Some format issues inherent in the e-media version may also appear in this print version.
# TABLE OF CONTENTS

## KEYNOTE

Learning Factories for Research, Education, and Training

Eberhard Abele, Joachim Metternich, Michael Tisch, George Chryssolouris, Wilfried Sihn, Hoda Elmaraghy, Vera Hummel, Fabian Ranz

## DIDACTIC APPROACHES

Competency-oriented Design of Learning Modules

J. Enke, K. Kraft, J. Metternich

Advanced Learning Factory (aLF) – Method, Implementation and Evaluation

Daniel Pflorin, David Jentsch, Hendrik Hopf, Egon Müller

Learning Integrated Product and Manufacturing Systems

Hoda Elmaraghy, Waguih Elmaraghy

Guideline-based Video Analysis of Competencies for a Target-oriented Continuous Improvement Process

J. Hambach, R. Tenberg, J. Metternich

A Two-way Knowledge Interaction in Manufacturing Education: The Teaching Factory

L. Rentzos, D. Mavrikios, G. Chryssolouris

Multimedia Support for Learning Factories

Reinhard Pittschellis

## RESOURCE EFFICIENCY AND SUSTAINABILITY

Designing Learning Environments for Energy Efficiency through Model Scale Production Processes

Alexander Kaluza, Max Juraschek, Benjamin Neef, Reinhard Pittschellis, Gerrit Posselt, Sebastian Thiede, Christoph Herrmann

Learning Factories and their Enhancements - A Comprehensive Training Concept to Increase Resource Efficiency

Björn Krückhans, Thom Wienbruch, Sebastian Freith, Henning Oberc, Dieter Kreimeier, Bernd Kahlenkötter

Concept of the Green Factory Bavaria in Augsburg


Green Factories Bavaria: A Network of Distributed Learning Factories for Energy Efficient Production

S. Kreitlein, A. Höft, S. Schwender, J. Franke

Developing a Learning Factory to Increase Resource Efficiency in Composite Manufacturing Processes

Johannes Böhmer, Max Weeber, Frank Kuebler, Rolf Steinthilper

Realization of a Learning Environment to Promote Sustainable Value Creation in Areas with Insufficient Infrastructure

Bernd Muschard, Günther Seliger

## INDUSTRY 4.0 AND CYBER-PHYSICAL SYSTEMS

Competence Development for the Holistic Design of Collaborative Work Systems in the Logistics

Vera Hummel, Kathrin Hyra, Fabian Ranz, Jan Schuhmacher

Promoting Work-based Learning through INDUSTRY 4.0

Günther Schuh, Thomas Gartzen, Timon Rodenhauser, Alexander Marks

Industry 4.0 Learning Factory for regional SMEs

Clemens Faller, Dorothee Feldmüller