

Editor-in-Chief

Kai Rannenberg, Goethe University Frankfurt, Germany

Editorial Board

TC 1 – Foundations of Computer Science

Jacques Sakarovitch, Télécom ParisTech, France

TC 2 – Software: Theory and Practice

Michael Goedicke, University of Duisburg-Essen, Germany

TC 3 – Education

Arthur Tatnall, Victoria University, Melbourne, Australia

TC 5 – Information Technology Applications

Erich J. Neuhold, University of Vienna, Austria

TC 6 – Communication Systems

Aiko Pras, University of Twente, Enschede, The Netherlands

TC 7 – System Modeling and Optimization

Fredi Tröltzsch, TU Berlin, Germany

TC 8 – Information Systems

Jan Pries-Heje, Roskilde University, Denmark

TC 9 – ICT and Society

Diane Whitehouse, The Castlegate Consultancy, Malton, UK

TC 10 – Computer Systems Technology

Ricardo Reis, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

TC 11 – Security and Privacy Protection in Information Processing Systems

Steven Furnell, Plymouth University, UK

TC 12 – Artificial Intelligence

Ulrich Furbach, University of Koblenz-Landau, Germany

TC 13 – Human-Computer Interaction

Marco Winckler, University Paul Sabatier, Toulouse, France

TC 14 – Entertainment Computing

Matthias Rauterberg, Eindhoven University of Technology, The Netherlands

IFIP – The International Federation for Information Processing

IFIP was founded in 1960 under the auspices of UNESCO, following the first World Computer Congress held in Paris the previous year. A federation for societies working in information processing, IFIP's aim is two-fold: to support information processing in the countries of its members and to encourage technology transfer to developing nations. As its mission statement clearly states:

IFIP is the global non-profit federation of societies of ICT professionals that aims at achieving a worldwide professional and socially responsible development and application of information and communication technologies.

IFIP is a non-profit-making organization, run almost solely by 2500 volunteers. It operates through a number of technical committees and working groups, which organize events and publications. IFIP's events range from large international open conferences to working conferences and local seminars.

The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is generally smaller and occasionally by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is also rigorous and papers are subjected to extensive group discussion.

Publications arising from IFIP events vary. The papers presented at the IFIP World Computer Congress and at open conferences are published as conference proceedings, while the results of the working conferences are often published as collections of selected and edited papers.

IFIP distinguishes three types of institutional membership: Country Representative Members, Members at Large, and Associate Members. The type of organization that can apply for membership is a wide variety and includes national or international societies of individual computer scientists/ICT professionals, associations or federations of such societies, government institutions/government related organizations, national or international research institutes or consortia, universities, academies of sciences, companies, national or international associations or federations of companies.

More information about this series at <http://www.springer.com/series/6102>


Hermann Lödding · Ralph Riedel
Klaus-Dieter Thoben · Gregor von Cieminski
Dimitris Kiritsis (Eds.)


Advances in Production Management Systems


The Path to Intelligent,
Collaborative and Sustainable
Manufacturing


IFIP WG 5.7 International Conference, APMS 2017
Hamburg, Germany, September 3–7, 2017
Proceedings, Part I

Editors

Hermann Lödding 
Hamburg University of Technology
Hamburg
Germany

Ralph Riedel 
Chemnitz University of Technology
Chemnitz
Germany

Klaus-Dieter Thoben 
University of Bremen and BIBA
Bremen
Germany

Gregor von Cieminski 
ZF Friedrichshafen AG
Friedrichshafen
Germany

Dimitris Kiritsis 
EPFL
Lausanne
Switzerland

ISSN 1868-4238

ISSN 1868-422X (electronic)

IFIP Advances in Information and Communication Technology

ISBN 978-3-319-66922-9

ISBN 978-3-319-66923-6 (eBook)

DOI 10.1007/978-3-319-66923-6

Library of Congress Control Number: 2017952324

© IFIP International Federation for Information Processing 2017

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature

The registered company is Springer International Publishing AG

The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

We live in exciting times. The technological revolution in information and communication technology has been going on for several decades already and there seemingly is no near end in sight. The possibilities for industrial companies are enormous, but so are the challenges.

The globalized economy has done its fair share in reducing extreme poverty levels. The United Nations report that the target of reducing extreme poverty by half was met five years ahead of the 2015 deadline: more than 1 billion people have been lifted out of extreme poverty since 1990.

The environmental burden humankind puts onto our planet is becoming bigger and bigger, threatening eco-systems and our own well-being in the future. Industrial companies are affecting, and affected by, all three environments. In fact they contribute significantly both to poverty relief by employing hundreds of millions of people but also to the ecological challenges we are confronted with by exploiting natural reserves and by their emissions to the environment.

Thus, the question of how to find the path to intelligent, collaborative and sustainable manufacturing is of eminent importance.

We invited experts, academics, researchers, and industrial practitioners from around the world to the Advances in Production Management Systems Conference 2017 in Hamburg, Germany, to contribute with ideas, concepts and theories. A large international panel of experts reviewed all the papers and selected the best to be presented and to be included in these conference proceedings.

In this collection of papers, the authors share their perspectives as well as their concepts and solutions for the challenges industrial companies are confronted with and the great opportunities new technologies, collaboration and the developments described above offer.

The chapters are organized in two parts

- Smart Manufacturing (Volume 1)
- Collaborative and Sustainable Manufacturing (Volume 2)

We hope that our readers will discover valuable new ideas and insights.

The conference was supported by the International Federation of Information Processing and was organized by the IFIP Working Group 5.7 on Advances in Production Management Systems.

We would like to thank all contributors for their research and for their willingness to share ideas and results. We are also indebted to the members of the IFIP Working Group 5.7 for their support in the review of the papers.

September 2017

Hermann Lödding
Ralph Riedel
Klaus-Dieter Thoben
Gregor von Cieminski
Dimitris Kiritsis

Organization

Conference Chairs

Hermann Lödding	Hamburg University of Technology, Germany
Ralph Riedel	Chemnitz University of Technology, Germany
Klaus-D. Thoben	University of Bremen and BIBA, Germany
Gregor von Cieminski	ZF Friedrichshafen AG, Germany

Vice-chair

Dimitris Kiritsis	EPFL, Switzerland
-------------------	-------------------

International Advisory Board

Dimitris Kiritsis	EPFL, Switzerland
Irenilza de Alencar Naas	UNIP - Paulista University, Brazil
Shigeki Umeda	Musashi University, Japan

APMS 2017 Local Organizing Committee

Axel Friedewald	Hamburg University of Technology, Germany
Robert Glöckner	Hamburg University of Technology, Germany
Kirsten Noetzel	Hamburg University of Technology, Germany
Ute Schmeller	Hamburg University of Technology, Germany
Henrik Schröder	Hamburg University of Technology, Germany

International Scientific Committee

Erlend Alfnes	NTNU, Norway
Thecle Alix	University of Bordeaux, France
Susanne Altendorfer-Kaiser	Montanuniversität Leoben, Austria
Frédérique Biennier	INSA Lyon, France
Umit S. Bititci	Heriot Watt University, UK
Magali Bosch-Mauchand	UTC, France
Luis Camarinha-Matos	NOVA University of Lisbon, Portugal
Sergio Cavalieri	University of Bergamo, Italy
Stephen Childe	Plymouth University, UK
Hyunbo Cho	Pohang University of Science & Technology, South Korea
Catherine da Cunha	Ecole Centrale de Nantes, France
Shengchun Deng	Zhejiang University of Finance and Economics, China
Mélanie Despeisse	Chalmers University of Technology, Sweden

Slavko Dolinsek	University of Ljubljana, Slovenia
Heidi Carin Dreyer	NTNU, Norway
Christos Emmanouilidis	Cranfield University, UK
Paola Fantini	Politecnico di Milano, Italy
Paolo Gaiardelli	University of Bergamo, Italy
Adriana Giret	Universidad Politecnica de Valencia, Spain
Bernard Grabot	ENIT, France
Hironori Hibino	Tokyo University of Science, Japan
Hans-Henrik Hvolby	Aalborg University, Denmark
Harinder Jagdev	NUIG, Ireland and The University of Manchester, UK
Toshiya Kaihara	Kobe University, Japan
Dimitris Kiritsis	EPFL, Switzerland
Tomasz Koch	Wroclaw University of Science and Technology, Poland
Boonserm Kulvatunyou	NIST, USA
Lenka Landryova	VSB - Technical University Ostrava, Czech Republic
Jan-Peter Lechner	FGL/USC, Germany
Ming K. Lim	Coventry University, UK
Hermann Lödding	Hamburg University of Technology, Germany
Peter Lunt	Airbus Operations Ltd., UK
Vidosav D. Majstorovich	Belgrade University, Serbia
Gökan May	Ecole Polytechnique Federale de Lausanne, Switzerland
Joao Gilberto Mendes dos Reis	Paulista University, Brazil
Kai Mertins	Knowledge Raven Management GmbH, Germany
Hajime Mizuyama	Aoyama Gakuin University, Japan
Ilkyeong Moon	Seoul National University, South Korea
Dimitris Mourtzis	University of Patras, Greece
Irenilza Alencar Nääs	Paulista University, Brazil
Masuru Nakano	Keio University Tokyo, Japan
Torbjörn Netland	ETH Zurich, Switzerland
Gilles Neubert	Emlyon Business School, France
Sang Do Noh	SKKU, South Korea
Henk-Jan Pels	Phi-kpe, Netherlands
Jin Woo Park	Seoul National University, South Korea
Fredrik Persson	Linköping University, Sweden
Selwyn Piramuthu	University of Florida, USA
Vittaldas V. Prabhu	Penn State University, USA
Ricardo José Rabelo	Federal University of Santa Catarina, Brazil
Mario Rapaccini	Università di Firenze - DIEF, Italy
Ralph Riedel	Chemnitz University of Technology, Germany
Irene Roda	Politecnico di Milano, Italy
Asbjörn Rolstadås	NTNU, Norway
David Romero	Tecnológico de Monterrey, Mexico
Christoph Roser	Karlsruhe University of Applied Sciences, Germany

Martin Rudberg	Linköping University, Sweden
Krzysztof Santarek	Warsaw University of Technology, Poland
Paul Schönsleben	ETH Zürich, Switzerland
Dan L. Shunk	Arizona State University, USA
Riitta Johanna Smeds	Aalto University, Finland
Alberto Portioli Staudacher	Politecnico di Milano, Italy
Kenn Steger-Jensen	Aalborg University, Denmark
Volker Stich	FIR an der RWTH Aachen, Germany
Richard Lee Storch	University of Washington, USA
Jan Ola Strandhagen	NTNU, Norway
Stanislaw Strzelczak	Warsaw University of Technology, Poland
Nick Szirbik	University of Groningen, Netherlands
Marco Taisch	Politecnico di Milano, Italy
Ilias Tatsiopoulos	NTU Athens, Greece
Sergio Terzi	Politecnico di Milano, Italy
Klaus-Dieter Thoben	University of Bremen/BIBA, Germany
André Thomas	University of Lorraine - CRAN, France
Jacques H. Trienekens	Wageningen University, Netherlands
Mario Tucci	University of Florence, Italy
Shigeki Umeda	Musashi University, Japan
Bruno Vallespir	University of Bordeaux, France
Agostino Villa	Politecnico di Torino, Italy
Gregor von Cieminski	ZF Friedrichshafen AG, Germany
Hans-Hermann Wiendahl	University of Stuttgart, Germany
Stefan Wiesner	BIBA, Germany
Joakim Wikner	Jönköping University, Sweden
J.C. (Hans) Wortmann	Rijksuniversiteit Groningen, Netherlands
Thorsten Wuest	West Virginia University, USA
Iveta Zolotová	Technical University Košice, Slovakia

Marco Garetti Doctoral Workshop

Chairs

Ralph Riedel	Chemnitz University of Technology, Germany
Marco Macchi	Politecnico di Milano, Italy
Torbjörn Netland	ETH Zurich, Switzerland

Academic Reviewers and Discussants

Erlend Alfnes	NTNU, Norway
Susanne Altendorfer-Kaiser	Montanuniversität Leoben, Austria
Gregor von Cieminski	ZF Friedrichshafen AG, Germany
Mélanie Despeisse	Chalmers University of Technology, Sweden
Paolo Gaiardelli	University of Bergamo, Italy

Adriana Giret Boggino	Universidad Politecnica de Valencia, Spain
Marco Macchi	Politecnico di Milano, Italy
Joao Gilberto Mendes dos Reis	Universidade Paulista, Brazil
Ralph Riedel	Chemnitz University of Technology, Germany
David Romero	Tecnológico de Monterrey, Mexico
Christoph Roser	University of Applied Sciences Karlsruhe, Germany
Torbjörn Netland	ETH Zurich, Switzerland

Sponsors for APMS 2017

IFIP WG 5.7 Advances in Production Management Systems

Contents – Part I

Smart Manufacturing System Characterization

Strategizing for Production Innovation	3
<i>David Romero, Lisa Larsson, Anna Öhrwall Rönnbäck, and Johan Stahre</i>	
A Maturity Model for Assessing the Digital Readiness of Manufacturing Companies	13
<i>Anna De Carolis, Marco Macchi, Elisa Negri, and Sergio Terzi</i>	
Improvement Strategies for Manufacturers Using the MESA MOM Capability Maturity Model	21
<i>Quanri Li, Michael Brundage, Boonserm (Serm) Kulvatunyou, Dennis Brandl, and Sang Do Noh</i>	
Auto-configurable Event-Driven Architecture for Smart Manufacturing	30
<i>Hui Cao and Xing Yang</i>	
Industry 4.0: Evolution of the Research at the APMS Conference	39
<i>Walter C. Satyro, Jose B. Sacomano, Márcia Terra da Silva, Rodrigo Franco Gonçalves, Jose Celso Contador, and Gregor von Cieminski</i>	
Production Internet - Functional Perspective	48
<i>Stanisław Strzelczak</i>	
Repair Crew Scheduling Considering Variable Disaster Aspects	57
<i>Sungwoo Kim, Youngsoo Park, Kihyun Lee, and Ilkyeong Moon</i>	

Product and Asset Life Cycle Management in Smart Factories of Industry 4.0

An Approach to Development of System Architecture in Large Collaborative Projects	67
<i>Gökan May, Dimosthenis Ioannidis, Ifigeneia N. Metaxa, Dimitrios Tzovaras, and Dimitris Kiritsis</i>	
Improved Life Cycle Management by Product Communication	76
<i>Marit Moe Bjørnbet and Kjersti Øverbø Schulte</i>	

Cross-Correlation Method for Orchestration of Preventive Maintenance Interventions	84
<i>Luca Fumagalli, Marco Macchi, Irene Roda, and Alice Giacomini</i>	
System-Oriented Reliability-Based Methodology for Optimal Joint Maintenance and Production Planning	92
<i>I. Roda, M. Macchi, C. Parmigiani, and A.A. Arata</i>	
Dispositioning Strategies of Maintenance Tasks in Offshore Wind Farms	101
<i>Felix Optehostert, Daniela Müller, and Philipp Jussen</i>	
Cyber-Physical (IIoT) Technology Deployments in Smart Manufacturing Systems	
Advances in Internet of Things (IoT) in Manufacturing	111
<i>Rakshith Badarinath and Vittaldas V. Prabhu</i>	
The Transition Towards Industry 4.0: Business Opportunities and Expected Impacts for Suppliers and Manufacturers	119
<i>Chiara Cimini, Roberto Pinto, Giuditta Pezzotta, and Paolo Gaiardelli</i>	
Exploiting Lean Benefits Through Smart Manufacturing: A Comprehensive Perspective.	127
<i>Elisa Mora, Paolo Gaiardelli, Barbara Resta, and Daryl Powell</i>	
Implementation of Industry 4.0 Technologies: What Can We Learn from the Past?	135
<i>Omid Maghazei and Torbjörn Netland</i>	
The IoT Technological Maturity Assessment Scorecard: A Case Study of Norwegian Manufacturing Companies	143
<i>Bjørn Jæger and Lise Lillebrygfeld Halse</i>	
Optimal Scheduling for Automated Guided Vehicles (AGV) in Blocking Job-Shops.	151
<i>Jens Heger and Thomas Voss</i>	
Deployment Architecture for Energy and Resource Efficient Cyber Physical Systems.	159
<i>Claudio Palasciano, Bastian Thiede, Marco Taisch, and Christoph Herrmann</i>	
Optimization of Production-Oriented Logistics Processes Through Camera-Based Identification and Localization for Cyber-Physical Systems	168
<i>Marcus Lewin, Helmut Weber, and Alexander Fay</i>	

Automaton-on-Tag: An Approach for an RFID-Driven Production Control with Mealy Machines Stored on an RFID Tag	177
<i>Timo Busert, Aljosa Köcher, Robert Julius, and Alexander Fay</i>	
The Role of ICT-Based Information Systems in Knowledge Transfer Within Multinational Companies	185
<i>Levente Szász, Maike Scherrer, Patricia Deflorin, Kozeta Sevrani, Betim Cico, Adrian Besimi, Kreshnik Vukatana, and Béla Rác</i>	
Conceptual Development Process of Mass-customizable Data Analytics Services for Manufacturing SMEs	194
<i>Hyunseop Park, Bongjun Ji, Minchul Lee, Junhyuk Choi, Jeesu Lee, Seung Hwan Bang, and Hyunbo Cho</i>	
A Thesaurus-Guided Framework for Visualization of Unstructured Manufacturing Capability Data	202
<i>Farhad Ameri and William Bernstein</i>	
Virtual Load Machine as Test Environment for Industrial Storage Applications	213
<i>Darian Andreas Schaab, Fabian Zimmermann, Sebastian Weckmann, and Alexander Sauer</i>	
The Influence of Big Data on Production and Logistics: A Theoretical Discussion	221
<i>Susanne Altendorfer-Kaiser</i>	
Multi-Disciplinary Collaboration in the Development of Smart Product-Service Solutions	
Identifying Key Aspects of Success for Product Service Systems	231
<i>Nathaniel Smith and Thorsten Wuest</i>	
Prerequisites for the Successful Launch of Enterprise Social Networks.	239
<i>Günther Schuh and Marcel Schwartz</i>	
Getting Ready for the Fourth Industrial Revolution: Innovation in Small and Medium Sized Companies	247
<i>Lise Lillebrygfeld Halse and Eli Fyhn Ullern</i>	
Effects of Environmental Dynamicity on Requirements Engineering for Complex Systems	255
<i>Stefan Wiesner, Marco Seregni, Mike Freitag, Jannicke Baalsrud Hauge, Annalaura Silvestro, and Klaus-Dieter Thoben</i>	

**Sustainable Human Integration in Cyber-Physical Systems:
The Operator 4.0**

Social Factory Architecture: Social Networking Services and Production Scenarios Through the Social Internet of Things, Services and People for the Social Operator 4.0.	265
<i>David Romero, Thorsten Wuest, Johan Stahre, and Dominic Gorecky</i>	
Impact of Technology on Work: Technical Functionalities that Give Rise to New Job Designs in Industry 4.0.	274
<i>S. Waschull, J.A.C. Bokhorst, and J.C. Wortmann</i>	
Jobs and Skills in Industry 4.0: An Exploratory Research.	282
<i>Marta Pinzone, Paola Fantini, Stefano Perini, Stefano Garavaglia, Marco Taisch, and Giovanni Miragliotta</i>	
Skills and Education for Additive Manufacturing: A Review of Emerging Issues.	289
<i>Mélanie Despeisse and Tim Minshall</i>	
The Effect of Industry 4.0 Concepts and E-learning on Manufacturing Firm Performance: Evidence from Transitional Economy	298
<i>Bojan Lalic, Vidosav Majstorovic, Ugljesa Marjanovic, Milan Delić, and Nemanja Tasic</i>	
Towards a Semantically-Enriched Framework for Human Resource Management.	306
<i>D. Arena, K. Ziazios, I.N. Metaxa, S. Parcharidis, S. Zikos, A. Tsolakis, S. Krinidis, D. Ioannidis, D. Tzovaras, and D. Kiritsis</i>	
An Ontology-Based Model for Training Evaluation and Skill Classification in an Industry 4.0 Environment.	314
<i>Stefano Perini, Damiano Arena, Dimitris Kiritsis, and Marco Taisch</i>	
Towards Industry 4.0: Increased Need for Situational Awareness on the Shop Floor.	322
<i>Marta Lall, Hans Torvatn, and Eva Amdahl Seim</i>	
Virtual Reality for the Training of Operators in Industry 4.0.	330
<i>Henrik Schroeder, Axel Friedewald, Chris Kahlefeldt, and Hermann Lödding</i>	
Productivity Strategies Using Digital Information Systems in Production Environments	338
<i>Marc-André Weber, Tim Jeske, Frank Lennings, and Sascha Stowasser</i>	

Analysis of the Potential Benefits of Digital Assembly Instructions for Single and Small Batch Production	346
<i>Günther Schuh, Bastian Franzkoch, Jan-Philipp Prote, Melanie Luckert, Frederick Sauermann, and Felix Basse</i>	
Integrated Production and Maintenance Scheduling Through Machine Monitoring and Augmented Reality: An Industry 4.0 Approach	354
<i>Dimitris Mourtzis, Ekaterini Vlachou, Vasilios Zogopoulos, and Xanthi Fotini</i>	
Recipe-Based Engineering and Operator Support for Flexible Configuration of High-Mix Assembly	363
<i>Jack P.C. Verhoosel and Michael A. van Bekkum</i>	
Evaluation of Functioning of an Innovating Enterprise Considering the Social Dimension.	372
<i>Stanisław Marciniak</i>	
Intelligent Diagnostics and Maintenance Solutions	
On the Advancement of Maintenance Management Towards Smart Maintenance in Manufacturing	383
<i>Marco Macchi, Irene Roda, and Luca Fumagalli</i>	
New Threats for Old Manufacturing Problems: Secure IoT-Enabled Monitoring of Legacy Production Machinery	391
<i>Stefano Tedeschi, Christos Emmanouilidis, Michael Farnsworth, Jörn Mehnert, and Rajkumar Roy</i>	
Condition-Based Predictive Maintenance in the Frame of Industry 4.0.	399
<i>Alexandros Bousdekis and Gregoris Mentzas</i>	
A Review of Current Machine Learning Techniques Used in Manufacturing Diagnosis	407
<i>Toyosi Toriola Ademujimi, Michael P. Brundage, and Vittaldas V. Prabhu</i>	
A Framework for Integrated Proactive Maintenance Decision Making and Supplier Selection	416
<i>Alexandros Bousdekis, Nikos Papageorgiou, Babis Magoutas, Dimitris Apostolou, and Gregoris Mentzas</i>	
Toward Semi-autonomous Information: Extraction for Unstructured Maintenance Data in Root Cause Analysis	425
<i>Michael Sharp, Thurston Sexton, and Michael P. Brundage</i>	

A Component Selection Method for Prioritized Predictive Maintenance	433
<i>Bongjun Ji, Hyunseop Park, Kiwook Jung, Seung Hwan Bang, Minchul Lee, Jeongbin Kim, and Hyunbo Cho</i>	
Collaborative Operations Using Process Alarm Monitoring.	441
<i>Patrik Urban and Lenka Landryova</i>	
Assessment of Counter-Measures for Disturbance Management in Manufacturing Environments	449
<i>Volker Stich, Moritz Schröter, Felix Jordan, Lucas Wenger, and Matthias Blum</i>	
Operations Planning, Scheduling and Control	
Solving a Discrete Lot Sizing and Scheduling Problem with Unrelated Parallel Machines and Sequence Dependent Setup Using a Generic Decision Support Tool.	459
<i>Nathalie Klement, Cristóvão Silva, and Olivier Gibaru</i>	
Decentralized Vs. Centralized Sequencing in a Complex Job-Shop Scheduling.	467
<i>Afshin Mehraei, Gonçalo Figueira, Nicolau Santos, Pedro Amorim, and Bernardo Almada-Lobo</i>	
A Dynamic Approach to Multi-stage Job Shop Scheduling in an Industry 4.0-Based Flexible Assembly System	475
<i>Dmitry Ivanov, Alexandre Dolgui, and Boris Sokolov</i>	
Genetic Algorithms with Simulation for a Job Shop Scheduling Problem with Crane Conveyance.	483
<i>Takashi Tanizaki and Hideaki Katagiri</i>	
A Proposal of Production Scheduling Method Considering Users’ Demand for Mass Customized Production	492
<i>Toshiya Kaihara, Daisuke Kokuryo, Nobutada Fujii, and Kodai Hirai</i>	
Production Capacity Pooling in Additive Manufacturing, Possibilities and Challenges	501
<i>Siavash H. Khajavi and Jan Holmström</i>	
Modeling Lateness for Workstations with Setup Cycles	509
<i>Friederike Engehausen and Hermann Lödding</i>	
A Nested Configuration of POLCA and Generic Kanban in a High Product Mix Manufacturing System	518
<i>Oladipupo Olaitan, Giuseppe Fragapane, Erlend Alfnes, and Jan Ola Strandhagen</i>	

<p>Balancing a Mixed-Model Assembly System in the Footwear Industry.</p> <p style="padding-left: 2em;"><i>Parisa Sadeghi, Rui Diogo Rebelo, and José Soeiro Ferreira</i></p>	<p>527</p>
<p>Analyzing the Impact of Different Order Policies on the Supply Chain Performance</p> <p style="padding-left: 2em;"><i>Volker Stich, Daniel Pause, and Matthias Blum</i></p>	<p>536</p>
<p>Passenger Transport Drawbacks: An Analysis of Its “Disutilities” Applying the AHP Approach in a Case Study in Tokyo, Japan.</p> <p style="padding-left: 2em;"><i>Helcio Raymundo and João Gilberto Mendes Reis</i></p>	<p>545</p>
<p>The Impact of Organizational Culture on Performance Measurement System Design, Implementation and Use: Evidence from Moroccan SMEs</p> <p style="padding-left: 2em;"><i>Meriam Jardioui, Patrizia Garengo, and Semma El Alami</i></p>	<p>553</p>
<p>Author Index</p>	<p>561</p>

Contents – Part II

Supply Chain Design

A System Maturity Model for Supply Chain Management	3
<i>Shigeki Umeda</i>	
The Link Between Supply Chain Design Decision-Making and Supply Chain Complexity: An Embedded Case Study	11
<i>Jesper Asmussen, Jesper Kristensen, and Brian Vejrum Wæhrens</i>	
Reframing the Outsourcing Process	20
<i>Børge Sjøbakk and Gaute Knutstad</i>	
A Production Transfer Risk Assessment Framework	29
<i>Maria Flavia Mogos, Børge Sjøbakk, and Erlend Alfnes</i>	
Design of Hybrid Multimodal Logistic Hub Network with Postponement Strategy	40
<i>Imane Essaadi, Bernard Grabot, and Pierre Féliès</i>	
Collaborative Process Planning on Route Market Platform	49
<i>Keisuke Beppu, Hajime Mizuyama, and Tomomi Nonaka</i>	
Continuous vs Step Change Production Process Improvement as Enablers for Product Redesign and New Market Opportunities.	57
<i>Geir Ringen and Kjersti Øverbø Schulte</i>	
Cluster Competitiveness Analysis: A Brazilian Case	65
<i>Elizangela Maria Menegassi de Lima, Isabela Romanha de Alcantara, Jose Benedito Sacomano, and Ana Paula de Lima da Silva</i>	
Goal Programming for Supply Chain Optimization with Insufficient Capacity	73
<i>Mohan Chiriki, Yooneun Lee, and Vittaladas V. Prabhu</i>	

Production Management in Food Supply Chains

Neural Network System to Forecast the Soybean Exportation on Brazilian Port of Santos.	83
<i>Emerson Rodolfo Abraham, João Gilberto Mendes dos Reis, Adriane Paulieli Colossetti, Aguinaldo Eduardo de Souza, and Rodrigo Carlo Tolo</i>	

Business Games Based on Simulation and Decision-Making in Logistics Processes	91
<i>Marco Aurelio Butzke, Anete Alberton, Jeancarlo Visentainer, Solimar Garcia, and Irenilza de Alencar Nääs</i>	
Managing Enterprise Resource System (ERP) and Balanced Scorecard (BSC) in Food Industry in Brazil - Food and Beverage Products: A Multiple Case Study	99
<i>Celso Affonso Couto, Marcos de Oliveira Morais, Antonio Sergio Brejão, Oduvaldo Vendrametto, and Pedro Luiz de Oliveira Costa Neto</i>	
Brazilian Corn Exports: An Analysis of Cargo Flow in Santos and Paranagua Port	105
<i>Aguinaldo Eduardo de Souza, João Gilberto Mendes dos Reis, Emerson Rodolfo Abraham, and Sivanilza Teixeira Machado</i>	
Inventory Allocation of Perishables: Guidelines	113
<i>Kasper Kiil, Hans-Henrik Hvolby, Heidi C. Dreyer, and Jan Ola Strandhagen</i>	
Challenges and Opportunities in ‘Last Mile’ Logistics for On-Line Food Retail.	122
<i>Jacques Trienekens, Hans-Henrik Hvolby, and Paul Turner</i>	
Replenishment Planning of Fresh Meat Products: Case Study from a Danish Wholesaler	130
<i>Flemming Max Møller Christensen, Iskra Dukovska-Popovska, and Kenn Steger-Jensen</i>	
Differentiated Demand and Supply Chain Planning of Fresh Meat Products: Linking to Animals’ Lifetime	139
<i>Flemming Max Møller Christensen, Iskra Dukovska-Popovska, and Kenn Steger-Jensen</i>	
Scheduling Fresh Food Production Networks	148
<i>Quan Yu, Taravatsadat Nehzati, Carl Philip T. Hedenstierna, and Jan Ola Strandhagen</i>	
Factory Planning	
Case Studies of Participatory Design: Comparison of Methodologies in Factory Planning	159
<i>Mandy Tawalbeh, Ralph Riedel, Samuel Horler, and Egon Müller</i>	

A Robust Facility Layout Planning Method Considering
Temporal Efficiency 168
Eiji Morinaga, Komei Iwasaki, Hidefumi Wakamatsu, and Eiji Arai

Approach for the Evaluation of Production Structures 176
Ulf Bergmann and Matthias Heinicke

An Investigation on Implemented Actions to Improve Responsiveness
in Manufacturing Firms 184
Alessia Napoleone, Marco Macchi, and Alessandro Pozzetti

Development Projects in SMEs: From Project Organization to Dynamic
Resource Planning 193
Bjørnar Henriksen, Carl Christian Røstad, and Moritz von Stietencron

Industrial and Other Services

Resource Planning for the Installation of Industrial Product
Service Systems 205
*Kosmas Alexopoulos, Spyros Koukas, Nikoletta Boli,
and Dimitris Mourtzis*

Morphology of Strategic Components for Data-Driven Industrial Services . . . 214
Günther Schuh and Dominik Kolz

Support to the Public Services Mutation Through Continuous
Improvement in a French Metropolis 222
*Gautier Aubourg, François Galasso, Bernard Grabot,
and Jacques Lamothe*

Service Innovation and Performance in Mexican Service SMEs 230
*Gonzalo Maldonado-Guzman, Jose Arturo Garza-Reyes,
Luis Rocha-Lona, and Vikas Kumar*

Operations Management in Engineer-to-Order Manufacturing

Project Execution Strategy and Planning Challenges 243
Kristina Kjersem, Gabriele H. Jünge, and Jan Emblemsvåg

A Three Steps Methodological Approach to Assess the Engineer-to-Order
Operations Environment. 251
Aldo Duchi and Paul Schönsleben

Operating Curves Based Working Capital Management for Engineer
to Order Manufacturers 259
Dennis Schiemann, Sudharshan Santhanam, and Günther Schuh

Resource and Information Sharing for the Installation Process of the Offshore Wind Energy	268
<i>Thies Beinke, Abderrahim Ait Alla, and Michael Freitag</i>	

Gamification of Complex Systems Design Development

Using a Serious Game Development Approach in the Learning Experience of System Engineering Design	279
<i>Marco Blokhuis and Nick Szirbik</i>	

A Generic Architecture for Quickly-Deployable, Flexible, Scenario-Oriented Serious Games	287
<i>Jan Willem Veenigen, Nick B. Szirbik, and Marco P. Blokhuis</i>	

Transforming a Supply Chain Towards a Digital Business Ecosystem	295
<i>Rita Lavikka, Antero Hirvensalo, Riitta Smeds, and Miia Jaatinen</i>	

Knowledge Fusion of Manufacturing Operations Data Using Representation Learning.	302
<i>Martin Ringsquandl, Steffen Lamparter, Raffaello Lepratti, and Peer Kröger</i>	

A Framework for Mathematical Analysis of Collaborative SCM in ColPMAN Game	311
<i>Tatsuki Furukawa, Tomomi Nonaka, and Hajime Mizuyama</i>	

Identifying Scenarios for Ambidextrous Learning in a Decoupling Thinking Context	320
<i>Annika Engström and Joakim Wikner</i>	

Lean and Green Manufacturing

Lean Manufacturing and Environmental Performance – Exploring the Impact and Relationship	331
<i>Simon Peter Nadeem, Jose Arturo Garza-Reyes, Sin-Ching Leung, Anass Cherrafi, Anthony I. Anosike, and Ming K. Lim</i>	

Industry 4.0 and Lean Management – Synergy or Contradiction?: A Systematic Interaction Approach to Determine the Compatibility of Industry 4.0 and Lean Management in Manufacturing Environment.	341
<i>Adam Sanders, Karthik R. K. Subramanian, Tobias Redlich, and Jens P. Wulfsberg</i>	

A Method of Multi-perspective Assessment of Lean Management.	350
<i>Andreas Mueller</i>	

Sustainability Strategies in Industrial Practice	358
<i>Silje Helene Aschehoug and Kjersti Øverbø Schulte</i>	
Introducing Buffer Management in a Manufacturing Planning and Control Framework	366
<i>Lisa Hedvall, Joakim Wikner, and Per Hilletoft</i>	
Bottleneck Prediction Using the Active Period Method in Combination with Buffer Inventories	374
<i>Christoph Roser, Kai Lorentzen, David Lenze, Jochen Deuse, Ferdinand Klenner, Ralph Richter, Jacqueline Schmitt, and Peter Willats</i>	
Relationship Between Variants and Inventory Under Consideration of the Replenishment Time.	382
<i>Christoph Roser, Hauke Meier, and Masaru Nakano</i>	
Health Impact of Electric Vehicles Considering Environmental Leakage. The Case Study on Japan, China, UK and Poland	390
<i>Kamila Romejko and Masaru Nakano</i>	
A Multi-agent Approach to Implement a Reverse Production Virtual Market in Green Supply Chains	399
<i>Adriana Giret and Miguel A. Salido</i>	
Eco-Efficiency in Manufacturing Operations	
Product Circularity Assessment Methodology	411
<i>Cecilia Maria Angioletti, Mélanie Despeisse, and Roberto Rocca</i>	
Teaching Energy Efficiency in Manufacturing Using Gamification: A Case Study	419
<i>Mélanie Despeisse and Peter Lunt</i>	
Organizational Designs for Sharing Environmental Best Practice Between Manufacturing Sites.	427
<i>Lampros Litos, Peter Lunt, Wen Liu, and Steve Evans</i>	
Simulation-Supported Verification of Methods for Controlling Disassembly Lines	435
<i>Jan Hrdina and Gert Zülch</i>	
A Novel Knowledge Repository to Support Industrial Symbiosis	443
<i>Miriam Benedetti, Maria Holgado, and Steve Evans</i>	
Ecological Footprint in the Cotton Supply Chain: The Consumers' View	452
<i>Solimar Garcia, Alexandra Cordeiro, Fernando Gorni Neto, and Irenilza de Alencar Nääs</i>	

Green Distribution – A Comparative Study of Sea and Road Transport Modes for a Norwegian Manufacturing Company	460
<i>Espen Rød and Mikhail Shlopak</i>	
From SCM to Eco-Industrial Park Management: Modelling Eco-Industrial Park's Symbiosis with the SCOR Model	467
<i>Mathilde Le Tellier, Lamia Berrah, Benoit Stutz, Simon Barnabé, and Jean-François Audy</i>	
An Integrated Supply Chain Model with Excess Heat Recovery	479
<i>Beatrice Marchi, Simone Zaroni, and Lucio Enrico Zavanella</i>	
Environmental KPI Selection Using Criteria Value and Demonstration.	488
<i>Deogratias Kibira and Shaw Feng</i>	
Simulation Method for Evaluation of Productivity and Energy Consumption Concerning Production Line for Injection Molding Machines	496
<i>Rio Takasaki, Hironori Hibino, Kazuhide Kaifuku, and Keitaro Nishitani</i>	
Author Index	505