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Andreas Jaeger, Ing., MSc., MBA, is researcher at Fraunhofer Austria Research and the Vienna University of Technology since 2011. He is in charge of the further development and operation of the “TU Vienna Learning & Innovation Factory for Integrative Production Education” where he holds trainings and lectures for students of the university and for employees from industry.

During his study he worked as a technical project manager in Central and Eastern Europe within a global electronic enterprise for five years. At Fraunhofer he is in charge of a long-term project focusing on the diagnostic and improvement-oriented evaluation of SMEs to initiate and accompany production optimization and innovation projects. Furthermore he contributes in an applied research project related to the human’s role in smart factories.

Fabian Ranz (ESB Reutlingen)



Fabian Ranz, M.Sc., is a research associate at ESB Business School, Reutlingen University in the field of Industrial Engineering and Logistics Planning and Design. He is responsible for the set-up of the “ESB Logistics Learning-Factory”, what includes infrastructure implementation as well as didactical design. Besides, he is coordinator for the Network of Innovative Learning Factories (NIL). Before joining ESB as a researcher, during his studies in Industrial Engineering Fabian gained experience at several multinational enterprises in engineering, logistics and strategy functions.



The Institute of Management Science, Department for Industrial Engineering and System Design at the Vienna University of Technology, in cooperation with the Fraunhofer Austria Research, Division Production and Logistics Management, and the ESB Reutlingen University, Division for Logistics Planning and Design are active in higher and advanced education in the field of industrial engineering. Both provide problem based, interactive hands-on training in their Learning Factories with the focus on Lean Management and the Product Creation Process.

Research of both institutes concentrates on the development and processing of scientific findings for practical application. Projects are dealing with the analysis, planning and optimization of the structure, organization and management of industrial and service enterprises and their logistics networks.

Fraunhofer Austria, TU Vienna and ESB Reutlingen collaborate in the European-wide applied research project “LOPEC” related to the systematic assessment of the personal excellence in lean logistics and the initiation of lifelong-learning on the shopfloor.

## INDUSTRY 4.0 – CHALLENGES FOR THE HUMAN FACTOR IN FUTURE PRODUCTION SCENARIOS

Industry 4.0 predicts that industrial processes, technological infrastructure and all corresponding business processes, with the help of information and communication technology (ICT), will advance to integrated, ad-hoc interconnected and decentralized Cyber-Physical Production Systems (CPPS) with real-time capabilities of self-optimization and adaptability.

Considering this change, the human being will remain in a dominant role, because it is not expected that the human factor with its characteristics and capabilities will be substituted entirely by autonomously acting technology in the foreseeable future. The mechanical intelligence, for instance, is limited to the selection of predefined options, while human creativity, flexibility, the ability to learn and to improve are required to design and configure systems, processes and products. Humans have the expertise and experience to analyze, assess and solve - even in exceptional situations.

However, the amount of purely manual tasks for shop floor workers will decrease. Their role will change from a manually executing to a proactive preconceiving worker with increased responsibility. Due to the growing degree of digitalization and interconnectedness, also the tasks and responsibilities for planning and design personnel will continuously expand and become more complex. The work in versatile ad-hoc networks with advanced ICT-tools and assistance systems will lead to increased requirements regarding the knowledge, capability and capacity of the respective employees. The on-going pervasion of IT and emergence of systems with unprecedented complexity specifically require significantly improved capabilities in analysis, abstraction, problem solving and decision making from future labour.

Accordingly, the industry is asking for graduates that are educated interdisciplinary and practice-oriented. Some universities already meet these expectations, using learning factories for realistic, action-oriented classes and trainings. Lecturers are confronted with the challenge to identify future job profiles and correlated qualification requirements, especially regarding the conceptualization and implementation of CPPS, and to adapt and enhance their education concepts and methods adequately and consequently. For the new, virtual world of manufacturing a proper understanding of engineering as well as computer sciences is essential. Industry 4.0 implies this interdisciplinary split. Integrated competencies for product and process planning and design, methodological competencies for systematical idea and innovation management as well as a holistic system and interface competence will be crucial to achieve interconnection of physical and digital processes and machines.

The Vienna University of Technology and the ESB Reutlingen committed to integrate key aspects of Industry 4.0 into their respective learning factories successively. Thus, the students will act as the coordinators of the CPPS and thereby remain in the center of all learning and implementation activities.

