



HAL
open science

Advances in Production Management Systems. Artificial Intelligence for Sustainable and Resilient Production Systems.

Alexandre Dolgui, Alain Bernard, David Lemoine, Gregor von Cieminski,
David Romero

► To cite this version:

Alexandre Dolgui, Alain Bernard, David Lemoine, Gregor von Cieminski, David Romero. Advances in Production Management Systems. Artificial Intelligence for Sustainable and Resilient Production Systems.: IFIP WG 5.7 International Conference, APMS 2021, Nantes, France, September 5–9, 2021, Proceedings, Part IV. IFIP Advances in Information and Communication Technology, AICT-633, Springer International Publishing, 2021, IFIP Advances in Information and Communication Technology (IFIP AICT), 978-3-030-85912-1. 10.1007/978-3-030-85910-7 . hal-03420615

HAL Id: hal-03420615

<https://hal.science/hal-03420615>

Submitted on 10 Oct 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Editor-in-Chief

Kai Rannenber, *Goethe University Frankfurt, Germany*

Editorial Board Members

TC 1 – Foundations of Computer Science

Luis Soares Barbosa, *University of Minho, Braga, Portugal*

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

Burkhard Stiller, *University of Zurich, Zürich, Switzerland*

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

David Kreps, *National University of Ireland, Galway, Ireland*

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

Eunika Mercier-Laurent, *University of Reims Champagne-Ardenne, Reims, France*

TC 13 – Human-Computer Interaction

Marco Winckler, *University of Nice Sophia Antipolis, France*

TC 14 – Entertainment Computing

Rainer Malaka, *University of Bremen, Germany*

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>


Alexandre Dolgui · Alain Bernard ·
David Lemoine · Gregor von Cieminski ·
David Romero (Eds.)


Advances in Production Management Systems


Artificial Intelligence for Sustainable
and Resilient Production Systems


IFIP WG 5.7 International Conference, APMS 2021
Nantes, France, September 5–9, 2021
Proceedings, Part IV


Editors

Alexandre Dolgui 
IMT Atlantique
Nantes, France

David Lemoine 
IMT Atlantique
Nantes, France

David Romero 
Tecnológico de Monterrey
Mexico City, Mexico

Alain Bernard 
Centrale Nantes
Nantes, France

Gregor von Cieminski 
ZF Friedrichshafen AG
Friedrichshafen, Germany

ISSN 1868-4238 ISSN 1868-422X (electronic)
IFIP Advances in Information and Communication Technology
ISBN 978-3-030-85909-1 ISBN 978-3-030-85910-7 (eBook)
<https://doi.org/10.1007/978-3-030-85910-7>

© IFIP International Federation for Information Processing 2021

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, expressed 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.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The scientific and industrial relevance of the development of sustainable and resilient production systems lies in ensuring future-proof manufacturing and service systems, including their supply chains and logistics networks. “Sustainability” and “Resilience” are essential requirements for competitive manufacturing and service provisioning now and in the future. Industry 4.0 technologies, such as artificial intelligence; decision aid models; additive and hybrid manufacturing; augmented, virtual, and mixed reality; industrial, collaborative, mobile, and software robots; advanced simulations and digital twins; and smart sensors and intelligent industrial networks, are key enablers for building new digital and smart capabilities in emerging cyber-physical production systems in support of more efficient and effective operations planning and control. These allow manufacturers and service providers to explore more sustainable and resilient business and operating models. By making innovative use of the aforementioned technologies and their enabled capabilities, they can pursue the triple bottom line of economic, environmental, and social sustainability. Furthermore, industrial companies will be able to withstand and quickly recover from disruptions that pose threats to their operational continuity. This is in the face of disrupted, complex, turbulent, and uncertain business environments, like the one triggered by the COVID-19 pandemic, or environmental pressures calling for decoupling economic growth from resource use and emissions.

The International Conference on Advances in Production Management Systems 2021 (APMS 2021) in Nantes, France, brought together leading international experts on manufacturing, service, supply, and logistics systems from academia, industry, and government to discuss pressing issues and research opportunities mostly in smart manufacturing and cyber-physical production systems; service systems design, engineering, and management; digital lean operations management; and resilient supply chain management in the Industry 4.0 era, with particular focus on artificial intelligence-enabled solutions.

Under the influence of the COVID-19 pandemic, the event was organised as online conference sessions. A large international panel of experts (497 from 50 countries) reviewed all the submissions (with an average of 3.2 reviews per paper) and selected the best 377 papers (70% of the submitted contributions) to be included in these international conference proceedings. The topics of interest at APMS 2021 included artificial intelligence techniques, decision aid, and new and renewed paradigms for sustainable and resilient production systems at four-wall factory and value chain levels, comprising their associated models, frameworks, methods, tools, and technologies for smart and sustainable manufacturing and service systems, as well as resilient digital supply chains. As usual for the APMS conference, the Program Committee was particularly attentive to the cutting-edge problems in production management and the quality of the papers, especially with regard to the applicability of the contributions to industry and services.

The APMS 2021 conference proceedings are organized into five volumes covering a large spectre of research concerning the global topic of the conference: “Artificial Intelligence for Sustainable and Resilient Production Systems”.

The conference was supported by the International Federation of Information Processing (IFIP), which is celebrating its 60th Anniversary, and was co-organized by the IFIP Working Group 5.7 on Advances in Production Management Systems, IMT Atlantique (Campus Nantes) as well as the Centrale Nantes, University of Nantes, Rennes Business School, and Audecia Business School. It was also supported by three leading journals in the discipline: Production Planning & Control (PPC), the International Journal of Production Research (IJPR), and the International Journal of Product Lifecycle Management (IJPLM).

Special attention has been given to the International Journal of Production Research on the occasion of its 60th Anniversary. Since its foundation in 1961, IJPR has become one of the flagship journals of our profession. It was the first international journal to bring together papers on all aspects of production research: product/process engineering, production system design and management, operations management, and logistics. Many exceptional scientific results have been published in the journal.

We would like to thank all contributing authors for their high-quality work and for their willingness to share their research findings with the APMS community. We are also grateful to the members of the IFIP Working Group 5.7, the Program Committee, and the Scientific Committee, along with the Special Sessions organizers for their support in the organization of the conference program. Concerning the number of papers, special thanks must be given to the local colleagues who managed the reviewing process as well as the preparation of the conference program and proceedings, particularly Hicham Haddou Benderbal and Maria-Isabel Estrepo-Ruiz from IMT Atlantique.

September 2021

Alexandre Dolgui
Alain Bernard
David Lemoine
Gregor von Cieminski
David Romero

Organization

Conference Chair

Alexandre Dolgui IMT Atlantique, Nantes, France

Conference Co-chair

Gregor von Cieminski ZF Friedrichshafen, Germany

Conference Honorary Co-chairs

Dimitris Kiritsis EPFL, Switzerland
Kathryn E. Stecke University of Texas at Dallas, USA

Program Chair

Alain Bernard Centrale Nantes, France

Program Co-chair

David Romero Tecnológico de Monterrey, Mexico

Program Committee

Alain Bernard Centrale Nantes, France
Gregor von Cieminski ZF Friedrichshafen, Germany
Alexandre Dolgui IMT Atlantique, Nantes, France
Dimitris Kiritsis EPFL, Switzerland
David Romero Tecnológico de Monterrey, Mexico
Kathryn E. Stecke University of Texas at Dallas, USA

International Advisory Committee

Farhad Ameri Texas State University, USA
Ugljesa Marjanovic University of Novi Sad, Serbia
Ilkyeong Moon Seoul National University, South Korea
Bojan Lalic University of Novi Sad, Serbia
Hermann Lödding Hamburg University of Technology, Germany

Organizing Committee Chair

David Lemoine IMT Atlantique, Nantes, France

Organizing Committee Co-chair

Hichem Haddou Benderbal IMT Atlantique, Nantes, France

Doctoral Workshop Chairs

Abdelkrim-Ramzi IMT Atlantique, Nantes, France
Yelles-Chaouche
Seyyed-Ehsan IMT Atlantique, Nantes, France
Hashemi-Petroodi

Award Committee Chairs

Nadjib Brahimi Rennes School of Business, France
Ramzi Hammami Rennes School of Business, France

Organizing Committee

Romain Billot IMT Atlantique, Brest, France
Nadjib Brahimi Rennes School of Business, France
Olivier Cardin University of Nantes, France
Catherine Da Cunha Centrale Nantes, France
Alexandre Dolgui IMT Atlantique, Nantes, France
Giannakis Mihalís Audencia, Nantes, France
Evgeny Gurevsky University of Nantes, France
Hichem Haddou Benderbal IMT Atlantique, Nantes, France
Ramzi Hammami Rennes School of Business, France
Oncu Hazir Rennes School of Business, France
Seyyed-Ehsan IMT Atlantique, Nantes, France
Hashemi-Petroodi
David Lemoine IMT Atlantique, Nantes, France
Nasser Mebarki University of Nantes, France
Patrick Meyer IMT Atlantique, Brest, France
Merhdad Mohammadi IMT Atlantique, Brest, France
Dominique Morel IMT Atlantique, Nantes, France
Maroua Nouri University of Nantes, France
Maria-Isabel Restrepo-Ruiz IMT Atlantique, Nantes, France
Naly Rakoto IMT Atlantique, Nantes, France
Ilhem Slama IMT Atlantique, Nantes, France
Simon Thevenin IMT Atlantique, Nantes, France
Abdelkrim-Ramzi IMT Atlantique, Nantes, France
Yelles-Chaouche

Scientific Committee

Erry Yulian Triblas Adesta	International Islamic University Malaysia, Malaysia
El-Houssaine Aghezzaf	Ghent University, Belgium
Erlend Alfnes	Norwegian University of Science and Technology, Norway
Hamid Allaoui	Université d'Artois, France
Thecle Alix	IUT Bordeaux Montesquieu, France
Farhad Ameri	Texas State University, USA
Bjørn Andersen	Norwegian University of Science and Technology, Norway
Eiji Arai	Osaka University, Japan
Jannicke Baalsrud Hauge	KTH Royal Institute of Technology, Sweden/BIBA, Germany
Zied Babai	Kedge Business School, France
Natalia Bakhtadze	Russian Academy of Sciences, Russia
Pierre Baptiste	Polytechnique de Montréal, Canada
Olga Battaïa	Kedge Business School, France
Farouk Belkadi	Centrale Nantes, France
Lyes Benyoucef	Aix-Marseille University, France
Bopaya Bidanda	University of Pittsburgh, USA
Frédérique Biennier	INSA Lyon, France
Jean-Charles Billaut	Université de Tours, France
Umit S. Bititci	Heriot-Watt University, UK
Magali Bosch-Mauchand	Université de Technologie de Compiègne, France
Xavier Boucher	Mines St Etienne, France
Abdelaziz Bouras	Qatar University, Qatar
Jim Browne	University College Dublin, Ireland
Luis Camarinha-Matos	Universidade Nova de Lisboa, Portugal
Olivier Cardin	University of Nantes, France
Sergio Cavalieri	University of Bergamo, Italy
Stephen Childe	Plymouth University, UK
Hyunbo Cho	Pohang University of Science and Technology, South Korea
Chengbin Chu	ESIEE Paris, France
Feng Chu	Paris-Saclay University, France
Byung Do Chung	Yonsei University, South Korea
Gregor von Cieminski	ZF Friedrichshafen, Germany
Catherine Da Cunha	Centrale Nantes, France
Yves Dallery	CentraleSupélec, France
Xavier Delorme	Mines St Etienne, France
Frédéric Demoly	Université de Technologie de Belfort-Montbéliard, France
Mélanie Despeisse	Chalmers University of Technology, Sweden
Alexandre Dolgui	IMT Atlantique, Nantes, France
Slavko Dolinšek	University of Ljubljana, Slovenia

Sang Do Noh	Sungkyunkwan University, South Korea
Heidi Carin Dreyer	Norwegian University of Science and Technology, Norway
Eero Eloranta	Aalto University, Finland
Soumaya El Kadiri	Texelia AG, Switzerland
Christos Emmanouilidis	University of Groningen, The Netherlands
Anton Eremeev	Siberian Branch of Russian Academy of Sciences, Russia
Åsa Fasth-Berglund	Chalmers University of Technology, Sweden
Rosanna Fornasiero	Consiglio Nazionale delle Ricerche, Italy
Xuehao Feng	Zhejiang University, China
Yannick Frein	INP Grenoble, France
Jan Frick	University of Stavanger, Norway
Klaas Gadeyne	Flanders Make, Belgium
Paolo Gaiardelli	University of Bergamo, Italy
Adriana Giret Boggino	Universidad Politécnica de Valencia, Spain
Samuel Gomes	Belfort-Montbéliard University of Technology, France
Bernard Grabot	INP-Toulouse, ENIT, France
Gerhard Gudergan	RWTH Aachen University, Germany
Thomas R. Gulledge Jr.	George Mason University, USA
Nikolai Guschinsky	National Academy of Sciences, Belarus
Slim Hammadi	Centrale Lille, France
Ahmedou Haouba	University of Nouakchott Al-Asriya, Mauritania
Soumaya Henchoz	Logitech AG, Switzerland
Hironori Hibino	Tokyo University of Science, Japan
Hans-Henrik Hvolby	Aalborg University, Denmark
Jan Holmström	Aalto University, Finland
Dmitry Ivanov	Berlin School of Economics and Law, Germany
Harinder Jagdev	National University of Ireland at Galway, Ireland
Jayanth Jayaram	University of South Carolina, USA
Zhibin Jiang	Shanghai Jiao Tong University, China
John Johansen	Aalborg University, Denmark
Hong-Bae Jun	Hongik University, South Korea
Toshiya Kaihara	Kobe University, Japan
Duck Young Kim	Pohang University of Science and Technology, South Korea
Dimitris Kiritsis	EPFL, Switzerland
Tomasz Koch	Wroclaw University of Science and Technology, Poland
Pisut Koomsap	Asian Institute of Technology, Thailand
Vladimir Kotov	Belarusian State University, Belarus
Mikhail Kovalyov	National Academy of Sciences, Belarus
Gül Kremer	Iowa State University, USA
Boonserm Kulvatunyou	National Institute of Standards and Technology, USA
Senthilkumaran Kumaraguru	Indian Institute of Information Technology Design and Manufacturing, India

Thomas R. Kurfess	Georgia Institute of Technology, USA
Andrew Kusiak	University of Iowa, USA
Bojan Lalić	University of Novi Sad, Serbia
Samir Lamouri	ENSAM Paris, France
Lenka Landryova	Technical University of Ostrava, Czech Republic
Alexander Lazarev	Russian Academy of Sciences, Moscow, Russia
Jan-Peter Lechner	First Global Liaison, Germany
Gyu M. Lee	Pusan National University, South Korea
Kangbok Lee	Pohang University of Science and Technology, South Korea
Genrikh Levin	National Academy of Sciences, Belarus
Jingshan Li	University of Wisconsin-Madison, USA
Ming K. Lim	Chongqing University, China
Hermann Lödding	Hamburg University of Technology, Germany
Pierre Lopez	LAAS-CNRS, France
Marco Macchi	Politecnico di Milano, Italy
Ugljesa Marjanovic	University of Novi Sad, Serbia
Muthu Mathirajan	Indian Institute of Science, India
Gökan May	University of North Florida, USA
Khaled Medini	Mines St Etienne, France
Jörn Mehnen	University of Strathclyde, UK
Vidosav D. Majstorovich	University of Belgrade, Serbia
Semyon M. Meerkov	University of Michigan, USA
Joao Gilberto Mendes dos Reis	UNIP Paulista University, Brazil
Hajime Mizuyama	Aoyama Gakuin University, Japan
Ilkyeong Moon	Seoul National University, South Korea
Eiji Morinaga	Osaka Prefecture University, Japan
Dimitris Mourtzis	University of Patras, Greece
Irenilza de Alencar Naas	UNIP Paulista University, Brazil
Masaru Nakano	Keio University, Japan
Torbjörn Netland	ETH Zürich, Switzerland
Gilles Neubert	EMLYON Business School, Saint-Etienne, France
Izabela Nielsen	Aalborg University, Denmark
Tomomi Nonaka	Ritsumeikan University, Japan
Jinwoo Park	Seoul National University, South Korea
François Pérès	INP-Toulouse, ENIT, France
Fredrik Persson	Linköping Institute of Technology, Sweden
Giuditta Pezzotta	University of Bergamo, Italy
Selwyn Piramuthu	University of Florida, USA
Alberto Portioli Staudacher	Politecnico di Milano, Italy
Daryl Powell	Norwegian University of Science and Technology, Norway
Vittaladas V. Prabhu	Pennsylvania State University, USA
Jean-Marie Proth	Inria, France
Ricardo José Rabelo	Federal University of Santa Catarina, Brazil

Rahul Rai	University at Buffalo, USA
Mario Rapaccini	Florence University, Italy
Nidhal Rezg	University of Lorraine, France
Ralph Riedel	Westfälische Hochschule Zwickau, Germany
Irene Roda	Politecnico di Milano, Italy
Asbjörn Rolstadås	Norwegian University of Science and Technology, Norway
David Romero	Tecnológico de Monterrey, Mexico
Christoph Roser	Karlsruhe University of Applied Sciences, Germany
André Rossi	Université Paris-Dauphine, France
Martin Rudberg	Linköping University, Sweden
Thomas E. Ruppli	University of Basel, Switzerland
Krzysztof Santarek	Warsaw University of Technology, Poland
Subhash Sarin	VirginiaTech, USA
Suresh P. Sethi	The University of Texas at Dallas, USA
Fabio Sgarbossa	Norwegian University of Science and Technology, Norway
John P. Shewchuk	Virginia Polytechnic Institute and State University, USA
Dan L. Shunk	Arizona State University, USA
Ali Siadat	Arts et Métiers ParisTech, France
Riitta Smeds	Aalto University, Finland
Boris Sokolov	Russian Academy of Sciences, Russia
Vijay Srinivasan	National Institute of Standards and Technology, USA
Johan Stahre	Chalmers University of Technology, Sweden
Kathryn E. Stecke	The University of Texas at Dallas, USA
Kenn Steger-Jensen	Aalborg University, Denmark
Volker Stich	RWTH Aachen University, Germany
Richard Lee Storch	University of Washington, USA
Jan Ola Strandhagen	Norwegian University of Science and Technology, Norway
Stanislaw Strzelczak	Warsaw University of Technology, Poland
Nick Szirbik	University of Groningen, The Netherlands
Marco Taisch	Politecnico di Milano, Italy
Lixin Tang	Northeastern University, China
Kari Tanskanen	Aalto University School of Science, Finland
Ilias Tatsiopoulos	National Technical University of Athens, Greece
Sergio Terzi	Politecnico di Milano, Italy
Klaus-Dieter Thoben	Universität Bremen, Germany
Manoj Tiwari	Indian Institute of Technology, India
Matthias Thüre	Jinan University, China
Jacques H. Trienekens	Wageningen University, The Netherlands
Mario Tucci	Università degli Studi di Firenze, Italy
Shigeki Umeda	Musashi University, Japan
Bruno Vallespir	University of Bordeaux, France
François Vernadat	University of Lorraine, France

Agostino Villa	Politecnico di Torino, Italy
Lihui Wang	KTH Royal Institute of Technology, Sweden
Sabine Waschull	University of Groningen, The Netherlands
Hans-Hermann Wiendahl	University of Stuttgart, Germany
Frank Werner	University of Magdeburg, Germany
Shaun West	Lucerne University of Applied Sciences and Arts, Switzerland
Joakim Wikner	Jönköping University, Sweden
Hans Wortmann	University of Groningen, The Netherlands
Desheng Dash Wu	University of Chinese Academy of Sciences, China
Thorsten Wuest	West Virginia University, USA
Farouk Yalaoui	University of Technology of Troyes, France
Noureddine Zerhouni	Université Bourgogne Franche-Comte, France

List of Reviewers

Abbou Rosa	Batocchio Antonio
Abdeljaouad Mohamed Amine	Battaia Olga
Absi Nabil	Battini Daria
Acerbi Federica	Behrens Larissa
Aghelinejad Mohsen	Ben-Ammar Oussama
Aghezzaf El-Houssaine	Benatia Mohamed Amin
Agrawal Rajeev	Bentaha M.-Lounes
Agrawal Tarun Kumar	Benyoucef Lyes
Alexopoulos Kosmas	Beraldi Santos Alexandre
Alix Thecle	Bergmann Ulf
Alkhudary Rami	Bernus Peter
Altekin F. Tevhide	Berrah Lamia-Amel
Alves Anabela	Bertnum Aili Biriita
Ameri Farhad	Bertoni Marco
Andersen Ann-Louise	Bettayeb Belgacem
Andersen Bjorn	Bevilacqua Maurizio
Anderson Marc	Biennier Frédérique
Anderson Matthew	Bititci Umit Sezer
Anholon Rosley	Bocanet Vlad
Antosz Katarzyna	Bosch-Mauchand Magali
Apostolou Dimitris	Boucher Xavier
Arica Emrah	Bourguignon Saulo Cabral
Arlinghaus Julia Christine	Bousdekis Alexandros
Aubry Alexis	Brahimi Nadjib
Baalsrud Hauge Jannicke	Bresler Maggie
Badulescu Yvonne Gabrielle	Brunoe Thomas Ditlev
Bakhtadze Natalia	Brusset Xavier
Barbosa Christiane Lima	Burow Kay
Barni Andrea	Calado Robisom Damasceno

Calarge Felipe	Dolgui Alexandre
Camarinha-Matos Luis Manuel	Dolinsek Slavko
Cameron David	Dou Runliang
Cannas Violetta Giada	Drei Samuel Martins
Cao Yifan	Dreyer Heidi
Castro Eduardo Lorenzo	Dreyfus Paul-Arthur
Cattaruzza Diego	Dubey Rameshwar
Cerqueus Audrey	Dümmel Johannes
Chang Tai-Woo	Eloranta Eero
Chaves Sandra Maria do Amaral	Emmanouilidis Christos
Chavez Zuhara	Ermolova Maria
Chen Jinwei	Eslami Yasamin
Cheng Yongxi	Fast-Berglund Åsa
Chiacchio Ferdinando	Faveto Alberto
Chiari da Silva Ethel Cristina	Federico Adrodegari
Childe Steve	Feng Xuehao
Cho Hyunbo	Finco Serena
Choi SangSu	Flores-García Erik
Chou Shuo-Yan	Fontaine Pirmin
Christensen Flemming Max Møller	Fosso Wamba Samuel
Chung Byung Do	Franciosi Chiara
Ciarapica Filippo Emanuele	Frank Jana
Cimini Chiara	Franke Susanne
Clivillé Vincent	Freitag Mike
Cohen Yuval	Frick Jan
Converso Giuseppe	Fruggiero Fabio
Cosenza Harvey	Fu Wenhan
Costa Helder Gomes	Fujii Nobutada
Da Cunha Catherine	Gahan Padmabati
Daaboul Joanna	Gaiardelli Paolo
Dahane Mohammed	Gallo Mosè
Dakic Dusanka	Ganesan Viswanath Kumar
Das Dyutimoy Nirupam	Gaponov Igor
Das Jyotirmoy Nirupam	Gayialis Sotiris P.
Das Sayan	Gebennini Elisa
Davari Morteza	Ghadge Abhijeet
De Arruda Ignacio Paulo Sergio de	Ghraiiri Zied
De Campos Renato	Gianessi Paolo
De Oliveira Costa Neto Pedro Luiz	Giret Boggino Adriana
Delorme Xavier	Gloeckner Robert
Deroussi Laurent	Gogineni Sonika
Despeisse Mélanie	Gola Arkadiusz
Di Nardo Mario	Goodarzian Fariba
Di Pasquale Valentina	Gosling Jon
Dillinger Fabian	Gouyon David
Djedidi Oussama	Grabot Bernard

Grangeon Nathalie	Jones Al
Grassi Andrea	Jun Chi-Hyuck
Grenzfurtner Wolfgang	Jun Hong-Bae
Guerpinar Tan	Jun Sungbum
Guillaume Romain	Juned Mohd
Guimarães Neto Abelino Reis	Jünger Gabriele
Guizzi Guido	Kaasinen Eija
Gupta Sumit	Kaihara Toshiya
Gurevsky Evgeny	Kalaboukas Kostas
Habibi Muhammad Khoirul Khakim	Kang Yong-Shin
Haddou Benderbal Hichem	Karampatzakis Dimitris
Halse Lise Lillebrygfjeld	Kayicki Yasanur
Hammami Ramzi	Kedad-Sidhoum Safia
Hani Yasmina	Keepers Makenzie
Hashemi-Petroodi S. Ehsan	Keivanpour Samira
Havzi Sara	Keshari Anupam
Hazir Oncu	Kim Byung-In
Hedayatinia Pooya	Kim Duck Young
Hemmati Ahmad	Kim Hwa-Joong
Henchoz El Kadiri Soumaya	Kim Hyun-Jung
Heuss Lisa	Kinra Aseem
Hibino Hironori	Kiritzis Dimitris
Himmiche Sara	Kitjacharoenchai Patchara
Hnaïen Faïcel	Kjeldgaard Stefan
Hofer Gernot	Kjersem Kristina
Holst Lennard Phillip	Klimchik Alexandr
Hovelaque Vincent	Klymenko Olena
Hrnjica Bahrudin	Kollberg Thomassen Maria
Huber Walter	Kolyubin Sergey
Husniah Hennie	Koomsap Pisut
Hvolby Hans-Henrik	Kramer Kathrin
Hwang Gyusun	Kulvatunyou Boonserm (Serm)
Irohara Takashi	Kumar Ramesh
Islam Md Hasibul	Kurata Takeshi
Iung Benoit	Kvadsheim Nina Pereira
Ivanov Dmitry	Lahaye Sébastien
Jacomino Mireille	Lalic Danijela
Jagdev Harinder	Lamouri Samir
Jahn Niklas	Lamy Damien
Jain Geetika	Landryova Lenka
Jain Vipul	Lechner Jan-Peter
Jasiulewicz-Kaczmarek Małgorzata	Lee Dong-Ho
Jebali Aida	Lee Eunji
Jelusic Elena	Lee Kangbok
Jeong Yongkuk	Lee Kyungsik
Johansen John	Lee Minchul

Lee Seokcheon
Lee Seokgi
Lee Young Hoon
Lehuédé Fabien
Leiber Daria
Lemoine David
Li Haijiao
Li Yuanfu
Lim Dae-Eun
Lim Ming
Lima Adalberto da
Lima Nilsa
Lin Chen-ju
Linares Jean-marc
Linnartz Maria
Listl Franz Georg
Liu Ming
Liu Xin
Liu Zhongzheng
Lödding Hermann
Lodgaard Eirin
Loger Benoit
Lorenz Rafael
Lu Jinzhi
Lu Xingwei
Lu Xuefei
Lucas Flavien
Lüftenegger Egon
Luo Dan
Ma Junhai
Macchi Marco
Machado Brunno Abner
Maier Janine Tatjana
Maihami Reza
Makboul Salma
Makris Sotiris
Malaguti Roney Camargo
Mandal Jasashwi
Mandel Alexander
Manier Hervé
Manier Marie-Ange
Marangé Pascale
Marchesano Maria Grazia
Marek Svenja
Marjanovic Ugljesa
Marmolejo Jose Antonio
Marques Melissa
Marrazzini Leonardo
Masone Adriano
Massonnet Guillaume
Matsuda Michiko
Maxwell Duncan William
Mazzuto Giovanni
Medić Nenad
Medini Khaled
Mehnen Jorn
Mendes dos Reis João Gilberto
Mentzas Gregoris
Metaxa Ifigeneia
Min Li Li
Minner Stefan
Mishra Ashutosh
Mitra Rony
Mizuyama Hajime
Mogale Dnyaneshwar
Mohammadi Mehrdad
Mollo Neto Mario
Montini Elias
Montoya-Torres Jairo R.
Moon Ilkyeong
Moraes Thais De Castro
Morinaga Eiji
Moser Benedikt
Moshref-Javadi Mohammad
Mourtzis Dimitris
Mundt Christopher
Muši Denis
Nääs Irenilza De Alencar
Naim Mohamed
Nakade Koichi
Nakano Masaru
Napoleone Alessia
Nayak Ashutosh
Neroni Mattia
Netland Torbjørn
Neubert Gilles
Nguyen Du Huu
Nguyen Duc-Canh
Nguyen Thi Hien
Nielsen Izabela
Nielsen Kjeld
Nishi Tatsushi

Nogueira Sara
Noh Sang Do
Nonaka Tomomi
Noran Ovidiu
Norre Sylvie
Ortmeier Frank
Ouazene Yassine
Ouzrout Yacine
Özcan Uğur
Paes Graciele Oroski
Pagnoncelli Bernardo
Panigrahi Sibarama
Panigrahi Swayam Sampurna
Papakostas Nikolaos
Papcun Peter
Pashkevich Anatol
Pattnaik Monalisha
Pels Henk Jan
Pérès François
Persson Fredrik
Pezzotta Giuditta
Phan Dinh Anh
Piétrac Laurent
Pinto Sergio Crespo Coelho da
Pirola Fabiana
Pissardini Paulo Eduardo
Polenghi Adalberto
Popolo Valentina
Portioli Staudacher Alberto
Powell Daryl
Prabhu Vittaldas
Psarommatis Foivos
Rabelo Ricardo
Rakic Slavko
Rapaccini Mario
Reis Milena Estanislau Diniz Dos
Resanovic Daniel
Rey David
Riedel Ralph
Rikalović Aleksandar
Rinaldi Marta
Roda Irene
Rodriguez Aguilar Roman
Romagnoli Giovanni
Romeo Bandinelli
Romero David
Roser Christoph
Rossit Daniel Alejandro
Rudberg Martin
Sabitov Rustem
Sachs Anna-Lena
Sahoo Rosalin
Sala Roberto
Santarek Kszysztof
Satolo Eduardo Guilherme
Satyro Walter
Savin Sergei
Schneider Daniel
Semolić Brane
Shafiq Muhammad
Sharma Rohit
Shin Jong-Ho
Shukla Mayank
Shunk Dan
Siadat Ali
Silva Cristovao
Singgih Ivan Kristianto
Singh Sube
Slama Ilhem
Smaglichenko Alexander
Smeds Riitta Johanna
Soares Paula Metzker
Softic Selver
Sokolov Boris V.
Soleilhac Gauthier
Song Byung Duk
Song Xiaoxiao
Souier Mehdi
Sørensen Daniel Grud Hellerup
Spagnol Gabriela
Srinivasan Vijay
Stavrou Vasileios P.
Steger-Jensen Kenn
Stich Volker
Stipp Marlucci Andrade Conceição
Stoll Oliver
Strandhagen Jan Ola
Suh Eun Suk
Suleykin Alexander
Suzanne Elodie
Szirbik Nick B.
Taghvaeipour Afshin

Taisch Marco
Tanimizu Yoshitaka
Tanizaki Takashi
Tasić Nemanja
Tebaldi Letizia
Telles Renato
Thevenin Simon
Thoben Klaus-Dieter
Thurer Matthias
Tiedemann Fredrik
Tisi Massimo
Torres Luis Fernando
Tortorella Guilherme Luz
Troyanovsky Vladimir
Turcin Ioan
Turki Sadok
Ulrich Marco
Unip Solimar
Valdiviezo Viera Luis Enrique
Vallespir Bruno
Vasic Stana
Vaz Paulo
Vespoli Silvestro
Vicente da Silva Ionaldo
Villeneuve Eric
Viviani Jean-Laurent
Vještica Marko
Vo Thi Le Hoa
Voisin Alexandre
von Cieminski Gregor
Von Stietenron Moritz
Wagner Sarah
Wang Congke
Wang Hongfeng
Wang Yin
Wang Yingli
Wang Yuling
Wang Zhaojie
Wang Zhixin
Wellsandt Stefan
West Shaun
Wiendahl Hans-Hermann
Wiesner Stefan Alexander
Wikner Joakim
Wiktorsson Magnus
Wimmer Manuel
Woo Young-Bin
Wortmann Andreas
Wortmann Johan Casper
Wuest Thorsten
Xu Tiantong
Yadegari Ehsan
Yalaoui Alice
Yang Danqin
Yang Guoqing
Yang Jie
Yang Zhaorui
Yelles Chaouche Abdelkrim Ramzi
Zaeh Michael Friedrich
Zaikin Oleg
Zambetti Michela
Zeba Gordana
Zhang Guoqing
Zhang Ruiyou
Zheng Feifeng
Zheng Xiaochen
Zoitl Alois
Zolotová Iveta
Zouggar Anne

Contents – Part IV

AI for Resilience in Global Supply Chain Networks in the Context of Pandemic Disruptions

Modelling COVID-19 Ripple Effect and Global Supply Chain Productivity Impacts Using a Reaction-Diffusion Time-Space SIS Model.	3
<i>Xavier Brusset, Morteza Davari, Aseem Kinra, and Davide La Torre</i>	
A Vector Logistic Dynamical Approach to Epidemic Evolution on Interacting Social-Contact and Production-Capacity Graphs	13
<i>Jan Bart Broekaert and Davide La Torre</i>	
Modeling Shock Propagation on Supply Chain Networks: A Stochastic Logistic-Type Approach	23
<i>Cinzia Colapinto, Davide La Torre, Iside Rita Laganà, and Danilo Liuzzi</i>	
Towards Explainable Artificial Intelligence (XAI) in Supply Chain Management: A Typology and Research Agenda	32
<i>Godfrey Mugurusi and Pross Nagitta Oluka</i>	
Distribution of Vaccines During a Pandemic (Covid-19)	39
<i>Vignesh Dhanapal and Subhash C. Sarin</i>	

Blockchain in the Operations and Supply Chain Management

Blockchain-Based Master Data Management in Supply Chains: A Design Science Study	51
<i>Jacob Lohmer, Lasse Bohlen, and Rainer Lasch</i>	
Blockchain for Product Authenticity in the Cannabis Supply Chain.	62
<i>Sven Januszek, Andreas Siegrist, and Torbjørn H. Netland</i>	
A Blockchain-Based Manufacturing Service Composition Architecture for Trust Issues.	70
<i>Qianhang Lyu, Yunqing Rao, Jiawei Wang, and Peng Qi</i>	
An Approach for Creating a Blockchain Platform for Labeling and Tracing Wines and Spirits	81
<i>Sotiris P. Gayialis, Evripidis P. Kechagias, Grigorios D. Konstantakopoulos, Georgios A. Papadopoulos, and Ilias P. Tatsiopoulos</i>	

Blockchain Design for Digital Supply Chain Integration 90
*Kari Korpela, Petr Novotny, Alevtina Dubovitskay, Tomi Dahlberg,
Mika Lammi, and Jukka Hallikas*

**Data-Based Services as Key Enablers for Smart Products,
Manufacturing and Assembly**

Customer Order Scheduling in an Additive Manufacturing Environment 101
Benedikt Zipfel, Janis S. Neufeld, and Udo Buscher

A Conceptual Reference Model for Smart Factory Production Data 110
*Giulia Boniotti, Paola Cocca, Filippo Marciano, Alessandro Marini,
Elena Stefana, and Federico Vernuccio*

Generating Synthetic Training Data for Assembly Processes 119
Johannes Dümmel, Valentin Kostik, and Jan Oellerich

Data Acquisition for Energy Efficient Manufacturing: A Systematic
Literature Review 129
Henry Ekwaro-Osire, Stefan Wiesner, and Klaus-Dieter Thoben

Review of Factors Influencing Product-Service System Requirements
Along the Life Cycle 138
Stefan Wiesner and Jannicke Baalsrud Hauge

Data-Driven Methods for Supply Chain Optimization

Data-Driven Solutions for the Newsvendor Problem: A Systematic
Literature Review 149
Thais de Castro Moraes and Xue-Ming Yuan

An Information Sharing Framework for Supply Chain Networks:
What, When, and How to Share 159
Eunji Lee and Stefan Minner

A Robust Data Driven Approach to Supply Planning 169
*Benoit Loger, Alexandre Dolgui, Fabien Lehuédé,
and Guillaume Massonnet*

Responsible Manufacturing with Information Disclosure Under
Regulatory Inspections 179
Yifan Cao and Bin Shen

Understanding Supply Chain Visibility Through Experts' Perspective:
A Delphi Based Approach 189
*Tarun Kumar Agrawal, Ravi Kalaiarasan, Jan Olhager,
and Magnus Wiktorsson*

Digital Twins Based on Systems Engineering and Semantic Modeling

STARdom: An Architecture for Trusted and Secure Human-Centered Manufacturing Systems	199
<i>Jože M. Rožanec, Patrik Zajec, Klemen Kenda, Inna Novalija, Blaž Fortuna, Dunja Mladenčić, Entso Veliou, Dimitrios Papamartzivanos, Thanassis Giannetsos, Sofia Anna Menesidou, Rubén Alonso, Nino Cauli, Diego Reforgiato Recupero, Dimosthenis Kyriazis, Georgios Sofianidis, Spyros Theodoropoulos, and John Soldatos</i>	
Semantic Modeling Supports the Integration of Concept-Decision-Knowledge	208
<i>Yili Jin, Jinzhi Lu, Guoxin Wang, Ru Wang, and Kiritsis Dimitris</i>	
Model-Based Systems Engineering Supporting Integrated Modeling and Optimization of Radar Cabin Layout	218
<i>Shiyan She, Jinzhi Lu, Guoxin Wang, Jie Ding, and Zixiang Hu</i>	
Supporting Digital Twin Integration Using Semantic Modeling and High-Level Architecture.	228
<i>Han Li, Jinzhi Lu, Xiaochen Zheng, Guoxin Wang, and Dimitris Kiritsis</i>	
Digital Twin-Driven Approach for Smart City Logistics: The Case of Freight Parking Management	237
<i>Yu Liu, Pauline Folz, Shenle Pan, Fano Ramparany, Sébastien Bolle, Eric Ballot, and Thierry Coupaye</i>	
Digital Twins in Companies First Developments and Future Challenges	
The Advent of the Digital Twin: A Prospective in Healthcare in the Next Decade	249
<i>Jorge Luis Rojas-Arce and Eduardo Cassiel Ortega-Maldonado</i>	
Reviewing the Application of Data Driven Digital Twins in Manufacturing Systems: A Business and Management Perspective	256
<i>Ehsan Badakhshan and Peter Ball</i>	
Improving a Manufacturing Process using Recursive Artificial Intelligence.	266
<i>Jose Antonio Marmolejo-Saucedo, Roman Rodriguez-Aguilar, Uriel Abel Romero Perea, Manuel Garrido Vaqueiro, Regina Robredo Hernandez, Fernando Sanchez Ramirez, and Ana Paula Martinez</i>	
Digital Twin in the Agri-Food Supply Chain: A Literature Review	276
<i>Letizia Tebaldi, Giuseppe Vignali, and Eleonora Bottani</i>	

A Digital Twin Implementation for Manufacturing Based on Open-Source Software and Standard Control Systems	284
<i>Christian Dalheim Øien, Håkon Dahl, and Sebastian Dransfeld</i>	
Human-Centered Artificial Intelligence in Smart Manufacturing for the Operator 4.0	
Towards Active Learning Based Smart Assistant for Manufacturing	295
<i>Patrik Zajec, Jože Martin Rožanec, Inna Novalija, Blaž Fortuna, Dunja Mladenič, and Klemen Kenda</i>	
Human-AI Collaboration in Quality Control with Augmented Manufacturing Analytics	303
<i>Alexandros Bousdekis, Stefan Wellsandt, Enrica Bosani, Katerina Lepenioti, Dimitris Apostolou, Karl Hribernik, and Gregoris Mentzas</i>	
Digital Platform and Operator 4.0 Services for Manufacturing Repurposing During COVID19	311
<i>John Soldatos, Nikos Kefalakis, Georgios Makantasis, Angelo Marguglio, and Oscar Lazaro</i>	
Anatomy of a Digital Assistant	321
<i>Stefan Wellsandt, Karl Hribernik, and Klaus-Dieter Thoben</i>	
Human in the AI Loop in Production Environments	331
<i>C. Emmanouilidis, S. Waschull, J. A. C. Bokhorst, and J. C. Wortmann</i>	
Operations Management in Engineer-to-Order Manufacturing	
Value Stream Mapping for Knowledge Work: A Study from Project-Based Engineering-To-Order Organization	345
<i>Daria Larsson, Arne Gildseth, and R. M. Chandima Ratnayake</i>	
A Literature-Based Exploration of Servitization in Engineer-to-Order Companies	354
<i>Antonio Masi, Margherita Pero, and Nizar Abdelkafi</i>	
The Unexpected Consequences of the Covid 19 on Managing ETO Projects	363
<i>Kristina Kjersem and Marte F. Giskeødegård</i>	
Requirements for Sales and Operations Planning in an Engineer-to-Order Manufacturing Environment	371
<i>Swapnil Bhalla, Erlend Alfnes, Hans-Henrik Hvolby, and Olumide Emmanuel Oluyisola</i>	

A Systematic Approach to Implementing Multi-sourcing Strategy in Engineer-to-Order Production	381
<i>Deodat Mwesiumo, Bella B. Nujen, and Nina Pereira Kvadsheim</i>	

Product and Asset Life Cycle Management for Smart and Sustainable Manufacturing Systems

A Holistic Approach to PLI in Smart Maintenance Towards Sustainable Manufacturing	393
<i>Harald Rødseth, Endre Sølvsberg, Anna Steine, Per Schjølberg, and Espen Henriksen-Polanscak</i>	

Sustainable Maintenance Performances and EN 15341:2019: An Integration Proposal	401
<i>Chiara Franciosi, Irene Roda, Alexandre Voisin, Salvatore Miranda, Marco Macchi, and Benoit Iung</i>	

System-Level Overall Equipment Effectiveness for Improving Asset Management Performance: A Case Study Application	410
<i>Alberto Franzini, Adalberto Polenghi, Irene Roda, and Marco Macchi</i>	

Semantic Interoperability and Sustainability an Industry 4.0 Product Life Cycle Issue	418
<i>Yasamin Eslami, Sahand Ashouri, and Mario Lezoche</i>	

The Concept of Sustainable Maintenance Criteria Assessment.	427
<i>Małgorzata Jasiulewicz-Kaczmarek and Katarzyna Antosz</i>	

Cost Projections for the Product Life Cycle at the Early Stages of Product Development	437
<i>Marcin Relich, Grzegorz Bocewicz, and Zbigniew Banaszak</i>	

Robotics Technologies for Control, Smart Manufacturing and Logistics

Redundancy Resolution in Kinematic Control of Serial Manipulators in Multi-obstacle Environment	449
<i>Wanda Zhao, Anatol Pashkevich, and Damien Chablat</i>	

Automatic Drones for Factory Inspection: The Role of Virtual Simulation . . .	457
<i>Omid Maghazei, Torbjørn H. Netland, Dirk Frauenberger, and Tobias Thalmann</i>	

Geometric Error Modeling and Sensitivity Analysis of a Laser Pipe-Cutting System Based on Lie Group and Sobol Method	465
<i>Yuze Jiang, Wenyu Yang, Liang Qin, and Tong Ding</i>	

Tensegrity Morphing: Machine Learning-Based Tensegrity Deformation Predictor for Traversing Cluttered Environments	473
<i>Eduard Zalyaev and Sergei Savin</i>	
Seed-and-Prune Approach for Rapid Discovery of Tensegrity-Like Structures of the Desired Shape	481
<i>Sergei Savin</i>	
Serious Games Analytics: Improving Games and Learning Support	
Experiencing the Role of Cooperation and Competition in Operations and Supply Chain Management with a Multiplayer Serious Game	491
<i>Matteo Galli, Davide Mezzogori, Davide Reverberi, Giovanni Romagnoli, and Francesco Zammori</i>	
Towards a Serious Game on Data Sharing in Business Ecosystems	500
<i>Ulriikka Järvihaavisto, Mikael Öhman, and Riitta Smeds</i>	
Accessibility Considerations in the Design of Serious Games for Production and Logistics	510
<i>Jannicke Baalsrud Hauge, Ioana Andreea Stefan, Niina Sallinen, and Jakob A. H. Baalsrud Hauge</i>	
Smart and Sustainable Production and Supply Chains	
Achieving Circular and Efficient Production Systems: Emerging Challenges from Industrial Cases	523
<i>Mélanie Despeisse, Arpita Chari, Clarissa Alejandra González Chávez, Xiaoxia Chen, Björn Johansson, Víctor Igelmo Garcia, Anna Syberfeldt, Tarek Abdulfatah, and Alexey Polukeev</i>	
Value Stream Mapping (VSM) to Evaluate and Visualize Interrelated Process-Chains Regarding Circular Economy	534
<i>Jeff Mangers, Meysam Minoufekar, and Peter Plapper</i>	
Research on a Preannounced Pricing Policy in a Two-Period Dual-Channel Supply Chain	543
<i>Haijiao Li, Kuan Yang, and Guoqing Zhang</i>	
Sustainable and Resilience Improvement Through the Design for Circular Digital Supply Chain	550
<i>Abla Chaouni Benabdellah, Kamar Zekhnini, and Anass Cherrafi</i>	
A Literature Review on Smart Technologies and Logistics	560
<i>Xingwei Lu, Xianhao Xu, and Yeming Gong</i>	

A Robust Optimization Model for a Community Healthcare Service Network Design Problem	568
<i>Congke Wang, Yankui Liu, Jinfeng Li, and Guoqing Yang</i>	
A Review of Explainable Artificial Intelligence.	574
<i>Kuo-Yi Lin, Yuguang Liu, Li Li, and Runliang Dou</i>	
The Impact of the Number of Regulated Suppliers in Green Supply Chain Action on Financial Performance	585
<i>Xuanchang Qi and Hanhui Hu</i>	
Digitalization for Resilience and Sustainability During the Covid-19 Pandemic: An Explorative Event Study	591
<i>Seyoum Eshetu Birkie</i>	

Smart Methods and Techniques for Sustainable Supply Chain Management

Minimising Total Costs of a Two-Echelon Multi-Depot Capacitated Vehicle Routing Problem (2E-MD-CVRP) that Describes the Utilisation of the Amsterdam City Canal Network for Last Mile Parcel Delivery	603
<i>Bartje Alewijnse and Alexander Hübl</i>	
Evaluating the Deployment of Collaborative Logistics Models for Local Delivery Services	613
<i>Andrea Bari, Fabio Salassa, Maurizio Arnone, and Tiziana Delmastro</i>	
Suppliers Selection Ontology for Viable Digital Supply Chain Performance.	622
<i>Kamar Zekhnini, Anass Cherrafi, Imane Bouhaddou, and Abla Chaouni Benabdellah</i>	
Green Supply Chain Management: A Meta-analysis of Recent Reviews.	632
<i>Eleonora Bottani and Teresa Murino</i>	
Development of an Eco-efficiency Distribution Model: A Case Study of a Danish Wholesaler	641
<i>Malte Herold Jeberg, Simon Hummelshøj Sloth, Janus Haslund Løgtved, Hans-Henrik Hvolby, and Kenn Steger-Jensen</i>	

The New Digital Lean Manufacturing Paradigm

The Automation of Lean Practices: Digitalized or Digitally Wasted?	651
<i>Jamila Alieva and Daryl Powell</i>	
Study of the Predictive Mechanism with Big Data-Driven Lean Manufacturing and Six Sigma Methodology	662
<i>Hong Chen, JianDe Wu, Wei Zhang, Qing Guo, and HuiFeng Lu</i>	

Industry 4.0: Expectations, Impediments and Facilitators 673
*Sergio Miele Ruggero, Nilza Aparecida dos Santos,
Antonio Carlos Estender, and Marcia Terra da Silva*

**Implementation of Digital Tools for Lean Manufacturing:
An Empirical Analysis. 681**
Bassel Kassem and Alberto Portioli Staudacher

**Reflections from a Hybrid Approach Used to Develop a Specification
of a Shopfloor Platform for Smart Manufacturing in an
Engineered-to-Order SME 691**
Yann Keiser, Shaun West, and Simon Züst

**The Role of Emerging Technologies in Disaster Relief Operations:
Lessons from COVID-19**

**Shelter Location-Allocation Problem with Vulnerabilities of Network
and Disruption of Shelter During the Response Phase of Disaster 705**
Sweety Hansuwa, Usha Mohan, and Viswanath Kumar Ganesan

**Technologies Helping Smart Cities to Build Resilience: Focus
on COVID-19. 714**
*Helton Almeida dos Santos, Emerson da Silva Santana,
Robson Elias Bueno, and Silvia Helena Bonilla*

**Key Success Factors for Supply Chain Sustainability in COVID-19
Pandemic: An ISM Approach. 724**
Surajit Bag, Peter Kilbourn, Noleen Pisa, and Mihalís Giannakis

Author Index 735