This roof constitutes a cross-disciplinary approach for understanding and improving the functioning of

tech-firms, i.e. technology-based enterprises and their management. Its cross-disciplinarity stems from firstly, seeing the tech-firms as socio-technical systems, and secondly, investigating them by applying engineering, i.e. technological, IT, and technical as well as economic, ecological, and sociological scientific methods. Consequently, the term "Economics"

in the "Tech-firms Economics" is not limited to a narrow definition of economics but goes far beyond by explicitly including the peculiarities of human beings that are first-citizen elements within the socio-technical system's view of tech-firms.



The socio-technical system's perspective assumes that organizations are "made up of people (the social system) using tools, techniques and knowledge (the technical system) to produce goods or services valued by customers (who are part of the organization's external environment)". (Griffith/Dougherty, Beyond socio-technical systems: introduction to the special issue, Journal of Engineering and Technology Management, 2002, p. 205). For a successful cross-disciplinary investigation it is crucial not simply to decompose these socio-technical systems into their social and technical parts and treating them as isolated entities. Instead, the technical and social interactions need to be jointly addressed for understanding, improving, and managing the tech-firms within the socio-technical system's view.

The cross-disciplinary approach of Tech-firms economics is a constituent characteristic of the TU Austria's business and management departments since their establishment after the 2nd world war. It is also in line with the Management of Technology (MOT) initiative that was specified by the "Task Force on Management of Technology" in response to the relative decline in the international competitiveness of U.S. industries in the 1980's. "To an ever-increasing extent, advanced technologies are a pervasive and crucial factor in the success of private corporations, the effectiveness of many government operations, and the well-being of national economies. Successful development and implementation of advanced technologies requires careful attention not only to scientific and engineering advances and resulting capabilities, but also to people, raw materials, financial feasibility, and the competitive environment.

Appropriate consideration of each of these factors requires conscious choices and actions, and achieving an appropriate balance is an increasingly difficult problem for modern managers. It is a problem of technology management." (National Research Council, Management of Technology: The Hidden Competitive Advantage, National Academy Press, Washington DC, 1987). Furthermore, the Tech-firms economics' cross-disciplinary approach is well suited for proactively managing complexity and diversity via its socio-technical systems foundation. "It is argued that state-of-the-art perceptions of terminology and management of technology have evolved over the years to include more and more issues. However, three current challenges, new understanding of organization, strategy, and management, point to a number of discussions for management of technology at this point in time. We therefore argue that a perception of technology should take into account the human aspects of technology, the irrational view of technology as socially constructed, should contribute to the new non-hierarchical organization, and make it possible to use the complexity and diversity of the business environment proactively." (Dreyer, The discipline of management of technology, based on considerations related to technology, Technovation, 17 (5), 1997, p. 253).

Compared to Anglo-Saxon countries the Management of Technology (MOT) considerations characterizing Tech-firms economics are already well established and they have a long success history with reference to tech-firms concerning research as well as teaching. There is a prospering relationship between the business and management departments

with many Austrian companies where relevant problems of the tech-firms are solved with scientific rigor. Besides that, the academic education system produces in the TU Austria's Industrial Engineering and Management (IEM) study programs ("Wirtschaftsingenieurwesen – Studienprogrammen") highly qualified and broadly competent graduates that find good and interesting engagements quite easily. Finally, there is a long standing relationship between the university departments, IEM students, alumnis, and tech-firms that has been organized and promoted since 1964 by the Austrian Industrial Engineering and Management Association ("Österreichischer Verband der Wirtschaftsingenieure").



Techno- Ökonomie Kolloquium



The “Techno-Ökonomie Kolloquium” is a knowledge platform and network for exchange and discourse of cutting-edge technological and economic topics. Scientific questions, such as the human-machine interaction (Cyber-Physical Systems), the influence of digitization on the finance sector, encompassing controlling as well as challenges to the topic of Industry 4.0, are just a few examples of the stimulating work presented over the last years. This event gives PhD students of the three universities TU Wien, TU Graz and the Montanuniversität

Leoben the opportunity to present their exhilarating concepts and research results of their dissertations to a broad scientific audience. The colloquium takes one day and is a possibility to expand and share the individuals’ knowledge base, and gives further opportunity to grow professional and personal networks. The direct collaboration between businesses and universities helps economic and social science to contribute to the competence development of technicians and related disciplines.



Projects & References

➤ BWL, TU Graz

CARBAFIN – Carbohydrate-based fine chemicals (EU-Project)

Based on integrated biocatalytic production technology, CARBAFIN will develop a radically new value chain for the utilization of surplus sucrose, estimated to exceed 300 kilotons/year as of 2019, from sugar beet biomass in the EU. Leading platform technologies in biocatalytic cell factories and downstream processing, conjointly optimized in CARBAFIN for performance efficiency and cost-effectiveness under full integration of LCA and economic evaluation, are key to making industrial co-production of glycosides and HMF via fructose competitive in today's markets (≤ 5 € production costs/kg).

PERISCOPE – Purchasing Education and Research with an Innovative Sustainability Scope (EU-Project)

In a previous Erasmus+ strategic partnership project we empirically identified the skills required for successful purchasers and developed a curriculum and a MOOC for teaching them (project-perfect.eu). The PERISCOPE project aims to prepare students in acquiring future PSM skills and key competencies towards innovative and sustainability solutions.

➤ UFO, TU Graz

Entrepreneurial accelerator “Gründungs-garage” as a support for start-ups

The Institute of General Management and Organisation aims to support the entrepreneurial spirit in the minds and hearts of students and staff. As an official cooperation partner of the start-up accelerator “Gründungsgarage”, the Institute is a highly appreciated contact point for students and academic staff who are willing to start their own business and wish to transform their own business ideas into viable business models.

New generation of stainless steel powder for enhanced additive manufacturing process

The Institute of General Management and Organisation is partner to an FFG Spin-Off Fellowship project in the field of additive manufacturing. A newly developed steel powder for use in a selective laser melting process is intended to significantly reduce the support elements of printed components during the printing process, thus reducing production time. To enter the fast-growing market of additive manufacturing, a suitable business model is required, which is being developed in cooperation with the Institute.

Technology study – Investigation of distributed generation plants and appropriate business models – Energie Steiermark

In addition to identifying and analyzing decentralized technologies for energy generation, the technological possibilities of decentralized energy generation were examined with regard to their economic feasibility. In addition, sustainable business models centered around the technology were developed. In a structured approach, existing business models were analyzed and sustainable business models developed and evaluated.

➤ MBI, TU Graz

Smart Maintenance

TPM4.0 is a data-based, predictive maintenance concept to enhance machine utilization and optimize resource allocation. TPM4.0 is based on standardized, transparent processes and integrates innovative information and communication technologies, in respect of the Internet of things philosophy.

INDUSTRY PROJECT

Modular Agile Production – Conceptual Model

Classical production systems and strategies have reached their limit in terms of producibility. The increasing diversity and dynamics of products prevent the utilization of the potential of rigid production lines (e.g. discrete manufacturing). To address these challenges a shift towards a modularization of the conceptual design and definition of versatile production systems is needed.

INDUSTRY PROJECT

CAMed – Clinical Additive Manufacturing for Medical Applications

The goal of the project is to establish and optimize procedures that will allow additive manufacturing of implants and other medical devices, directly in the clinic and optimally close to, or during surgeries. Therefore, it is required to develop manufacturing and business processes that can be implemented for different clinical applications as well as for various additive manufacturing technologies.

➤ IIM, TU Graz

Maker, Industry & Research

Developing strategies and methods to enable and enforce the cooperation of makers, industry and research for excellent product development. To do so, a Makerspace, the new Schumpeter Laboratory for Innovation was planned, built, and put into service in November 2018.

EnableMe 50+

The project aims to close the gap deriving from demographic change by addressing the specific needs of elderly workers. This is done by taking into account the three relevant dimensions of technology (digitalization, organization and humans).

Agile Factory Planning

Enabling factory planning taking into account the configuration and coordination of the internal production network in order to obtain a more robust and agile overall system – both at factory and production network level – to cope with future uncertainties.



➤ IMW, TU Wien

Modeling and Simulation for Planning and Optimization in Digital Production Networks

The aim of the project includes the improvement of medium and long-term capacity planning in the network of manufacturing companies. This goal could be achieved by using simulation methods (discrete event-oriented and agent-based). Another important focus is on the identification of relevant parameters and levers that have a significant impact on network capacity. In particular, the trade-off for investment needs is examined. It is also necessary to examine measures in the network which would allow for capacity expansions and keep investment costs low. An important key figure that can be used for this is the Overall Equipment Effectiveness (OEE), which serves as the starting point for the measurability of the available capacity.

INCOMSMEs

Increase the competitiveness of domestic SMEs to improve their cooperation with companies from foreign investors.

Work-Life-Balance 4.0

This joint project together with Vienna International Airport is about supporting people to better manage their work-life-balance with the help of a smartphone application.

INSOR – Integrative Social Robotics

In this collaborative research project with the University of Aarhus we are investigating the use of humanoid robots in conflict resolution and mediation.

ERM-Maturity Assessment (Funk Stiftung)

Web-based tool for assessing and monitoring the maturity level of the enterprise risk management system's implementation in enterprises.

Statistical Default Study (Creditreform)

Measuring default rates of Austrian enterprises in different industries and regions and their developments over time.

Capital Market Study (Spängler IQAM Invest GmbH)

Development of applicable asset and risk management strategies.

CoMeMak – Cobot Meets Makerspace

In the project “CoMeMak – Cobot Meets Makerspace: Democratization of Collaborative Robot Technology in Public Workshops” (funded by the FFG) we are researching problems in the area of intuitive robot programming, robot safety and the knowledge gained from the use of robots in makerspaces and industrial fablabs.

DigiBack

In the project DigiBack – Digital Assistance System for the production of bakery products with a wide range of variants (funded by the Vienna Business Agency), we are developing a digital assistance system to reduce material waste in the production of bakery products together with STRÖCK-BIO-BROT Produktions GmbH.

TÜV Austria #SafeSecLab

In the #SafeSecLab (funded by TÜV Austria) we are researching solutions for future questions of industrial safety (safety and security) in the context of intelligently networked production systems together with colleagues

from the faculties of computer science, electrical engineering and information technology at TU Wien.

➤ **WBW,**
Montanuniversität Leoben

Smart Maintenance (Siemens Mobility GmbH)

Reorganization of maintenance and further development towards Lean Smart Maintenance. Introduction of a new IT system and joint development, implementation and improvement of software modules. Special focus on criticality and weak point analysis.

Data-based weak point analysis (Egger Holzwerkstoffe GmbH)

Development of the procedural methodology of the application of a data-based weak point analysis. Selection of data mining methods and use cases (descriptive/diagnostic/predictive/pre-scriptive) based on the maturity level of the data quality.

EnEffGieß – Evaluation of energy efficient, sustainable foundry products (WKO)

Development of a life cycle-oriented approach for the evaluation of energy efficient, sustainable foundry products with a process model, which integrates technical, economic and ecological methods, and evaluation procedures in order to identify the most promising energy efficiency potentials at product level. A practicable application tool “Quick Check Tool” was developed, which supports the decision-making process regarding strategic and operative measures for increasing energy efficiency. In addition, Life Cycle Assessments for two representative foundry productions and material flow cost accounting for the monetary evaluation of energy and material flows and losses were carried out within the scope of the project.

“Underground Sun Storage” – Life Cycle Assessment (FFG)

Investigation into the behavior of hydrogen admixtures in pore storage systems, demonstration of the storage capacity of renewable energy based on synthetic gases, and the identification of sustainable forms of use of natural reservoirs. The Chair WBW has conducted a comprehensive risk analysis for the joint storage and withdrawal of methane and hydrogen, as well as a life cycle analysis for different business models of hydrogen storage (power-to-gas). The results obtained serve as a basis for future research projects in the field of this future-oriented form of energy production and storage.

➤ **IL,**
Montanuniversität Leoben

SME4.0 (Horizon 2020)

In an international cooperation with eight universities and enterprises we investigate SME-specific solutions for digitalization in the research fields “Smart Production”, “Smart Logistics” and “Organization and Management Models”.

KOMOLAS (FFG)

This project develops models for a cooperative and modular usage of load carriers in the field of industrial logistics, as a first step towards the Physical Internet. Furthermore, the research team is conceptualizing a roadmap for the systematic development of cooperative transport networks.

RedPILOT (FFG)

This project evaluates bottleneck strategies as well as methods for system modeling of warehouse systems for a holistic optimization approach.

Cooperation with more than 70 Universities and Research Institutes

SELECTION, SINCE 2015

Aalto University	Fraunhofer Austria	Medizinische Universität Graz	TU Braunschweig	University of Ghent
Aarhus University	Friedrich-Alexander-Universität Erlangen-Nürnberg	MedUni Wien	TU Darmstadt	University of Latvia, Latvia
AIT Austrian Institute of Technology GmbH	High-level Expert Group on Artificial Intelligence of the European Commission	Österreichischer Rat für Robotik und Künstliche Intelligenz	TU München	University of Lincoln
Chalmers University of Technology	JOANNEUM RESEARCH Forschungsgesellschaft mbH	Otto-von-Guericke-Universität Magdeburg	Tufts School of Arts & Sciences	University of Maribor
Chiang Mai University, Thailand	Johannes Kepler Universität Linz	Oxford University	Universidad de Ibagué, Columbia	University of Michigan
Copenhagen Business School, CBS	Karl-Franzens-Universität Graz	Pace University, New York City	Universität Innsbruck	University of Mostar
Czech TU	Kopenhagen Business School	Public Safety Communication Europe (PSCE), Forum AISBL	Universität St. Gallen	University of Patras
Deutsches Zentrum für Luft- und Raumfahrt e. V. German Aerospace Center	KU Leuven	Riga Technical University, Latvia	Universität Stuttgart	University of Skövde
Ecole Supérieure de Commerce Audencia Nantes	Massachusetts Institute of Technology, USA	SACS MAVMM, School of Engineering, India	Universität Wien	University of Split
École Supérieure des Sciences Commerciales d'Angers, ESSCA	Max-Planck-Institut	Stanford University	Université Saint-Louis – Bruxelles	University of Sussex
ETH Zürich	MDW Universität für Musik und darstellende Kunst Wien	Technical University of Košice, Slovakia	Universiteit Twente	University of Tartu
FAU Erlangen-Nürnberg		Technische Universität Clausthal	University of Antwerp	Worcester Polytechnic Institute, USA
			University of Auckland	
			University of Bolzano	
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KRAIBURG
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und Wärme aus
Biomasse GmbH

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Austria GmbH

MAN Truck
& Bus SE

Miba AG

Münze
Österreich AG

NXP
Semiconductors
Austria GmbH

ÖBB

OMV AG

Österreichische
Post AG

Ottakringer
Brauerei GmbH

Palfinger AG

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Rosendahl
Nextrom GmbH

Roto Frank AG

Saubermacher
Dienstleistungs
AG

SEAT S.A.

Sebring
Technology GmbH

Siemens AG

SKIDATA AG

SSI Schäfer
Automation
GmbH

Stahl
Judenburg
GmbH

STRÖCK
BIO-BROT
Produktions
GmbH

Styria Media
Group AG

TGW Systems
Integration
GmbH

thyssenkrupp
Aufzüge GmbH

thyssenkrupp
Steel Europe AG

Trotec Laser
GmbH

VENTREX
Automotive
GmbH

Vienna Airport
Technik GmbH

Virtual Vehicle
Research GmbH

voestalpine AG

Voith GmbH
& Co. KGaA

Volkswagen AG

Wacker Neuson
Linz GmbH

Zellstoff
Pöls AG

ZF Friedrichs-
hafen AG

Facilities & laboratories

➤ MBI, TU Graz

Operations Research & Management Science Lab

Operations Research & Management Science enables optimal decisions based on quantitative models and algorithms in a vast field of application areas, such as transportation, production, health care and many more. In our lab, we develop decision support systems like simulation and optimization models for industry partners in order to help them make the most efficient use of their resources and optimize their operations.



➤ MBI, TU Graz

Human-Centered Service Design and Engineering Lab

The embedding of new technologies into socio-technical systems such as medical, or industrial production environments requires a holistic view that includes social, technical, legal, environmental, and economic aspects. In our Human-Centered Systems Design and Engineering Lab, we collaborate with industry and research partners to support them in sensing and seizing digital innovation opportunities for novel information systems.

Schumpeter Laboratory for Innovation

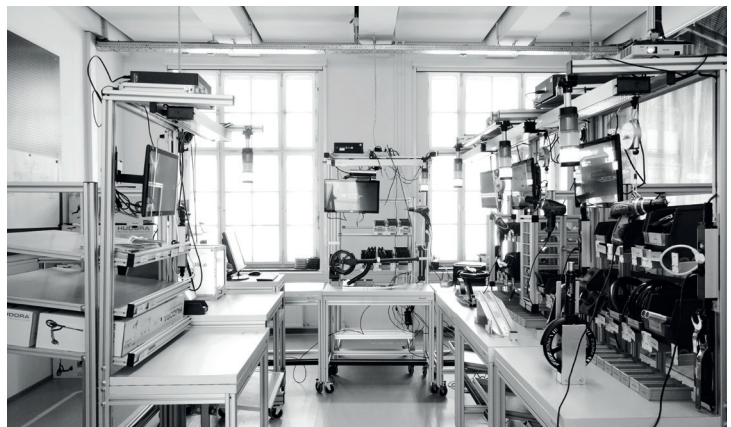
The Schumpeter Laboratory for Innovation is a place for learning, exchanging ideas, and prototyping, to foster product creation. Students (Maker), people from start-ups, SMEs and established companies (Industry) and staff from University (Research) are using high-tech

infrastructure like digital production machines, multimedia and communication systems. The result of this cooperation is product development and business model development in the best possible way involving Maker, Industry and Research.



LEAD Factory

Efficient work involves employing the right methods whether on a small or large scale. The focus of capability building in the LEAD Factory is Lean Production, Energy Efficiency, Agility and Digitalization. The learning factory is an industrial manufacturing site containing an assembly line of a market available scooter.



Business Model Lab



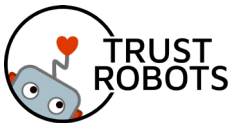
In our “Business Model Lab” we work together with companies on issues around the topic of business models. We contribute our expertise in the form of know-how transfer, tailored workshops, as well as support of student projects. The lab is located at the Institute of General Management and Organisation at TU Graz.

The Business Model Lab addresses CEOs, managers, interdisciplinary teams, project groups and entrepreneurs facing the challenge of having to develop new, sometimes disruptive, business models, or to question the status quo of the existing business model, and develop innovative solutions.

Living Lab Trust Robots



In the interdisciplinary doctoral college “Trust in Robots – Trusting Robots” a total of 12 doctoral students from various scientific disciplines analyze the role trust in the context of robots and autonomous systems.



Pilot Factory Industry 4.0

In the future, the production of industrial goods will work in a completely different way than before. In the pilot factory at the TU Wien, research is being conducted into how intelligent production can be achieved using the latest technologies and organizational concepts. Manufacturing products today is more than just setting up a machine and pressing the button. Industrial production is becoming increasingly complex and networked. In the future, it will no longer be possible to view individual production steps separately from each other. All areas of production will be networked

and coordinated with each other using information technology. The TU Wien is now taking an important step into the new age of production – in the pilot factory of the TU Wien, research and testing is being carried out into what the industry of tomorrow should look like. In the future, intelligent IT systems will ensure that different machines are optimally coordinated and react to each other – in this context, one often speaks of “Industry 4.0” or “Smart Production” based on the “Internet of Things” or cyber-physical systems. It should be possible to avoid idle running, for example, due to the non-availability

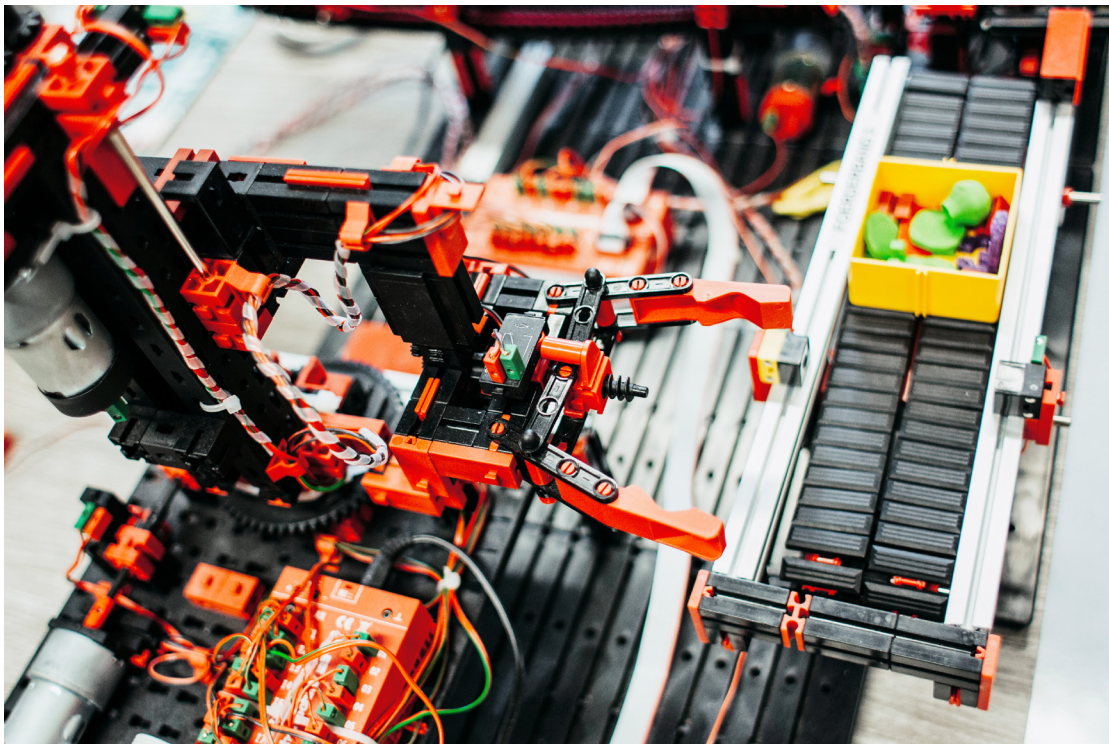
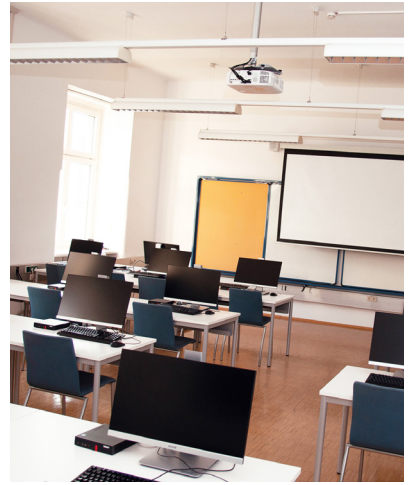
of required components, or storage costs incurred by over-production in one work step, and the system should react intelligently to failures. The planning is not to be carried out by people at a central control point, but is to be significantly supported by communication between individual “intelligent” devices. The supplier industry and sales can also be integrated into the overall system. This brings many advantages: Production will be faster, cheaper, and more energy-efficient, and it will also be possible to respond to individual customer wishes much better than before.



PC laboratory

The Chair WBW has a PC laboratory, which was renovated and equipped with the latest technology in the academic year 2018/19. In total, it contains 18 PCs for students and a lecturer PC. The latest software is used for teaching in the areas of ERP (Enterprise Resource Planning), data analysis, sustainability and resource efficiency. Our

state-of-the-art equipment includes a projector, whiteboards and pin boards to create an ideal teaching environment. In addition, the PC lab has a moderation area, complete with a widescreen monitor. This area is used intensively for further training, allowing interactive exercises and examples to be carried out easily, quickly and practically.



logiLab

Logistics laboratory “logiLab”: The learning, teaching and research laboratory was opened in 2016. Since then, “logiLab” has been a testbed to simulate logistics systems and processes (warehousing and picking) in a real-world environment to test

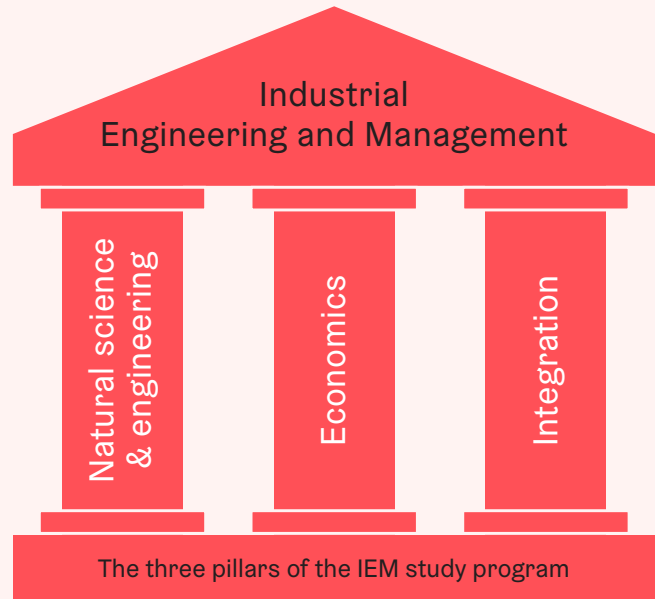
and continuously improve new logistics technologies. The continuous transfer of knowledge from application-oriented research to teaching also helps students to develop real-time solutions within a logistics system.

IEM program

The Industrial Engineering & Management study program*

The study program Industrial Engineering and Management (IEM), in German “Wirtschaftsingenieurwesen”, is based on a content-related combination of economics and technology. The program imparts knowledge of engineering sciences, natural sciences, information technology, economics, law and social sciences along with providing soft skills such as teamwork, international and intercultural competency, presentation techniques, communication skills as well as negotiation and conflict resolution.

The IEM study program comprises three interdisciplinary subject areas: Natural science & engineering, Economics and Integration. In terms of scope, an IEM study program includes at least 50% technical and scientific courses, at least 20% economic courses and at least 10% integrative courses.



Skills Profile of Industrial Engineers*

Industrial engineers have the innovative potential of recognizing current developments in technology and management, taking entrepreneurial steps, developing appropriate sustainable technical and economic solutions and implementing them in a highly networked, digitized environment. A prerequisite for the successful implementation of innovative technologies and solutions on the market is professional competence, which includes specialist, methodical and social skills.

Due to their integrative, interdisciplinary competence, graduates of Industrial Engineering and Management are particularly qualified for managerial positions and tasks.

*cf. “Qualifikationsrahmen Wirtschaftsingenieurwesen, Stuttgart 2019” (Qualifications Framework Industrial Engineering) and “Wirtschaftsingenieurwesen-Berufsbildstudie, Graz 2018” (Industrial Engineering – A Vocational Study)

WING –
academic
programs

Bachelor

Master

Montan-
universität
Leoben

➤ Industrial Logistics
Industrielogistik

➤ Industrial Logistics
Industrielogistik

➤ Industrial Energy Technology
Industrielle Energietechnik

➤ Industrial Energy Technology
Industrielle Energietechnik

➤ Industrial Management and
Business Administration

TU Graz

➤ Mechanical Engineering
and Business Economics
Wirtschaftsingenieurwesen –
Maschinenbau

➤ Mechanical Engineering
and Business Economics
Wirtschaftsingenieurwesen –
Maschinenbau

➤ Civil Engineering and
Construction Management
Bauingenieurwissenschaften
und Wirtschaftsingenieur-
wissenschaften

➤ Production Science
and Management

➤ Construction Management
and Civil Engineering
Wirtschaftsingenieurwesen –
Bauwesen

➤ Software Engineering
and Management
Softwareentwicklung –
Wirtschaft

➤ Software Engineering
and Management

➤ Electrical Engineering
and Business
Elektrotechnik – Wirtschaft

TU Wien

➤ Business Informatics
Wirtschaftsinformatik

➤ Business Informatics
Wirtschaftsinformatik

➤ Mechanical Engineering –
Management
Wirtschaftsingenieurwesen –
Maschinenbau

➤ Mechanical Engineering –
Management
Wirtschaftsingenieurwesen –
Maschinenbau

➤ Data Science

Purpose

WING was founded in 1964 to support Industrial Engineering and Management (IEM)-students (WING.net) and IEM-Alumni (WING) in their professional careers and interests.

Key activities

- transfer of professional knowledge e.g. Journal WING business, WING-Conference
- brand management of the trademark “Wirtschaftsingenieure”
- protection of the distinctive profile of WING-professionals
- job profile surveys to assure the quality of study-programs
- supporting and consultation HEIs in configurational IEM-study-programs
- promote networking between WING and employers to foster employability of IEMs (WINGS)
- International cooperation to strengthen the European Higher Education Area

WING International

Corporation in the German speaking HEI-Area (DACH-Region) with the “Verband Deutscher Wirtschaftsingenieure” (vwi.org) and the “Vereinigung Wirtschaftsingenieure Schweiz” (vwischweiz.ch) in questions of trademark, branding, profile formation, job profile formation, etc.

In addition WING and WINGnet are members of the International Community of European Professors of Industrial Engineering and Management (EPIEM) and of European Students of IEM (ESTIEM), established in HEIs in 28 European Countries.



Contact

WING – Österreichischer Verband der Wirtschaftsingenieure

➔ wing-online.at

Three Austrian Universities of Technology One Force — United Through Excellence



IMW
**Labor Science
and Organization**
Arbeitswissenschaft
und Organisation

IMW
**Industrial, System
Engineering and
Facility Management**
Betriebstechnik
und Systemplanung

IMW
**Accounting, Finance and
Management Control**
Finanzwirtschaft
und Controlling

IMW
**Human Centered
Cyber Physical
Production and
Assembly Systems**
Mensch-Maschine-
Interaktion

MBI
**Institute of
Engineering and
Business Informatics**
Institut für
Maschinenbau- und
Betriebsinformatik

IIM
**Institute of Innovation and
Industrial Management**
Institut für Innovation und
Industrie Management

BWL
**Institute of Economics
and Industrial Sociology**
Institut für Betriebs-
wirtschaftslehre und
Betriebssoziologie

UFO
**Institute of
General Management
and Organization**
Institut für Unter-
nehmensführung
und Organisation

TU Wien

Institute of Management Science



TU Graz

Labor Science and Organization

Institute of Management Science

Sabine Theresia Kösze

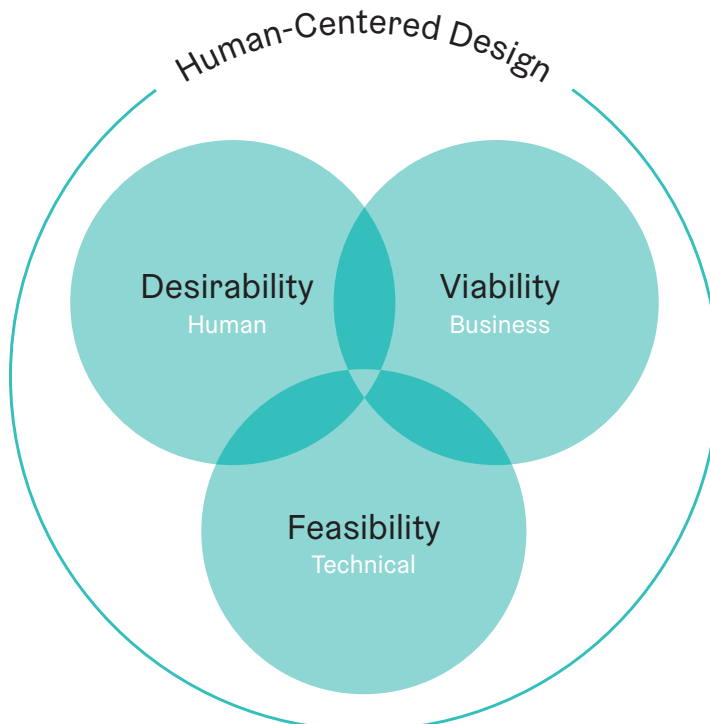


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IMW We are a group of interdisciplinary researchers dedicated to the mission of developing technologies to enable healthy living, working and ageing. Applying a human-centered research design, we put individual and societal well-being into the focus in our teaching and research, acknowledging diversity and human dignity.

TEACHING Education is key to developing talents in industry and society. Our (future) workforce not only requires strong technical skills but also skills that are complementary to technical systems such as problem solving, critical and analytical thinking, management, as well as social and personal competences. Teaching these skills is part of our mission at the Department of Labor Science and Organization.

RESEARCH The research focus of the Department Labor Science and Organization at the Institute of Management Science is at the interface between technology and people. Following the mission of TU Wien: "Technology for People", we commit ourselves to research in science and technology that delivers not only a direct value to society but is also dedicated to the well-being of people. Inspired by the European Research Agenda Horizon 2020, our goal is to contribute to a diverse and integrated society with our research projects in areas such as Robotics & AI, New World of Work, or Innovation Systems.



Industrial, System Engineering and Facility Management

Institute of Management Science

Univ.-Prof. Prof. eh. Dipl.-Wirtsch.-Ing.
Dr. h.c. Dr.-Ing.

Wilfried
Sihn



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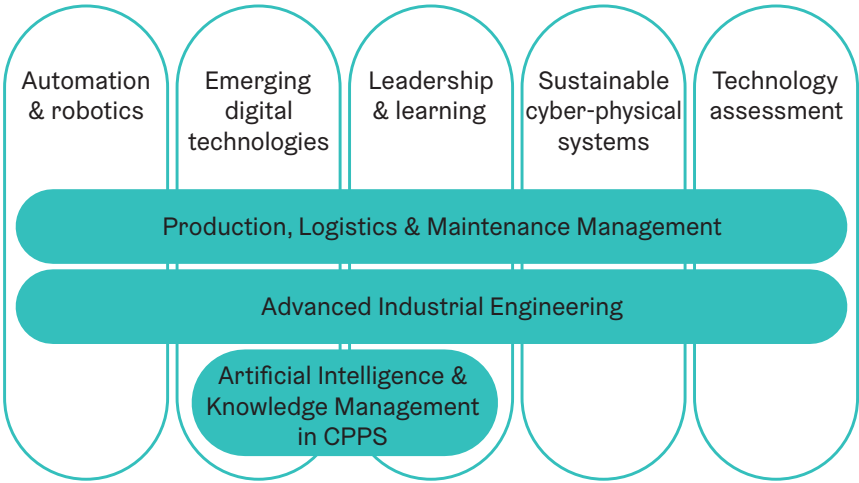


IMW The *Research Group of Smart and Knowledge-Based Maintenance* is aimed at conducting basic and applied-oriented research towards bridging the gap between basic scientific findings and their practical application in *predictive and prescriptive maintenance*, and in a wider scope, health management of physical assets.

TEACHING Fundamental and basic research on future-oriented maintenance strategies and models inspired by the scientific trends on cyber physical production systems (CPPS), AI, semantic technology, Natural Language Processing as well as new learning paradigms and task divisions in human-centered CPPS. Applied-oriented research on maintenance analytics (predictive/prescriptive maintenance) and human-oriented maintenance inspired by emerging industrial trends, namely “Digital Transformation”, “Industry 4.0” and “Biological transformation in Manufacturing”. Practice-based research on maintenance professions from the angle of lifelong learning (LLL), in particular workplace learning and vocational education, and training.

RESEARCH Implementation and development of new teaching methods in basic and advanced courses. The field of teaching intends to coordinate and process the 47 courses, fully execute 13 courses and takes part in various projects appropriate to the subject areas.

Clustertopics



Research Themes

Accounting, Finance and Management Control

Institute of Management Science

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MBA



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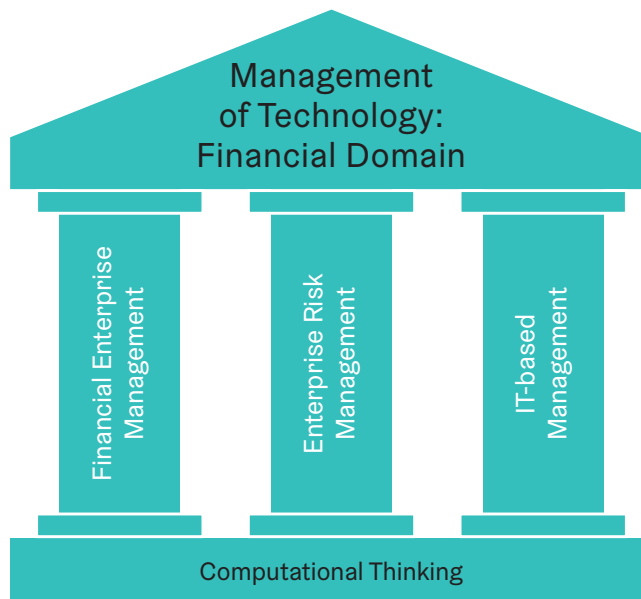


IMW The “Accounting, Finance and Management Control” research group covers the financial domain in the field of “Management of Technology”. Based upon the requirements of the International Financial Reporting Standards (IFRS) we are developing performance management, planning (including forecasting and budgeting) and control systems. Furthermore we are developing financing and investment decision support systems that are empirically validated by capital market studies.

TEACHING We teach the core topics from accounting, finance and management control in undergraduate and graduate study programs, applying the research-driven teaching approach.

RESEARCH In order to ensure effectiveness, efficiency, and financial sustainability, we contribute to three research fields:

- In “Financial Enterprise Management” we build IFRS-compliant planning and control systems as well as financing and investment decision support systems.
- In “Enterprise Risk Management” we integrate risk considerations into the planning and control systems at the operational, business and strategic management level.
- In “IT-based Management” we conceptualize accounting and management information systems and implement them prototypically.



Human Centered Cyber Physical Production and Assembly Systems

Institute of Management Science

Sebastian Schlund



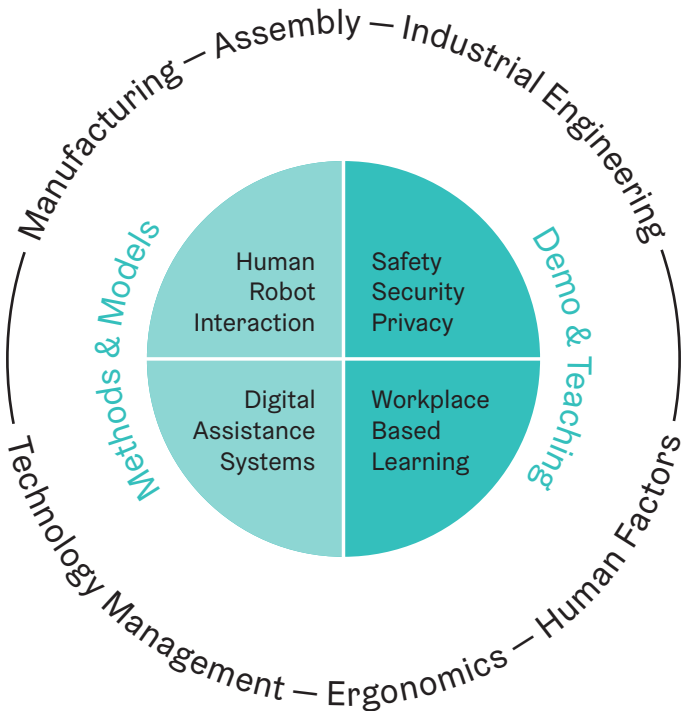
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IMW We are an interdisciplinary team with the shared goal to design and utilize manufacturing technologies to improve productivity and working conditions. Our research is driven by the vision to create assistance systems for manufacturing and assembly. That takes into account individual preferences, contextual information and tacit knowledge to foster competence development and learning with assistance systems that are integrated seamlessly and intuitively within work processes and organizations.

TEACHING We teach ergonomics, project and process management for engineering students with special emphasis on industrial engineering. Within the Master’s curricula we offer manufacturing-specific courses such as ‘assistance systems in manufacturing’, ‘assembly’ and ‘advanced manufacturing’. Our teaching is based on a constructivist approach, combining lectures with hands-on exercises and practical projects in the pilot factory of the TU Wien.

RESEARCH Our fundamental research goal is to design, develop and evaluate assistance systems for manufacturing. We strive for solutions that best fit technological, human and organizational needs. Our research agenda covers digital and physical assistance systems, reciprocal learning between humans and machines, individualizability and context-awareness with safety, security and privacy issues, and human-robot-partnership.



Institute of Engineering and Business Informatics

Siegfried Vössner



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MBI The Institute of Engineering and Business Informatics has a thematic focus on business informatics and quantitative methods within the techno-economic institutes of the TU Graz. This includes modeling, design and optimization processes as well as the design of the associated information systems and services.

TEACHING We teach courses in the fields of Business Informatics, Systems Engineering, and Operations Research and enable students to apply their gained knowledge in various application domains, such as industrial engineering.

RESEARCH At the center of our approach are people and their interaction with the environment, technology and economy. For these socio-technical systems, we design human-centered information-based solutions using scientific tools and process models. In this way, we contribute to the techno-economic basic research and method development, and to a positive development of business and society.

Modeling,
Simulation &
Optimization

- Conceptual Models
- Statistic analysis
- Situation-based optimization
- Mathematical modeling
- Agent-based / Discrete Event Simulation
- System Dynamics & Business Simulation



- Human Centered Computing
- Requirements Engineering
- Design Thinking
- Business Informatics
- Technology Acceptance
- Value Network Analysis



IT Service
Design & System
Architecture

- Forecasting Techniques
- Operations Management
- Predictive Analytics / Machine learning



Decision
Support
Systems

- System Identification
- System Analysis
- Socio Economic Systems



System
Engineering

Institute of Innovation and Industrial Management

Christian Ramsauer

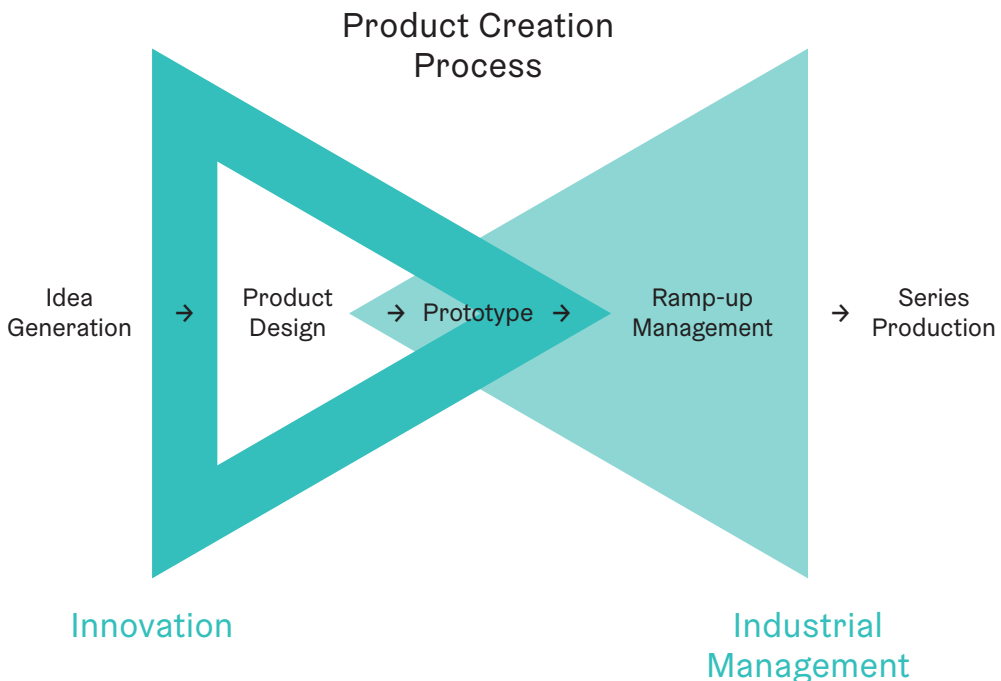


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IIM Our team is passionate for teaching and research. We offer 35 courses mainly in English language, are part of an international research community and strive for excellence in two working groups: Innovation and Industrial Management. In research we cooperate closely with industry, from where the majority of external funding comes.

TEACHING We focus on what customers value the most: *The product*. From idea generation to product design and rapid prototyping – factory planning and ramp-up management to series production of the product. This is the main content of our courses in different study programs. We teach Harvard case studies in our “Harvard seminar room” and promote participant centered learning.

RESEARCH Product design and maker movement, agility and digitization drive our research projects. We work closely with leading research institutes around the world. The working group “Innovation” operates the “Schumpeter Laboratory for Innovation” including the FabLab. The working group “Industrial Management” runs the “LEAD Factory” – a learning factory focusing on Lean, Energy efficiency, Agility and Digitalization. We offer various cooperation models for industrial companies across different industries.



Institute of Business Economics and Industrial Sociology

Ulrich
Bauer

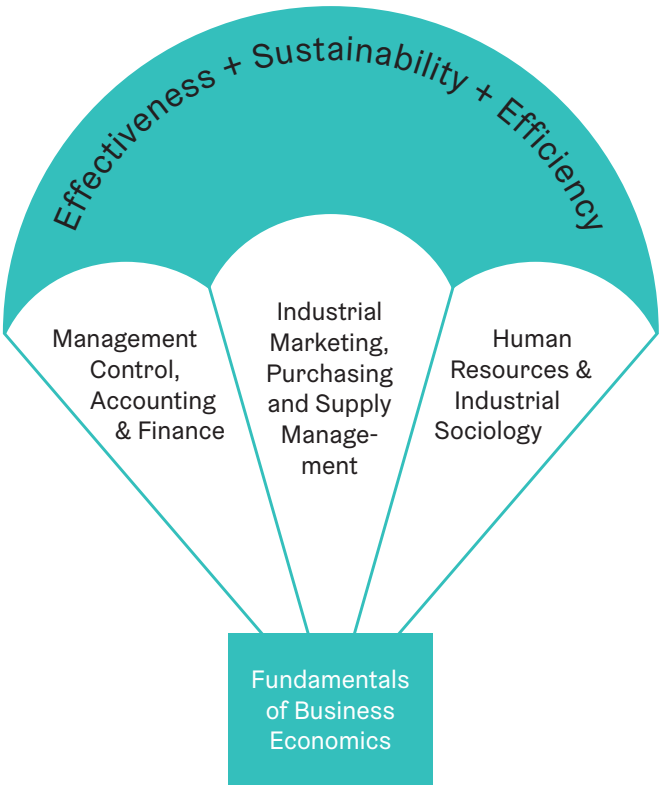


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BWL The Institute of Business Economics and Industrial Sociology at TU Graz is a multi- and interdisciplinary unit in the field of “Management of Technology”. Within the context of decision-based business management, our focus is on a sustainable description and configuration of techno- and socio-economic systems at corporate level.

TEACHING We teach business management principles for all engineering management degrees, but also for students of other technical degree programs as the basis for life-long learning and sustainable economic thought and action. We offer advanced courses in “Management Control, Accounting and Finance”, “Industrial Marketing, Purchasing and Supply Management” and “Human Resource Management and Industrial Sociology” to enable students to specialize depending on their particular interests.

RESEARCH Our research activities also focus on these three main topics, ranging from international research projects and dissertations to master’s thesis projects with companies. The research findings are made available to the public in scientific publications and events.



Institute of General Management and Organisation

Stefan
Vorbach

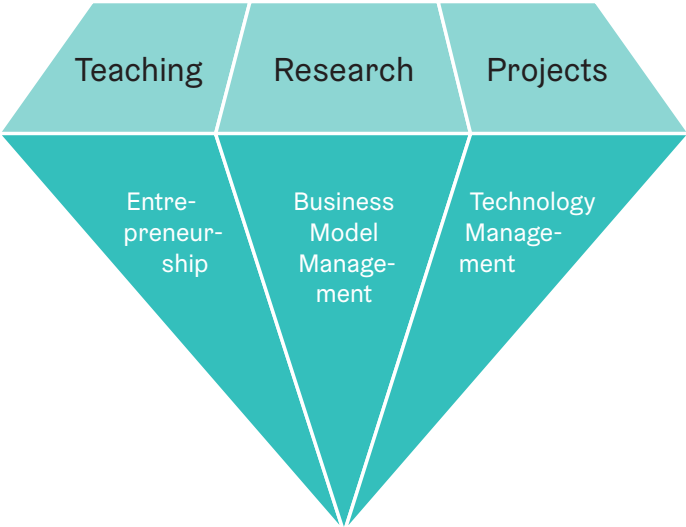


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UFO The Institute of General Management and Organisation anchors the topics of leadership and organization at the interface of technology and business, thus making an important contribution to the development and advancement of future leaders at TU Graz. We are doing research and teaching on all aspects that enable best practice management in an organization.

TEACHING We combine general management theory with industry practice. This allows us to perform high-quality training and educational programs with highly relevant content.

RESEARCH Our research activities focus on three research fields: Business Model Management, Entrepreneurship and Technology Management. With our activities we bridge the gap between industry practice and science. We collaborate with numerous industry partners in research projects, dissertations and master's thesis projects. Our scientific findings are internationally recognized in scientific publications and conferences. In addition, we use our findings to generate added value in our Business Model Lab. The Lab provides a perfect frame for companies to identify potentials and development opportunities as well as connect with students.



Chair of Economics and Business Management

Hubert Biedermann

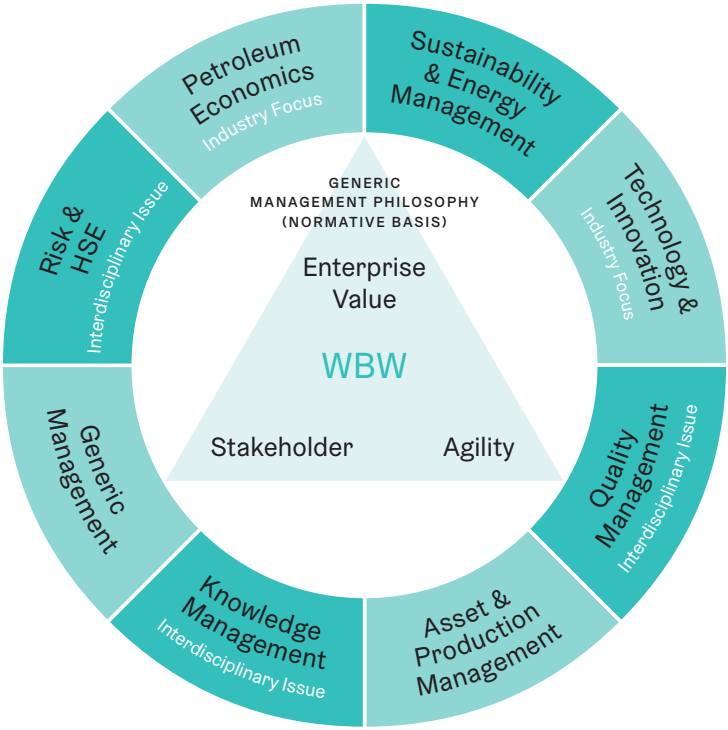


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WBW The Chair of Economics and Business Management (WBW) at Montanuniversität Leoben focuses on the solution of techno-economic problems of raw material extracting, processing, and the asset & material intensive industry. The core competencies of the WBW are asset- and production-management, sustainability and energy management, risk- and quality management, and data analytics.

TEACHING The central task of WBW is to provide students with a profound education in the field of economics and business, starting with basic instruments to comprehensive management tools. In addition to the main areas of asset-, production-, sustainability and energy management, students are empowered to apply instruments from the areas of petroleum economics, generic-, risk-, quality-, knowledge and innovation management.

RESEARCH Through numerous research and further training activities, the WBW contributes to an increase in the long-term efficiency of industrial companies. Further, the capital productivity rises through a resource-efficient operating mode, focusing on strategic objectives, quality, flexibility, cost and time. The results are presented in dissertations, scientific publications, research activities and at conferences.



Chair of Industrial Logistics

Helmut Zsifkovits

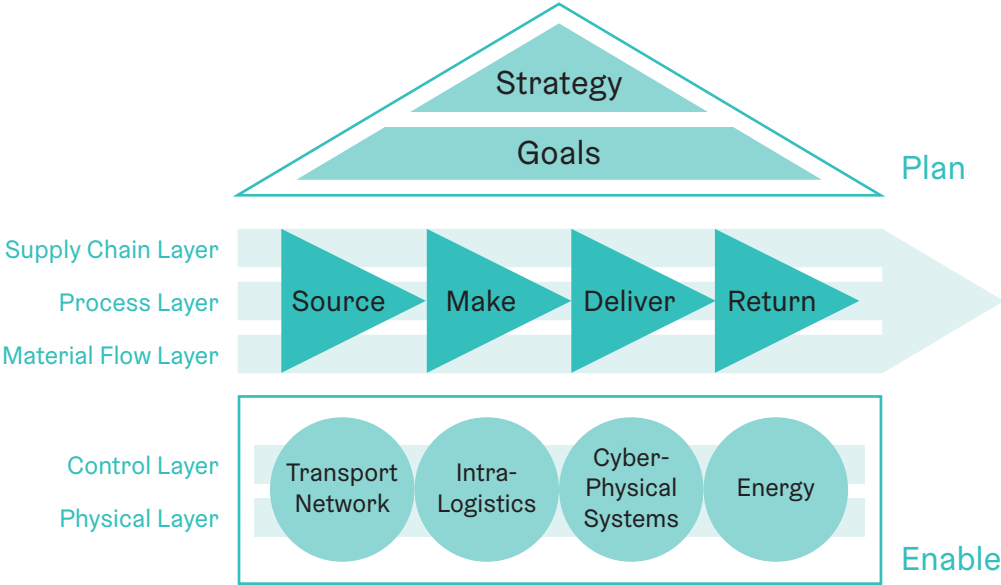


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IL The Chair of Industrial Logistics combines a technical and an economic view on logistics, with a focus on logistics systems design and engineering, material flow management and process optimization in production systems. We have developed a distinct profile in the scientific and business community, through our activities in research and industry projects.

TEACHING We integrate engineering education and education in logistics management with a high level of practical experience. Industrial Logistics provides a foundation which enables graduates to cover a broad range of job profiles in engineering and management. Four specializations are offered within the program: Logistics Management, Logistics System Engineering, Computational Optimization and Automation.

RESEARCH Our research focuses on logistics systems design and engineering, for manufacturing companies and industrial supply chains. We investigate innovative technologies in logistics and production, in order to improve traceability, material flows, flexibility, and performance.



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Institute of Management Science

➤ IMW

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TU Graz

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Montan- universität Leoben

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