

48th CIRP International Conference on Manufacturing Systems (CIRP CMS 2015)

Key Enabling Technologies for the
Factories of the Future

Procedia CIRP Volume 41

Ischia, Italy
24 - 26 June 2015

Part 1 of 2

Editor:

Roberto Teti

ISBN: 978-1-5108-2073-9

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



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

Copyright© by Elsevier B.V.
All rights reserved.

Printed by Curran Associates, Inc. (2016)

For permission requests, please contact Elsevier B.V.
at the address below.

Elsevier B.V.
Radarweg 29
Amsterdam 1043 NX
The Netherlands

Phone: +31 20 485 3911
Fax: +31 20 485 2457

<http://www.elsevierpublishingsolutions.com/contact.asp>

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

PART 1

EDITORIAL	1
<i>Roberto Teti</i>	
 <u>MANUFACTURING SYSTEMS</u>	
A FUZZY LOGIC BASED APPROACH TO EXPLORE MANUFACTURING SYSTEM CHANGEABILITY LEVEL DECISIONS	3
<i>Emmanuel Francalanza, Jonathan C. Borg, Carmen Constantinescu</i>	
MANUFACTURING STRATEGY – A NEGLECTED SUCCESS FACTOR FOR IMPROVING COMPETITIVENESS	9
<i>Uwe Dombrowski, Carsten Intra, Thimo Zahn, Philipp Krenkel</i>	
BUILDING BLOCKS FOR VOLUME-ORIENTED CHANGEABILITY OF ASSETS IN PRODUCTION PLANTS	15
<i>Manuel Rippel, Johannes Schmiester, Matthias Wandfluh, Paul Schönsleben</i>	
A MATERIAL FLOW MODELLING TOOL FOR RESOURCE EFFICIENT PRODUCTION PLANNING IN MULTI-PRODUCT MANUFACTURING SYSTEMS	21
<i>Oliver Gould, Alessandro Simeone, James Colwill, Roy Willey, Shahin Rahimifard</i>	
CHANGEABLE MANUFACTURING ON THE NETWORK LEVEL	27
<i>M. Mikusz, D. Heber, C. Katzfuß, M. Monauni, T. Tauterat</i>	
CONTEXT MODEL DESIGN FOR A PROCESS-ORIENTED MANUFACTURING CHANGE MANAGEMENT	33
<i>Jonas Koch, Nicolas Michels, Gunther Reinhart</i>	
LONG-TERM CAPACITY PLANNING IN DIE MANUFACTURING USING THE ESTIMATED PRODUCT COST: AN EXPLORATORY RESEARCH	39
<i>Marius-Vasile Apostu, Julia Bendul</i>	
INTRODUCING FUNCTIONAL PRODUCTS IN PRODUCTION SYSTEMS: PROBLEMS AND ISSUES ENCOUNTERED	45
<i>John Lindström</i>	
IMPROVING DATA CONSISTENCY IN PRODUCTION CONTROL	51
<i>Christina Reuter, Felix Brambring</i>	
VALID METHODOLOGY FOR USING DISCRETE EVENT SIMULATION TO IMPROVE THE RESOURCE CONSUMPTION FOR THE MANUFACTURING OF MASONRY UNITS	57
<i>Toni Donhauser, Tobias Rackow, Johannes Hirschbrunn, Peter Schuderer, Jörg Franke</i>	
A COMPLEXITY BASED LOOK-AHEAD MECHANISM FOR SHOP FLOOR DECISION MAKING	63
<i>Minakshi Kumari, Makarand S. Kulkarni</i>	
IDENTIFICATION OF KEY MACHINES IN COMPLEX PRODUCTION NETWORKS	69
<i>Till Becker, Darja Wagner</i>	
MANUFACTURING LEAD TIME ESTIMATION WITH THE COMBINATION OF SIMULATION AND STATISTICAL LEARNING METHODS	75
<i>András Pfeiffer, Dávid Gyulai, Botond Kádár, László Monostori</i>	
THE LEAD TIME SYNDROME OF MANUFACTURING CONTROL: COMPARISON OF TWO INDEPENDENT RESEARCH APPROACHES	81
<i>Julia Bendul, Mathias Knollmann</i>	
FIXTURE CAPABILITY OPTIMISATION FOR EARLY-STAGE DESIGN OF ASSEMBLY SYSTEM WITH COMPLIANT PARTS USING NESTED POLYNOMIAL CHAOS EXPANSION	87
<i>Pasquale Franciosa, Salvatore Gerbino, Darek Ceglarek</i>	
ENABLERS FOR SELF-OPTIMIZING PRODUCTION SYSTEMS IN THE CONTEXT OF INDUSTRIE 4.0	93
<i>Malte Brettel, Felix Gabriel Fischer, David Bendig, Anja Ruth Weber, Bartholomäus Wolff</i>	
MANUFACTURING SYSTEM FLEXIBILITY: PRODUCT FLEXIBILITY ASSESSMENT	99
<i>Meriem Lafou, Luc Mathieu, Stéphane Pois, Marc Alochet</i>	

THE RELEVANCE OF MANUFACTURING FLEXIBILITY IN THE CONTEXT OF INDUSTRIE 4.0	105
<i>Malte Brettel, Manuel Klein, Niklas Friederichsen</i>	
OPTIMAL CONFIGURATION OF MANUFACTURING CELLS FOR HIGH FLEXIBILITY AND COST REDUCTION BY COMPONENT SUBSTITUTION	111
<i>Philipp Holtewert, Thomas Bauernhansl</i>	
INFLUENCE OF SHIFTS IN PRODUCTION PROGRAMS ON THE RESILIENCE OF PRODUCTION SYSTEMS	117
<i>Matthias Heinicke</i>	
A CONCEPT FOR A PALLET CONFIGURATION APPROACH USING ZERO-POINT CLAMPING SYSTEMS	123
<i>Stefania Pellegrinelli, Walter Terkaj, Marcello Urgo</i>	
STRATEGIC MANAGEMENT METHOD FOR THE INCUBATION PROCESS OF INDUSTRIAL COMPANIES: CASE STUDY OF THE TOOLING INDUSTRY IN BRAZIL	129
<i>Leone Peter Correia Da Silva Andrade, Cristiano Vasconcellos Ferreira, Rafaela Campos Da Silva, Jefferson De Oliveira Gomes</i>	
DISPATCHING RULE-BASED SCHEDULING ALGORITHMS IN A SINGLE MACHINE WITH SEQUENCE-DEPENDENT SETUP TIMES AND ENERGY REQUIREMENTS	135
<i>Yong-Chan Choi</i>	
APPROACHING THE DILEMMA BETWEEN PLAN AND VALUE IN COMPUTER AIDED ENGINEERING OF PRODUCTION MACHINES	141
<i>Denis Özdemir, Werner Herfs, Christian Brecher</i>	
CONTEXT-SENSITIVE ADAPTIVE PRODUCTION PROCESSES	147
<i>C. Timurhan Sungur, Uwe Breitenbücher, Frank Leymann, Matthias Wieland</i>	
TOWARDS DECISION-SUPPORT FOR RECONFIGURABLE MANUFACTURING SYSTEMS BASED ON COMPUTATIONAL DESIGN SYNTHESIS	153
<i>Johannes Unglert, Sipke Hoekstra, Juan Jauregui-Becker, Fred Van Houten</i>	
A FRAMEWORK FOR MULTI-LEVEL MODELING AND OPTIMIZATION OF MODULAR HIERARCHICAL SYSTEMS	159
<i>Tobias Wagner, Dirk Biermann</i>	
SUPPORT OF ENGINEERING CHANGES IN MANUFACTURING SYSTEMS BY PRODUCTION PLANNING AND CONTROL METHODS	165
<i>Daniel Cichos, Jan C. Aurich</i>	
THE TRANSFORMABLE FACTORY: ADAPTING AUTOMOTIVE PRODUCTION CAPACITIES	171
<i>Thomas Creutzmacher, Ulrich Berger, Raffaello Lepratti, Steffen Lamparter</i>	
PROPOSAL OF AN INNOVATIVE ENVIRONMENT FOR SUPPORTING PRODUCTION SCALE-UP, INCLUDING DESIGN, PROTOTYPING, MANUFACTURING, ASSEMBLY, TESTING, AND CERTIFICATION OF PRODUCTS THAT REQUIRE SPECIAL CONDITIONS	177
<i>Leone Peter Correia Da Silva Andrade, Rafaela Campos Da Silva, Luis Alberto Breda Mascarenhas, Jefferson De Oliveira Gomes, Flavio De Souza Marinho</i>	

ASSEMBLY SYSTEMS

ENTROPY BASED VERSUS COMBINATORIAL PRODUCT CONFIGURATION COMPLEXITY IN MASS CUSTOMIZED MANUFACTURING	183
<i>Vladimir Modrak, Slavomir Bednar</i>	
DRIVERS OF COMPLEXITY IN A FLEXIBLE ASSEMBLY SYSTEM- A CASE STUDY	189
<i>Narges Asadi, Mats Jackson, Anders Fundin</i>	
PERFORMANCE ASSESSMENT OF PRODUCTION SYSTEMS WITH MOBILE ROBOTS	195
<i>George Michalos, Niki Kousi, Sotiris Makris, George Chryssolouris</i>	
AN ANALYTICAL FRAMEWORK FOR HANDLING PRODUCTION TIME VARIETY AT WORKSTATIONS OF MIXED-MODEL ASSEMBLY LINES	201
<i>Stefan Keckl, Wolfgang Kern, Antoin Abou-Haydar, Engelbert Westkämper</i>	
REQUIREMENTS FOR THE DESIGN OF FLEXIBLE AND CHANGEABLE MANUFACTURING AND ASSEMBLY SYSTEMS: A SME-SURVEY	207
<i>Pasquale Russo Spena, Philipp Holzner, Erwin Rauch, Renato Vidoni, Dominik T. Matt</i>	
METHOD FOR EVALUATING MODULARIZATION POTENTIAL IN PRODUCT DESIGN BASED ON PRODUCTION TIME VARIETY	213
<i>Stefan Keckl, Antoin Abou-Haydar, Engelbert Westkämper</i>	

A MULTI-AGENT BASED CONSTRUCTION OF THE DIGITAL ECO-FACTORY FOR A PRINTED-CIRCUIT ASSEMBLY LINE	218
<i>Michiko Matsuda, Yasuhiro Sudo, Fumihiko Kimura</i>	
INTERACTIVE PLANNING OF MANUAL ASSEMBLY OPERATIONS: FROM LANGUAGE TO MOTION	224
<i>Stephan Busemann, Jörg Steffen, Erik Herrmann</i>	
CHANGEABLE ASSEMBLY SYSTEMS THROUGH FLEXIBLY LINKED PROCESS MODULES	230
<i>Petra Foith-Förster, Thomas Bauernhansl</i>	
RESOURCE EFFICIENT CONFIGURATION OF AN AIRCRAFT ASSEMBLY LINE.....	236
<i>Alessandra Caggiano, Adelaide Marzano, Roberto Teti</i>	
AUTOMATIC ASSEMBLING OF BEARINGS INCLUDING CLEARANCE MEASUREMENT	242
<i>Nicolas Meier, Anthimos Georgiadis</i>	
METHODOLOGY TOWARDS COMPUTER-AIDED TESTING OF COMPLEX MECHATRONIC SYSTEMS: A CASE STUDY ABOUT ASSEMBLING A TRAIN SYSTEM	247
<i>David Meinel, Paryanto, Jörg Franke</i>	
PLANNING OF MODULAR FIXTURES IN A ROBOTIC ASSEMBLY SYSTEM.....	252
<i>Hossein Tohidi, Tarek Algeddawy</i>	

SUSTAINABLE MANUFACTURING AND ENERGY EFFICIENCY

PRODUCT RECOVERY CONFIGURATION DECISIONS FOR ACHIEVING SUSTAINABLE MANUFACTURING.....	258
<i>Swee S. Kuik, Toshiya Kaihara, Nobutada Fujii</i>	
EXERGETIC CONTROL CHARTS (VARIABILITY ANALYSIS IN A REAL INJECTION-MOULDING INDUSTRIAL APPLICATION).....	264
<i>Michele Dassisti, Concetta Semeraro</i>	
APPLICATION POTENTIALS FOR AN ONTOLOGY-BASED INTEGRATION OF INTELLIGENT MAINTENANCE SYSTEMS AND SPARE PARTS SUPPLY CHAIN PLANNING.....	270
<i>Philipp Saalmann, Marcos Zuccolotto, Thiago Regal Da Silva, Carolin Wagner, Anderson Giacomolli, Bernd Hellgrath, Carlos Eduardo Pereira</i>	
SUSTAINABLE NETWORKS FOR WEEE TREATMENT: A CASE STUDY	276
<i>Rosanna Fornasiero, Carlo Brondi, Federico Fragassi</i>	
A FRAMEWORK FOR THE RESILIENT USE OF CRITICAL MATERIALS IN SUSTAINABLE MANUFACTURING SYSTEMS	282
<i>Liam Gardner, James Colwill</i>	
AN APPROACH TO INTEGRATE PARAMETERS AND INDICATORS OF SUSTAINABILITY MANAGEMENT INTO VALUE STREAM MAPPING	289
<i>Thomas Edtmayr, Alexander Sunk, Wilfried Sihn</i>	
REAL-TIME FAULT DETECTION FOR ADVANCED MAINTENANCE OF SUSTAINABLE TECHNICAL SYSTEMS.....	295
<i>Abderrahim Ait-Alla, Michael Lütjen, Marco Lewandowski, Michael Freitag, Klaus-Dieter Thoben</i>	
EFFECT OF CHANGING OPERATING POLICIES ON ENERGY USE CONSUMPTION	301
<i>Ahmed M. Marzouk, Hoda A. Elmaraghy, Waguih H. Elmaraghy</i>	
METHOD FOR ENERGY-EFFICIENT ASSEMBLY SYSTEM DESIGN WITHIN PHYSICS-BASED VIRTUAL ENGINEERING IN THE AUTOMOTIVE INDUSTRY.....	307
<i>Felix Damrath, Anton Strahilov, Thomas Bär, Michael Vielhaber</i>	
A NEW FRAMEWORK OF ENERGY-EFFICIENT MANUFACTURING SYSTEMS BASED ON ENERGY LOAD PROFILES.....	313
<i>Haruhiko Suwa, Tetsuo Samukawa</i>	
A STUDY ON ELECTRIC ENERGY CONSUMPTION OF MANUFACTURING COMPANIES IN THE GERMAN INDUSTRY WITH THE FOCUS ON ELECTRIC DRIVES.....	318
<i>Tallal Javied, Tobias Rackow, Roland Stankalla, Christian Sterk, Jörg Franke</i>	
FAST EXPERIMENTAL ENERGY CHARACTERIZATION OF A CONTROLLED ROTARY AXIS	323
<i>Jeremi Wójcicki, Stefano Borgia, Giacomo Bianchi</i>	
ENERGY VISUALIZATION TECHNIQUES FOR MACHINE TOOLS IN VIRTUAL REALITY	329
<i>Luigi Pelliccia, Philipp Klimant, Marco Schumann, Franziska Pürzel, Volker Wittstock, Matthias Putz</i>	
MULTI-PRODUCT EVSM SIMULATION	334
<i>Malte Schönemann, Denis Kurle, Christoph Herrmann, Sebastian Thiede</i>	

DIGITAL FACTORY, MODELLING AND SIMULATION

AN INTEGRATED ENVIRONMENT BASED ON AUGMENTED REALITY AND SENSING DEVICE FOR MANUAL ASSEMBLY WORKSTATIONS	340
<i>Michela Dalle Mura, Gino Dini, Franco Failli</i>	
DYNAMIC OPERATOR INSTRUCTIONS BASED ON AUGMENTED REALITY AND RULE-BASED EXPERT SYSTEMS	346
<i>Anna Syberfeldt, Oscar Danielsson, Magnus Holm, Lihui Wang</i>	
QUALIFICATION OF A COLLABORATIVE HUMAN-ROBOT WELDING CELL	352
<i>Dario Antonelli, Sergey Astanin</i>	
CAD TO VR – A METHODOLOGY FOR THE AUTOMATED CONVERSION OF KINEMATIC CAD MODELS TO VIRTUAL REALITY	358
<i>Mario Lorenz, Michael Spranger, Tino Riedel, Franziska Pürzel, Volker Wittstock, Philipp Klimant</i>	
FORMAL MODELLING OF MANUAL WORK PROCESSES FOR THE APPLICATION OF INDUSTRIAL SERVICE ROBOTICS	364
<i>André Hengstebeck, Kirsten Weisner, Maïke Klöckner, Jochen Deuse, Bernd Kuhlenkötter, Jürgen Roßmann</i>	
AUGMENTED REALITY (AR) APPLICATIONS FOR SUPPORTING HUMAN-ROBOT INTERACTIVE COOPERATION	370
<i>George Michalos, Panagiotis Karagiannis, Sotiris Makris, Önder Tokçalar, George Chryssolouris</i>	
AN UNCERTAINTY-BASED EVALUATION APPROACH FOR HUMAN-ROBOT-COOPERATION WITHIN PRODUCTION SYSTEMS	376
<i>Yi Shen, Stefanie Zastrow, Johannes Graf, Gunther Reinhart</i>	
PROPOSED DESIGN MODEL OF SINGLE USE BIOREACTOR FOR MESENCHYMAL STEM CELLS PROLIFERATION	382
<i>Rima Shah, Chintal Shah, Hong-Seok Park</i>	
ONLINE SIMULATION OF FLUIDS IN EARLY DESIGN	387
<i>Stefan Krottil, Gunther Reinhart</i>	
MODELLING DEPENDENCIES TO IMPROVE THE CROSS-DOMAIN COLLABORATION IN THE ENGINEERING PROCESS OF SPECIAL PURPOSE MACHINERY	393
<i>Tobias Helbig, Stefan Erler, Engelbert Westkämper, Johannes Hoos</i>	
AUTOMATED VENDOR SELECTION FOR INDUSTRIAL SERVICE SHARES	399
<i>Eckart Uhlmann, Nikolas Sawczyn, Niels Raue, Christian Gabriel</i>	
A PROCESS MODEL FOR THE ELECTROLYTE FILLING OF LITHIUM-ION BATTERIES	405
<i>Thomas Knoche, Florian Surek, Gunter Reinhart</i>	
SIMULATION APPROACH TO ENHANCE PRODUCTION SCHEDULING PROCEDURES AT A PHARMACEUTICAL COMPANY WITH LARGE PRODUCT MIX	411
<i>Hazem Kaylani, Anas M. Atieh</i>	
SELF-OPTIMIZING PRODUCTION SYSTEMS	417
<i>Eike Permin, Felix Bertelsmeier, Matthias Blum, Jennifer Büttler, Sebastian Haag, Sinem Kuz, Denis Özdemir, Sebastian Stemmler, Ulrich Thombansen, Robert Schmitt, Christian Brecher, Christopher Schlick, Dirk Abel, Reinhart Poprawe, Peter Loosen, Wolfgang</i>	
INFORMATION LINKS BETWEEN PRODUCT LIFE CYCLES AND PRODUCTION SYSTEM MANAGEMENT IN DESIGNING OF DIGITAL MANUFACTURING	423
<i>Andrey Kutin, Vitalii Dolgov, Mikhail Sedykh</i>	
PRELIMINARY EXTENSION TO ADDRESS LAW COMPLIANCE OF MANUFACTURING SYSTEMS	427
<i>Rhythm S. Wadhwa, Nancy Mead, Aron Alva</i>	

COGNITIVE SYSTEMS AND MANUFACTURING KNOWLEDGE

NEURAL NETWORKS TOOL CONDITION MONITORING IN SINGLE-POINT DRESSING OPERATIONS	431
<i>Doriana M. D'Addona, Davide Matarazzo, Paulo R. De Aguiar, Eduardo C. Bianchi, Cesar H. R. Martins</i>	
CYBERNETIC APPROACH FOR CONTROLLING TECHNOLOGY MANAGEMENT ACTIVITIES	437
<i>Günther Schuh, Linda Kramer</i>	
ENHANCING CONSTRAINT PROPAGATION IN ACO-BASED SCHEDULERS FOR SOLVING THE JOB SHOP SCHEDULING PROBLEM	443
<i>Ulrich Teschemacher, Gunther Reinhart</i>	

DESIGN PERFORMANCE ANALYSIS OF A SELF-ORGANIZING MAP FOR STATISTICAL MONITORING OF DISTRIBUTION-FREE DATA STREAMS	448
<i>Massimiliano Di Mauro, Matteo F. Maggioni, Marco Grasso, Bianca Maria Colosimo</i>	
A FEATURE-BASED CONCEPT FOR DECISION SUPPORT TO COPE WITH PRODUCT VARIETY	454
<i>Clemens Haussmann, Hans-Georg Kemper</i>	
SIMULTANEOUS WORKLOAD ALLOCATION AND CAPACITY DIMENSIONING FOR DISTRIBUTED PRODUCTION CONTROL	460
<i>Henning Blunck, Dieter Armbruster, Julia Bendul</i>	
COGNITIVE DECISION-MAKING SYSTEMS FOR SCRAPS CONTROL IN AEROSPACE TURBINE BLADE CASTING	466
<i>Davide Matarazzo, Doriana M. D'Addona, Ciro Caramiello, Michele Di Foggia, Roberto Teti</i>	
AN INFERENCE-BASED KNOWLEDGE REUSE FRAMEWORK FOR HISTORICAL PRODUCT AND PRODUCTION INFORMATION RETRIEVAL	472
<i>Dimitris Mourtzis, Michael Doukas, Christos Giannoulis</i>	
SEMANTIC INFORMATION MODELLING FOR FACTORY PLANNING PROJECTS	478
<i>Christian Büscher, Hanno Voet, Moritz Krunke, Peter Burggräf, Tobias Meisen, Sabina Jeschke</i>	
CONTEXT-AWARENESS: A KEY ENABLER FOR UBIQUITOUS ACCESS TO MANUFACTURING KNOWLEDGE	484
<i>Mohamed Anis Dhuieb, Florent Laroche, Alain Bernard</i>	
INTRODUCING CUSTOMIZED ICT FOR OPERATORS IN MANUFACTURING	490
<i>Magnus Åkerman, Åsa Fast-Berglund, Malin Karlsson, Johan Stahre</i>	
CONTINUOUS INTEGRATION OF FIELD LEVEL PRODUCTION DATA INTO TOP-LEVEL INFORMATION SYSTEMS USING THE OPC INTERFACE STANDARD	496
<i>Max Hoffmann, Christian Büscher, Tobias Meisen, Sabina Jeschke</i>	
USING LINKED DATA WITH INFORMATION STANDARDS FOR INTEROPERABILITY IN PRODUCTION ENGINEERING	502
<i>Navid Shariatzadeh, Didem Gurdur, Jad El-Khoury, Lars Lindberg, Gunilla Sivard</i>	

SUPPLY CHAINS AND PRODUCTION NETWORKS

OPTIMIZATION OF MULTI-PERIOD BILEVEL SUPPLY CHAINS UNDER DEMAND UNCERTAINTY	508
<i>Tatsushi Nishi, Okihiko Yoshida</i>	
DEVELOPMENT AND APPLICATION OF A MATURITY MEASUREMENT FRAMEWORK FOR SUPPLY CHAIN FLEXIBILITY	514
<i>Jan-Hendrik Fischer, Antônio Márcio T. Thomé, Luiz Felipe Scavarda, Bernd Hellgrath, Roberto Martins</i>	
EMERGENCE OF NON-PREDICTABLE DYNAMICS CAUSED BY SHARED RESOURCES IN PRODUCTION NETWORKS	520
<i>Mirko Kück, Till Becker, Michael Freitag</i>	
TOWARDS AN OPTIMAL ORDER PLANNING IN GLOBAL SUPPLY CHAIN	526
<i>Shota Suginochi, Toshiya Kaihara, Nobutada Fujii, Satoshi Yoshida, Yasutaka Koga</i>	
GLOBAL PRODUCTION NETWORKS – AN APPROACH TO FIND THE OPTIMAL OPERATING POINT IN THE CONFLICT BETWEEN RISK- AND COST-MINIMIZATION	532
<i>Christina Reuter, Jan-Philipp Prote, Carsten Witthohn</i>	
BEST PRACTICE SHARING FOR COMPLEXITY MANAGEMENT IN SUPPLY CHAINS OF THE SEMICONDUCTOR INDUSTRY	538
<i>Can Sun, Thomas Rose, Hans Ehm, Tobias Herbig</i>	
SUPPLY CHAIN DEVELOPMENT – MODEL, OPPORTUNITIES, AND CHALLENGES	544
<i>Leone Peter Correia Da Silva Andrade, Cristiano Vasconcellos Ferreira, Luc De Ferran, Lars Ziegler, Jefferson De Oliveira Gomes, Luciano Pisanu, Rafaela Campos Da Silva</i>	

LOGISTICS SYSTEMS

AUTOMATIC ROUTE-FINDING WITH NON-MONOTONIC-TREND FACTOR FOR LARGE-SCALE PLANT MAINTENANCE TASK	550
<i>Alice Okabe, Atsuko Enomoto, Norisuke Fuji, Yoichi Nonaka, Juergen Rasch, Sonja Schulte, Michael Engelhardt, Joerg Kolibabka</i>	
PLANNING METHOD FOR THE DESIGN OF FLEXIBLE AS WELL AS ECONOMIC ASSEMBLY AND LOGISTICS PROCESSES IN THE AUTOMOTIVE INDUSTRY	556
<i>Christian Küber, Engelbert Westkämper, Bernd Keller, Hans-Friedrich Jacobi</i>	

OVERALL COMMISSIONING EFFECTIVENESS: SYSTEMATIC IDENTIFICATION OF VALUE-ADDED SHARES IN MATERIAL SUPPLY	562
<i>Siri Adolph, Patrick Kübler, Joachim Metternich, Eberhard Abele</i>	
PERFORMANCE IMPROVEMENT OF INVENTORY MANAGEMENT SYSTEM PROCESSES BY AN AUTOMATED WAREHOUSE MANAGEMENT SYSTEM	568
<i>Anas M. Arieh, Hazem Kaylani, Yousef Al-Abdallat, Abeer Qaderi, Luma Ghoul, Lina Jaradat, Iman Hdairis</i>	

PART 2

EXACT METHOD FOR THE VEHICLE ROUTING PROBLEM WITH MIXED LINEHAUL AND BACKHAUL CUSTOMERS, HETEROGENEOUS FLEET, TIME WINDOW AND MANUFACTURING CAPACITY	573
<i>Jonathan Oesterle, Thomas Bauernhansl</i>	
IMPACT OF RESOURCE SHARING IN MANUFACTURING ON LOGISTICAL KEY FIGURES	579
<i>Till Becker, Hendrik Stern</i>	
THE BENEFIT OF INTEGRATING PRODUCTION AND TRANSPORT SCHEDULING	585
<i>Jens Ehm, Michael Freitag</i>	

LEAN MANUFACTURING

THE PIVOTING PROBLEM OF LEAN	591
<i>Halvor Holtskog, Kristian Martinsen, Torbjørn Skogsrød, Geir Ringen</i>	
DEVELOPMENT OF DESIGN SUPPORT TOOL FOR NEW LEAN PRODUCTION SYSTEMS	596
<i>W. De Kogel Ir., J. M. Jauergui Becker Ir.</i>	
IMPROVING LEAN DESIGN OF PRODUCTION SYSTEMS BY VISUALIZATION SUPPORT	602
<i>Erik Lindskog, Johan Vallhagen, Jonatan Berglund, Björn Johansson</i>	
VARIATION MODELING OF LEAN MANUFACTURING PERFORMANCE USING FUZZY LOGIC BASED QUANTITATIVE LEAN INDEX	608
<i>Omogbai Oleghe, Konstantinos Salonitis</i>	
LEAN HOSPITALITY - APPLICATION OF LEAN MANAGEMENT METHODS IN THE HOTEL SECTOR	614
<i>Erwin Rauch, Andreas Damian, Philipp Holzner, Dominik T. Matt</i>	
ENABLING RADICAL INNOVATION THROUGH HIGHLY ITERATIVE PRODUCT EXPEDITION IN RAMP UP AND DEMONSTRATION FACTORIES	620
<i>Günther Schuh, Thomas Gartzzen, Felix Basse, Elisabeth Schrey</i>	
LIFE CYCLE ANALYSIS: COMPARISON BETWEEN DIFFERENT METHODS AND OPTIMIZATION CHALLENGES	626
<i>Panagiotis Stavropoulos, Christos Giannoulis, Alexios Papacharalampopoulos, Panagis Foteinopoulos, George Chryssolouris</i>	

CLOUD MANUFACTURING AND CYBER PHYSICAL SYSTEMS

ENGINEERING APPS FOR ADVANCED INDUSTRIAL ENGINEERING	632
<i>Johannes W. Volkmann, Martin Landherr, Dominik Lucke, Marco Sacco, Michael Lickefett, Engelbert Westkämper</i>	
CHARACTERIZATION OF CYBER-PHYSICAL SENSOR SYSTEMS	638
<i>Christoph Berger, Andreas Hees, Stefan Braunreuther, Gunther Reinhart</i>	
A CLOUD SERVICE CONTROL APPROACH FOR DISTRIBUTED AND ADAPTIVE EQUIPMENT CONTROL IN CLOUD ENVIRONMENTS	644
<i>Göran Adamson, Magnus Holm, Philip Moore, Lihui Wang</i>	
A CLOUD-BASED SYSTEM TO PROTECT AGAINST INDUSTRIAL MULTI-RISK EVENTS	650
<i>Giuseppe Stecca, Antonio Puliafito, Marco Simonetti, Guido Mariotta, Pierluigi Sciuto</i>	
A CLOUD-BASED APPROACH FOR MAINTENANCE OF MACHINE TOOLS AND EQUIPMENT BASED ON SHOP-FLOOR MONITORING	655
<i>Dimitris Mourtzis, Ekaterini Vlachou, Nikolaos Milas, Nikitas Xanthopoulos</i>	
CLOUD-BASED JOB DISPATCHING USING MULTI-CRITERIA DECISION MAKING	661
<i>Nikolaos Tapoglou, Jörn Mehen</i>	

QUALITY MANAGEMENT

A HOLISTIC APPROACH FOR PLANNING AND ADAPTING QUALITY INSPECTION PROCESSES BASED ON ENGINEERING CHANGE AND KNOWLEDGE MANAGEMENT	667
<i>Jan Kukulies, Bjoern Falk, Robert Schmitt</i>	
PLANNING SUPPORT FOR THE DESIGN OF QUALITY CONTROL STRATEGIES IN GLOBAL PRODUCTION NETWORKS	675
<i>Tobias Arndt, Gisela Lanza</i>	
DEVELOPMENT OF A CONCEPTUAL FRAMEWORK TO ASSESS PRODUCIBILITY FOR FABRICATED AEROSPACE COMPONENTS	681
<i>Julia Madrid, Rikard Söderberg, Johan Vallhagen, Kristina Wärmeffjord</i>	
CALCULATING THE WORKPIECE QUALITY USING A HOBBIING SIMULATION	687
<i>Fritz Klocke, Christian Brecher, Christoph Löpenhaus, Markus Krömer</i>	
IMPROVING A GAME-BASED EDUCATION TOOL FOR QUALITY MANAGEMENT IN PRODUCTION NETWORKS	692
<i>Marco Fuhrmann, Daniel Frank, Björn Falk, Robert Schmitt</i>	
ON THE TRADE-OFF BETWEEN DATA DENSITY AND DATA CAPTURE DURATION IN 3D LASER SCANNING FOR PRODUCTION SYSTEM ENGINEERING	697
<i>Jonatan Berglund, Erik Lindskog, Björn Johansson</i>	

SENSOR SYSTEMS AND DATA PROCESSING

ERGONOMIC ASSESSMENT FOR DHM SIMULATIONS FACILITATED BY SENSOR DATA	702
<i>Dan Gläser, Lars Fritzsche, Sebastian Bauer, Vipin Jayan Sylaja</i>	
SENSING UNCERTAINTY EVALUATION FOR PRODUCT QUALITY	706
<i>Peng Wang, Robert X. Gao, Xinyao Tang, Zhaoyan Fan</i>	
DISTRIBUTABLE MODULAR SOFTWARE FRAMEWORK FOR MANUFACTURING SYSTEMS	712
<i>Jan Papadoudis, Anthimos Georgiadis</i>	
IMPROVED SIGNAL CHARACTERIZATION VIA EMPIRICAL MODE DECOMPOSITION TO ENHANCE IN-LINE QUALITY MONITORING	717
<i>Andrea Carroccia, Marco Grasso, Matteo Maggioni, Bianca M. Colosimo</i>	
THE EFFECT OF COMMUNICATIONS ON NETWORKED MONITORING AND CONTROL OF MANUFACTURING PROCESSES	723
<i>Alexios Papacharalampopoulos, Panagiotis Stavropoulos, John Stavridis, George Chryssolouris</i>	
MONITORING AND SOURCE TRACING OF MACHINING ERROR BASED ON BUILT-IN SENSOR SIGNAL	729
<i>Xinping Xu, Tao Tao, Gedong Jiang, Xiaoyong Huang, Runqing Liu, Lei Liu</i>	
MONITORING AND CONTROL OF MANUFACTURING PROCESS TO ASSIST THE SURFACE WORKPIECE QUALITY WHEN DRILLING	735
<i>Marek Vrabel, Ildikó Manková, Jozef Beno</i>	

MOTION TRACKING AND VISION SYSTEMS

EXOSKELETON-CENTERED PROCESS OPTIMIZATION IN ADVANCED FACTORY ENVIRONMENTS	740
<i>Carmen Constantinescu, Daniela Popescu, Paul-Cristian Muresan, Sebastian-Ioan Stana</i>	
JOINT ANGLE DATA REPRESENTATION FOR DATA DRIVEN HUMAN MOTION SYNTHESIS	746
<i>Han Du, Martin Manns, Erik Herrmann, Klaus Fischer</i>	
MOTION PARAMETERS IDENTIFICATION FOR THE AUTHORIZING OF MANUAL TASKS IN DIGITAL HUMAN SIMULATIONS: AN APPROACH USING SEMANTIC MODELLING	752
<i>George Pintzos, Nikolaos Nikolakis, Kosmas Alexopoulos, George Chryssolouris</i>	
ON THE USE OF MULTI-DEPTH-CAMERA BASED MOTION TRACKING SYSTEMS IN PRODUCTION PLANNING ENVIRONMENTS	759
<i>Florian Geiselhart, Michael Otto, Enrico Rukzio</i>	
ANALYSIS OF CAMERA CALIBRATION WITH RESPECT TO MEASUREMENT ACCURACY	765
<i>Oleksandr Semeniuta</i>	

SAFE AND AUTOMATED ASSEMBLY PROCESS USING VISION ASSISTED ROBOT MANIPULATOR.....	771
<i>Rafiq Ahmad, Peter Plapper</i>	
A NEW STRAIGHT LINE MATCHING TECHNIQUE BY INTEGRATION OF VISION-BASED IMAGE PROCESSING	777
<i>Kanuengnit Patoommakesorn, Frédéric Vignat, François Villeneuve</i>	

MACHINE TOOLS

MULTI-LEVEL ENERGY DEMAND OPTIMIZER SYSTEM FOR MACHINE TOOL CONTROLS.....	783
<i>Jan Schlechtendahl, Philipp Eberspächer, Philipp Schraml, Alexander Verl, Eberhard Abele</i>	
A REAL-TIME COLLISION PREVENTION SYSTEM FOR MACHINE TOOLS (PART II)	789
<i>Marco Schumann, Marco Witt, Philipp Klimant</i>	
EXPERIMENTAL AND ANALYTICAL INVESTIGATIONS ON NORMAL AND ANGULAR STIFFNESS OF LINEAR GUIDES IN MANUFACTURING SYSTEMS	795
<i>Mahdi Rahmani, Friedrich Bleicher</i>	
CHARACTERISTIC DIAGRAM BASED CORRECTION ALGORITHMS FOR THE THERMO- ELASTIC DEFORMATION OF MACHINE TOOLS	801
<i>Christian Naumann, Ilka Riedel, Steffen Ihlenfeldt, Ulrich Priber</i>	
APPLICATION OF AN IMPROVED PSO ALGORITHM TO CONTROL PARAMETERS AUTO- TUNING FOR BI-AXIAL SERVO FEED SYSTEM	806
<i>Xiaoyong Huang, Dong Zhang, Bin Feng, Xin Xu, Shi Guo, Run Liu</i>	
APPROACH FOR A GENERAL POSE-DEPENDENT MODEL OF THE DYNAMIC BEHAVIOR OF LARGE LIGHTWEIGHT MACHINE TOOLS FOR VIBRATION REDUCTION	812
<i>Stefanie Apprich, Frederik Wulle, Armin Lechler, Andreas Pott, Alexander Verl</i>	
EXPERIMENTAL AND NUMERICAL STUDIES OF THE INFLUENCE OF GEOMETRIC DEVIATIONS IN THE PERFORMANCE OF MACHINE TOOLS LINEAR GUIDES	818
<i>Mahdi Rahmani, Friedrich Bleicher</i>	

MACHINING

MACHINING ACCURACY ON CNC LATHES UNDER THE LACK OF UNITY OF THE PROCESS AND DESIGN DATA.....	824
<i>Dimitar Dimitrov, Tamas Szecsi</i>	
ENVIRONMENTALLY FRIENDLY TECHNOLOGICAL SYSTEM OF CUTTING USING MAGNETIC MICROCAPSULES AND CUTTING TOOLS WITH NANOSCALE COMPOSITE COATING	829
<i>G. Naumov Alexander, A. Vereschaka Alexey, D. Batako Andre, S. Vereschaka Anatoly</i>	
INVESTIGATION OF COOLING AND LUBRICATION STRATEGIES FOR MACHINING HIGH- TEMPERATURE ALLOYS.....	835
<i>Katja Busch, Carsten Hochmuth, Bernhard Pause, Andrea Stoll, Rafael Wertheim</i>	
ANALYSIS OF SURFACE ROUGHNESS IN HARD TURNING USING WIPER INSERT GEOMETRY	841
<i>D. M. D'Addona, Sunil J. Raykar</i>	
MACHINING WITH INTERNALLY COOLED TOOLHOLDER USING A PHASE CHANGE FLUID.....	847
<i>Luiç Eduardo De Angelo Sanchez, Rubens Roberto Ingraci Neto, Renan Luis Fragelli, Carlos Elias Da Silva Junior, Vicente Luiç Scalon</i>	
CLOSED-LOOP MANUFACTURING, A STEP-NC PROCESS FOR DATA FEEDBACK: A CASE STUDY	852
<i>Christophe Danjou, Julien Le Duigou, Benoît Eynard</i>	
THE CONTROL PLATFORM FOR DECOMPOSITION AND SYNTHESIS OF SPECIALIZED CNC SYSTEMS	858
<i>Sergej N. Grigoriev, Georgi M. Martinov</i>	
ANALYSIS AND DESIGN OF COMPUTERIZED NUMERICAL CONTROLS FOR EXECUTION ON MULTI-CORE SYSTEMS	864
<i>José María Vivanco, Matthias Keinert, Armin Lechler, Alexander Verl</i>	
OPTIMIZATION METHOD FOR DOUBLE-SIDED POLISHING PROCESS BASED ON KINEMATICAL ANALYSIS.....	870
<i>Urara Satake, Toshiyuki Enomoto, Keitaro Fujii, Kenji Hirose</i>	

PROCESS CONCEPTS FOR GEAR FINISH HOBGING	875
<i>Fritz Klocke, Christoph Löpenhaus, Deniz Sari</i>	
AN ECONOMICAL APPROACH TO STOP AN EXPERIMENTAL CAMPAIGN WITH THE AIM OF REDUCING COST	881
<i>Alessia Beretta, Stefania Cacace, Quirico Semeraro</i>	
ANALYSIS OF RESPONSE VARIABLES IN WEDM OF INCONEL 718 USING TAGUCHI TECHNIQUE	886
<i>U. A. Dabade, S. S. Karidkar</i>	
PROCESS BEHAVIOUR OF SUPER-HARD CUTTING MATERIALS FOR MACHINING MINERAL CAST	892
<i>Eckart Uhlmann, Felix Kaulfersch</i>	
METHODOLOGY TO PREDICT THE SHAPE OF THE TOOL FABRICATED BY AWJM PROCESS	898
<i>Mrigank Singh, Vijay Kumar Pal, Sounak Kumar Choudhury</i>	
DESIGN OF ACOUSTICAL OPTIMIZED BEVEL GEARS USING MANUFACTURING SIMULATION	902
<i>Christian Brecher, Christoph Löpenhaus, Peter Knecht</i>	
ASCERTAINING LIFE CYCLE INVENTORY DATA FOR ELECTRICAL DISCHARGE MACHINING	908
<i>Janaka R. Gamage, Anjali K. M. Desilva, Colin Harrison, David Harrison</i>	
EXPERIMENTAL STUDY OF SURFACE INTEGRITY OF AL/SIC PARTICULATE METAL-MATRIX COMPOSITES IN HOT MACHINING	914
<i>U. A. Dabade, M. R. Jadhav</i>	

EC FP7 PROJECTS: REALISM AND INTERACT

REAL TIME MONITORING OF THE CNC PROCESS IN A PRODUCTION ENVIRONMENT-THE DATA COLLECTION & ANALYSIS PHASE	920
<i>Jonathan Downey, Denis O'Sullivan, Mirosław Nejmen, Sebastian Bombinski, Paul O'Leary, Ramesh Raghavendra, Krzysztof Jemielniak</i>	
ONLINE PREDICTION OF CUTTING TOOL LIFE IN TURNING VIA COGNITIVE DECISION MAKING	927
<i>Sara Karam, Piera Centobelli, Doriana M. D'Addona, Roberto Teti</i>	
HUMAN-MACHINE INTERFACE FOR ARTIFICIAL NEURAL NETWORK BASED MACHINE TOOL PROCESS MONITORING	933
<i>Kristian Martinsen, Jonathan Downey, Ivanna Baturynska</i>	
MULTI SENSOR SIGNAL PROCESSING FOR CATASTROPHIC TOOL FAILURE DETECTION IN TURNING	939
<i>Vittorio Balsamo, Alessandra Caggiano, Krzysztof Jemielniak, Joanna Kossakowska, Mirosław Nejman, Roberto Teti</i>	
MEASURING MOTION CAPTURE DATA QUALITY FOR DATA DRIVEN HUMAN MOTION SYNTHESIS	945
<i>Martin Manns, Michael Otto, Markus Mauer</i>	
LIGHT-RESPONSIVE RFID TAGS FOR PRECISE LOCATING OF OBJECTS IN MANUAL ASSEMBLY VERIFICATION WORKSHOPS	951
<i>Bartłomiej Gladysz, Cezary Lysiak</i>	
ERGONOMIC ANALYSIS IN MANUFACTURING PROCESS. A REAL TIME APPROACH	957
<i>Enrico Del Fabbro, Daria Santarossa</i>	

LASER MANUFACTURING

TECHNICAL FEASIBILITY OF LASER DISSIMILAR WELDING OF SUPERALLOYS ON CASTED NOZZLE GUIDE VANES	963
<i>Fabrizia Caiazzo, Vittorio Alfieri, Vincenzo Sergi, Andrea Tartaglia, Michele Di Foggia, Antonio Niola</i>	
ON THE PERFORMANCE EVALUATION OF REMOTE LASER WELDING PROCESS: AN AUTOMOTIVE CASE STUDY	969
<i>Apostolos Fysikopoulos, George Pastras, John Stavridis, Panagiotis Stavropoulos, George Chryssolouris</i>	
LASER MARKING OF TITANIUM COATING FOR AEROSPACE APPLICATIONS	975
<i>C. Velotti, A. Astarita, C. Leone, S. Genna, F. Memola Capece Minutolo, A. Squillace</i>	

PREDICTION OF POLY-METHYL-METHACRYLATE LASER MILLING PROCESS CHARACTERISTICS BASED ON NEURAL NETWORKS AND FUZZY DATA	981
<i>Doriana M. D'Addona, Silvio Genna, Claudio Leone, Davide Matarazzo</i>	
LASER REMELTING FOR ENHANCING TRIBOLOGICAL PERFORMANCES OF A DUCTILE IRON.....	987
<i>N. Pagano, V. Angelini, L. Ceschini, G. Campana</i>	
FEM ANALYSIS OF FIBER LASER WELDING OF TITANIUM AND ALUMINUM	992
<i>Giuseppe Casalino, Michelangelo Mortello, Patrice Peyre</i>	
AN APPROACH TO BUILDING A SPECIALIZED CNC SYSTEM FOR LASER ENGRAVING MACHINING	998
<i>Georgi M. Martinov, Aleksandr I. Obuhov, Lilija I. Martinova, Anton S. Grigoriev</i>	

ADDITIVE MANUFACTURING AND COMPOSITE MATERIALS

ADDITIVE MANUFACTURING OFFERS NEW OPPORTUNITIES IN UAV RESEARCH	1004
<i>Carlo Ferro, Roberto Grassi, Carlo Seclì, Paolo Maggiore</i>	
ADJUSTING THE FACTORY PLANNING PROCESS WHEN USING IMMATURE TECHNOLOGIES.....	1011
<i>Robin Kopf, Lorena Schlesinger, Steven Peters, Gisela Lanza</i>	
COMPENSATING WARPAGE OF 3D PRINTED PARTS USING FREE-FORM DEFORMATION.....	1017
<i>Christoph Schmutzler, Alexander Zimmermann, Michael F. Zaeh</i>	
MACHINING OF THIN-WALLED PARTS PRODUCED BY ADDITIVE MANUFACTURING TECHNOLOGIES.....	1023
<i>Isaev Alexander, Grechishnikov Vladimir, Pivkin Petr, Kozochkin Mihail, Ilyuhin Yuriy, Vorotnikov Andrey</i>	
BENCHMARKING OF FDM MACHINES THROUGH PART QUALITY USING IT GRADES.....	1027
<i>Paolo Minetola, Luca Iuliano, Giovanni Marchiandi</i>	
FLUID-BASED REMOVAL OF INNER SUPPORT STRUCTURES MANUFACTURED BY FUSED DEPOSITION MODELING: AN INVESTIGATION ON FACTORS OF INFLUENCE	1033
<i>Mario Lušić, Frank Feuerstein, Driton Morina, Rüdiger Hornfeck</i>	
COMPOSITE MANUFACTURING DATA MANAGEMENT IN AEROSPACE INDUSTRY	1039
<i>Erdal Tekin, Özge Kapan</i>	
GAME THEORETIC ANALYSIS OF EXCLUSIVE CONTRACT FOR CARBON FIBER REINFORCED PLASTIC IN THE AVIATION INDUSTRY	1043
<i>Kenju Akai, Kazuma Sakamoto, Nariaki Nishino, Kazuro Kageyama</i>	
MULTI-LEVEL MODELING AND SIMULATION OF MANUFACTURING SYSTEMS FOR LIGHTWEIGHT AUTOMOTIVE COMPONENTS	1049
<i>Malte Schönemann, Christopher Schmidt, Christoph Herrmann, Sebastian Thiede</i>	
ADVANCED ULTRASONIC NON-DESTRUCTIVE EVALUATION FOR METROLOGICAL ANALYSIS AND QUALITY ASSESSMENT OF IMPACT DAMAGED NON-CRIMP FABRIC COMPOSITES.....	1055
<i>Tiziana Segreto, Alberto Bottillo, Roberto Teti</i>	

FORMING AND CASTING

A NUMERICAL AND ANALYTICAL METHOD BASED ON ENERGETIC CRITERION TO DESIGN AND OPTIMIZE THE PROCESS PARAMETERS FOR AN AUTOMOTIVE COMPONENT.....	1061
<i>Antonello D'Annibale, Antoniomaria Di Ilio, Michele Trozzi, Luigi Bonaventura</i>	
EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF PUNCH VELOCITY ON THE SPRINGBACK BEHAVIOR AND THE FLAT LENGTH IN FREE BENDING	1066
<i>Michael Krinninger, Daniel Opritescu, Roland Golle, Wolfram Volk</i>	
PHYSICS-DRIVEN SHAPE VARIATION MODELLING AT EARLY DESIGN STAGE.....	1072
<i>Abhishek Das, Pasquale Franciosa, David Williams, Darek Ceglarek</i>	
DETERMINING THE INFLUENCE OF SHEAR CUTTING PARAMETERS ON THE EDGE CRACKING SUSCEPTIBILITY OF HIGH-STRENGTH-STEELS USING THE EDGE-FRACTURE-TENSILE-TEST	1078
<i>Martin Feistle, Roland Golle, Wolfram Volk</i>	
AN AGILE INFORMATION PROCESSING FRAMEWORK FOR HIGH PRESSURE DIE CASTING APPLICATIONS IN MODERN MANUFACTURING SYSTEMS	1084
<i>Michael Rix, Bernd Kujat, Tobias Meisen, Sabina Jeschke</i>	

EFFICIENT PARAMETERIZED CHARACTERIZATION OF MANUFACTURING STRATEGIES FOR AUTOMATED COPIED DRIVING.....	1090
<i>Daniel Opritescu, Christoph Hartmann, Wolfram Volk</i>	

EDUCATION AND HUMAN FACTORS

SELECTION OF ICT-TOOLS FOR MANUFACTURING EDUCATION.....	1096
<i>Nina Tvenge, Kristian Martinsen</i>	
WHY I WANT TO BE A FUTURE SWEDISH SHOP-FLOOR OPERATOR	1101
<i>Magnus Holm, Göran Adamson, Philip Moore, Lihui Wang</i>	
DESIGN FOR SAFETY: PROPOSITION OF A MODEL TO DETECT HAZARDS THROUGH ENERGY FLOWS ANALYSIS.....	1107
<i>Nicholas De Galvez, Jacques Marsot, Patrick Martin, Ali Siadat, Alain Etienne, Xavier Godot</i>	
WORKER INFORMATION SYSTEMS: STATE OF THE ART AND GUIDELINE FOR SELECTION UNDER CONSIDERATION OF COMPANY SPECIFIC BOUNDARY CONDITIONS	1113
<i>Mario Lušic, Christian Fischer, Jochen Böning, Rüdiger Hornfeck, Jörg Franke</i>	
BARRIERS TO CONTINUOUS IMPROVEMENT: PERCEPTIONS OF TOP MANAGERS, MIDDLE MANAGERS AND WORKERS	1119
<i>Eirin Lodgaard, Jonas A. Ingvaldsen, Silje Aschehoug, Inger Gamme</i>	
DIGITALISATION OF MEETINGS – FROM WHITE-BOARDS TO SMART-BOARDS	1125
<i>Åsa Fast-Berglund, Ulrika Harlin, Magnus Åkerman</i>	
Author Index	