



PROGRAMME CHAIRS

P. JOHN CLARKSON
University of Cambridge

UDO LINDEMANN
Technical University of Munich

TIM MCALOONE
Technical University of Denmark

CHRISTIAN WEBER
Technical University of Ilmenau

DORIAN MARJANOVIĆ
*University of Zagreb
Faculty of Mechanical Engineering
and Naval Architecture*

excellence in design

15TH INTERNATIONAL DESIGN CONFERENCE
MAY, 21 - 24, 2018 - DUBROVNIK, CROATIA

All the papers submitted for the DESIGN 2018 conference have been reviewed by at least two members of the Scientific Advisory Board.

Authors were asked to submit manuscripts electronically. In some instances, the layout of the manuscripts has been redone where the layout did not correspond to the conference manuscript style standard. The readers are therefore asked to excuse any deficiencies that may have arisen due to the above. If you have any difficulty interpreting the text or diagrams, please contact the corresponding author of the article directly.

The publisher and authors state that these proceedings have been compiled meticulously and to the best of their knowledge, however, the publisher and authors can in no way guarantee the accuracy or completeness of the information. The publishers and authors, therefore, do not accept any liability for any damage resulting from actions or decisions based on the information in the question. Users of these proceedings are strongly advised not to use this information solely, but to rely on their professional knowledge and experience, and to check the information to be used. The DESIGN 2018 Secretariat cannot guarantee the accuracy of information provided by participating companies and authorities. The publisher reserves the right to combine, delete and change sections, to edit and re-use (parts of) the proceedings and to distribute the information by any means.

This publication is copyright under the Berne Convention and International Copyright convention. All rights reserved. Apart from any fair dealing for the purpose of private study, research, criticism or review, as permitted under the DESIGN 2018 Conference Copyright and Licensed Agreement, Designs and Patents Act of 1988, no part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, electrical, chemical, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright owners. Unlicensed multiple copying of the contents of this publication is illegal. Abstracting and non-profit use of this material is permitted with a credit to the source.

Authors may self-archive their articles on their own websites or the repositories of their academic institutions, provided the source is credited and a link made to www.designsociety.org. All enquiries should be addressed to The DESIGN 2018 Secretariat.

DESIGN 2018 – PROCEEDINGS

ISSN 1847-9073

Editors:

Dorian Marjanović
Mario Štorga
Stanko Škec
Nenad Bojčetić
Neven Pavković

© 2018 Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Croatia

Published by:

Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb
The Design Society, Glasgow

DESIGN conference is endorsed event by the Design Society.
The Design Society is a charitable body, registered in Scotland, number SC031694.
Registered Company Number: SC401016

Technical Support:

CADLab – FSB, University of Zagreb
www.cadlab.fsb.hr

cad lab

Conference organizing team:

Dorian Marjanović (chair), Mario Štorga, Stanko Škec, Neven Pavković, Nenad Bojčetić,
Tomislav Martinec, Marija Majda Perišić, Jasmin Juranić, Filip Valjak, Nikola Horvat, Lucijan Stamać,
Vlasta Klaić, Dragan Žeželj, Daniel Miler
University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture

Design: Gordana Radaković; Excedo d.o.o., www.excedo.hr 

Print: Sveučilišna tiskara, Zagreb, 2018.



excellence in design

15TH INTERNATIONAL DESIGN CONFERENCE
MAY, 21 - 24, 2018 - DUBROVNIK, CROATIA

www.designconference.org

is organised
Under the auspices of
Ministry of Science and Education
of the Republic of Croatia

by



FSB

University of Zagreb
Faculty of Mechanical Engineering
and Naval Architecture



in co-operation with
HDESC - Croatian Society for
Mechanical Engineering Design

Sponsored by:
DASSAULT SYSTÈMES
CADCAM group
Print Studio d.o.o.

Co-sponsors:
EAG Centar d.o.o.
HSM informatika d.o.o.
RENAULT NISSAN HRVATSKA d.o.o.
Toyota centar Zagreb d.o.o.



SCIENTIFIC ADVISORY BOARD

- Achiche Sofiane**, Ecole Polytechnique de Montreal, Canada
Adams Robin, Purdue University, United States of America
Agogino Alice, University of California, Berkeley, United States of America
Ahmed-Kristensen Saeema, Royal College of Art, United Kingdom
Albers Albert, Karlsruhe Institute of Technology, Germany
Allais Romain, APESA, France
Almfelt Lars, Chalmers University of Technology, Sweden
Anderl Reiner, Technische Universität Darmstadt, Germany
Andersson Kjell, KTH Royal Institute of Technology, Sweden
Atherton Mark Anthony, Brunel University London, United Kingdom
Badke-Schaub Petra, Delft University of Technology, Netherlands
Barone Sandro, Università di Pisa, Italy
Basan Robert, University of Rijeka, Croatia
Bayrak Alparslan Emrah, University of Michigan, United States of America
Becattini Niccolò, Politecnico di Milano, Italy
Behdinan Kamran, University of Toronto, Canada
Ben-Ahmed Walid, Renault, France
Bencetić Sanja, University of Zagreb, Croatia
Bertoni Alessandro, Blekinge Institute of Technology, Sweden
Bertoni Marco, Blekinge Institute of Technology, Sweden
Bjärnermo Robert, Lund University, Sweden
Blanco Eric, Grenoble INP, France
Bohemia Erik, Loughborough University London, United Kingdom
Bojčetić Nenad, University of Zagreb, Croatia
Boks Casper, Norwegian University of Science and Technology, Norway
Bonjour Eric, Université de Lorraine, France
Bonvoisin Jérémie, University of Bath, United Kingdom
Bordogoni Monica, Politecnico di Milano, Italy
Borg Jonathan, University of Malta, Malta
Borgianni Yuri, Free University of Bozen-Bolzano, Italy
Boujut Jean-François, Grenoble INP, France
Bouwhuis Dominic G., Eindhoven University of Technology, Netherlands
Brown David C., Worcester Polytechnic Institute, United States of America
Burnap Alex, Massachusetts Institute of Technology, United States of America
Bursac Nikola, Karlsruhe Institute of Technology, Germany
Burville Colin R., The University of Melbourne, Australia
Bylund Nicklas, Sandvik Coromant, Sweden
Cagan Jonathan, Carnegie Mellon University, United States of America
Caillaud Emmanuel, University of Strasbourg, France
Caldwell Nicholas, University of Suffolk, United Kingdom
Campean Felician, University of Bradford, United Kingdom
Carulli Marina, Politecnico di Milano, Italy
Casakin Hernan, Ariel University, Israel
Cascini Gaetano, Politecnico di Milano, Italy
Cash Philip, Technical University of Denmark, Denmark
Cavallucci Denis, INSA Strasbourg, France
Cerić Anita, University of Zagreb, Croatia
Chakrabarti Amresh, Indian Institute of Science, India
Chen Jahau Lewis, National Cheng Kung University, Taiwan
Chen Wei, Northwestern University, United States of America
Childs Peter R. N., Imperial College London, United Kingdom
Choi Young Mi, Georgia Institute of Technology, United States of America
Chulvi Vicente, Universitat Jaume I, Spain
Cicconi Paolo, Università Politecnica delle Marche, Italy
Clarkson P. John, University of Cambridge, United Kingdom
Cluzel François, CentraleSupélec, France
Coatanea Eric, Tampere University of Technology, Finland
Cormican Kathryn, National University of Ireland Galway, Ireland
Coutellier Daniel, ENSIAME, France
Coutts Euan, University of Strathclyde, United Kingdom
Crilly Nathan, University of Cambridge, United Kingdom
Culley Stephen, University of Bath, United Kingdom
Čok Vanja, University of Ljubljana, Slovenia
Daalhuizen Jaap, Technical University of Denmark, Denmark
de Bont Cees, The Hong Kong Polytechnic University, People's Republic of China
Dekoninck Elies, University of Bath, United Kingdom
Dhokia Vimal, University of Bath, United Kingdom
Dolšak Bojan, University of Maribor, Slovenia
Dong Andy, The University of Sydney, Australia
Dorst Kees, Eindhoven University of Technology, Netherlands
Duffy Alex H. B., University of Strathclyde, United Kingdom
Eckert Claudia, The Open University, United Kingdom
Eifler Tobias, Technical University of Denmark, Denmark
Eigner Martin, Technische Universität Kaiserslautern, Germany
Eisenbart Boris, Swinburne University of Technology, Australia
Elgh Fredrik Per Wilhelm, Jönköping University, Sweden
Ellman Asko, Tampere University of Technology, Finland
Ericson Åsa, Luleå University of Technology, Sweden
Esparragoza Ivan Enrique, The Pennsylvania State University, United States of America
Eynard Benoit, University of Technology of Compiègne, France
Fadel Georges, Clemson University, United States of America
Fain Nuša, University of Strathclyde, United Kingdom
Fantoni Gualtiero, Università di Pisa, Italy
Fargnoli Mario, Ministry of Agriculture, Italy
Farrugia Philip, University of Malta, Malta
Fernandes Sania da Costa, University of São Paulo, Brazil
Fels Antonia, RWTH Aachen University, Germany
Ferrise Francesco, Politecnico di Milano, Italy
Filippi Stefano, University of Udine, Italy
Finger Susan, Carnegie Mellon University, United States of America
Fiorineschi Lorenzo, University of Florence, Italy
Fischer Xavier, ESTIA, France
Flynn Joseph Michael, University of Bath, United Kingdom
Fortin Clement, Skolkovo Institute of Science and Technology (Skoltech), Russia
Fukuda Shuichi, Keio University, Japan
Galeta Tomislav Josip Juraj Strossmayer University of Osijek, Croatia
Gausemeier Jürgen, Paderborn University, Germany
Georgiev Georgi V., University of Oulu, Finland
Gerhard Detlef, TU Wien, Austria
Gericke Kilian, University of Luxembourg, Luxembourg
Gero John, UNC Charlotte / George Mason University, United States of America
Girard Philippe, University of Bordeaux, France
Goh Yee Mey, Loughborough University, United Kingdom
Gooch Shayne, University of Canterbury, New Zealand
Gopsill James, University of Bath, United Kingdom
Graessler Iris, Paderborn University, Germany
Graziosi Serena, Politecnico di Milano, Italy
Grote Karl-Heinrich, Otto von Guericke University Magdeburg, Germany

SCIENTIFIC ADVISORY BOARD



- Guerra Andrea Luigi**, University of Technology of Compiègne, France
Guertler Matthias R., University of Technology Sydney, Australia
Gurumoorthy Balan, Indian Institute of Science, India
Gustafsson Göran, Chalmers University of Technology, Sweden
Gzara Liia, Grenoble INP, France
Hales Crispin, Hales & Gooch Ltd, United States of America
Hallstedt Sophie, Blekinge Institute of Technology, Sweden
Hansen Claus Thorp, Technical University of Denmark, Denmark
Hansen Paul Kyvsgaard, Aalborg University, Denmark
Hassannezhad Mohammad, University of Cambridge, United Kingdom
Hehenberger Peter, University of Applied Sciences Upper Austria, Austria
Hein Andreas Makoto, CentraleSupélec, France
Herriott Richard William, Design School Kolding, Denmark
Herrmann Jeffrey, University of Maryland, United States of America
Hicks Ben, University of Bristol, United Kingdom
Hoffenson Steven, Stevens Institute of Technology, United States of America
Höhne Günter, Technical University of Ilmenau, Germany
Hölttä-Otto Katja, Aalto University, Finland
Horak Peter, Budapest University of Technology and Economics (BME), Hungary
Huang Tao, Southern Illinois University, United States of America
Husung Stephan, em engineering methods AG, Germany
Ilie Horea, University of Connecticut, United States of America
Inkermann David, TU Braunschweig, Germany
Ion William, University of Strathclyde, United Kingdom
Isaksson Ola, Chalmers University of Technology, Sweden
Ivanic Željko, Josip Juraj Strossmayer University of Osijek, Croatia
Jagtap Santosh, Blekinge Institute of Technology, Sweden
Jamieson Marnie, University of Alberta, Canada
Janković Marija, CentraleSupélec, France
Jean Camille, Arts et Métiers ParisTech, France
Jerbić Bojan, University of Zagreb, Croatia
Johansson Glenn, Jönköping University, Sweden
Jung Eui Chul, Seoul National University, South Korea
Jurčević Lulic, Tarja, University of Zagreb, Croatia
Juuti Tero Sakari, Tampere University of Technology, Finland
Kannengiesser Udo, eneon IT-solutions GmbH, Austria
Karlsson Anna Sofie, Luleå University of Technology, Sweden
Kato Takeo, Keio University, Japan
Keates Simeon, University of Greenwich, United Kingdom
Khan Mohammed Rajik, National Institute of Technology Rourkela, India
Kim Euiyoung, University of California, Berkeley, United States of America
Kipouros Timoleon, University of Cambridge, United Kingdom
Kleinsmann Maaike, Delft University of Technology, Netherlands
Kljajin Milan, Josip Juraj Strossmayer University of Osijek, Croatia
Koh Edwin, National University of Singapore, Singapore
Köhler Christian, htw saar - Saarland University of Applied Sciences, Germany
Kokkolaras Michael, McGill University, Canada
Komashie Alexander, University of Cambridge, United Kingdom
Koronis Georgios, Singapore University of Technology and Design, Singapore
Kovačević Ahmed, City, University of London, United Kingdom
Krause Dieter, Hamburg University of Technology, Germany
Krauss Gordon, Harvey Mudd College, United States of America
Kreimeyer Matthias, MAN Truck & Bus AG, Germany
Kristensen Tore, Copenhagen Business School, Denmark
Kroll Ehud, ORT Braude College, Israel
Kuosmanen Petri, Aalto University, Finland
Lachmayer Roland, Leibniz Universität Hannover, Germany
Lamé Guillaume, University of Cambridge, United Kingdom
Larsson Tobias, Blekinge Institute of Technology, Sweden
Layout Astrid, Texas A&M University, United States of America
Le Masson Pascal, Mines ParisTech, France
Lecomte Chloe, Haute École Arc, Switzerland
Legardeur Jeremy, ESTIA, France
Lei Ningrong, Sheffield Hallam University, United Kingdom
Lenau Torben Anker, Technical University of Denmark, Denmark
Lewis Kemper, University at Buffalo, United States of America
Liem André, Norwegian University of Science and Technology, Norway
Lindahl Mattias, Linköping University, Sweden
Lindemann Udo, Technical University of Munich, Germany
Linsey Julie S., Georgia Institute of Technology, United States of America
Livotov Pavel, Offenburg University of Applied Sciences, Germany
Lloveras Joaquim, Universitat Politècnica de Catalunya, Spain
Lohmeyer Quentin, ETH Zurich, Switzerland
Lugnet Johan, Luleå University of Technology, Sweden
Lugomer Armando Goranka, University of Zagreb, Croatia
Lulić Zoran, University of Zagreb, Croatia
MacDonald Erin, Stanford University, United States of America
Maier Anja, Technical University of Denmark, Denmark
Malmqvist Johan, Chalmers University of Technology, Sweden
Maranzana Nicolas, Arts et Métiers ParisTech, France
Marjanović Dorian, University of Zagreb, Croatia
Marle Franck, CentraleSupélec, France
Marxt Christian, ETH Zurich, Switzerland
Matsumae Akane, Kyushu University, Japan
Matta Nada, University of Technology of Troyes, France
Matthews Jason, University of the West of England, United Kingdom
Matthiesen Sven, Karlsruhe Institute of Technology, Germany
Maurer Christiane, Independent designer and researcher, Netherlands
Maurer Maik, Akamai Technologies, United States of America
Maw Sean, University of Saskatchewan, Canada
McAloone Tim C., Technical University of Denmark, Denmark
McKay Alison, University of Leeds, United Kingdom
McMahon Chris A., Technical University of Denmark, Denmark
Meboldt Mirko, ETH Zurich, Switzerland
Mekhlief Mounib, University of Orleans, France
Milčić Diana, University of Zagreb, Croatia
Mocko Gregory M., Clemson University, United States of America
Moehringer Stefan, Simon Moehringer Anlagenbau GmbH, Germany
Montagna Francesca, Politecnico di Torino, Italy
Moon Seung Ki, Nanyang Technological University, Singapore
Mortensen Niels Henrik, Technical University of Denmark, Denmark
Moultrie James, University of Cambridge, United Kingdom
Mullineux Glen, University of Bath, United Kingdom
Nagai Yukari, Japan Advanced Institute of Science and Technology, Japan
Nespoli Oscar, University of Waterloo, Canada
O'Hare Jamie Alexander, University of Bath, United Kingdom
Oehmen Josef, Technical University of Denmark, Denmark
Öhrwall Rönnbäck Anna, Luleå University of Technology, Sweden
Oizumi Kazuya, The University of Tokyo, Japan



SCIENTIFIC ADVISORY BOARD

- Olechowski Alison, University of Toronto, Canada
Olsson Annika, Lund University, Sweden
Ölvander Johan, Linköping University, Sweden
Otsuka Akimasa, Tokyo University of Science, Japan
Otto Kevin N., Aalto University, Finland
Paetzold Kristin, Bundeswehr University Munich, Germany
Pakkanen Jarkko Tapani, Tampere University of Technology, Finland
Palm William J., Roger Williams University, United States of America
Panarotto Massimo, Chalmers University of Technology, Sweden
Papalambros Panos Y., University of Michigan, United States of America
Parraguez Ruiz Pedro, Technical University of Denmark, Denmark
Pavković Neven, University of Zagreb, Croatia
Peruzzini Margherita, University of Modena and Reggio Emilia, Italy
Peters Diane, Kettering University, United States of America
Petiot Jean-François, Centrale Nantes, France
Pigosso Daniela, Technical University of Denmark, Denmark
Qureshi Ahmed Jawad, University of Alberta, Canada
Ravn Poulsen Martin, Technical University of Denmark, Denmark
Ray Pascal, Ecole Nationale Supérieure des Mines de Saint-Etienne, France
Rebola Claudia B., University of Cincinnati, United States of America
Reich Yoram, Tel Aviv University, Israel
Reyes Tatiana, University of Technology of Troyes, France
Riel Andreas, Grenoble INP, France
Riihahuhta Asko, Tampere University of Technology, Finland
Rohmer Serge, University of Technology of Troyes, France
Rossa-Sierra Alberto, Universidad Panamericana, Mexico
Roth Bernard, Stanford University, United States of America
Rotini Federico, University of Florence, Italy
Rozenfeld Henrique, University of São Paulo, Brazil
Sakao Tomohiko, Linköping University, Sweden
Salustri Filippo A., Ryerson University, Canada
Savšek Tomaž, TPV Group, Slovenia
Schabacker Michael, Otto von Guericke University Magdeburg, Germany
Schaefer Dirk, University of Liverpool, United Kingdom
Schaub Harald, IABG, Germany
Schmidt Linda, University of Maryland, United States of America
Schulze Sven-Olaf, GfSE, Germany
Seepersad Carolyn Conner, The University of Texas at Austin, United States of America
Seering Warren P., Massachusetts Institute of Technology, United States of America
Self James Andrew, Ulsan National Institute of Science and Technology, South Korea
Setchi Rossi, Cardiff University, United Kingdom
Shea Kristina, ETH Zurich, Switzerland
Shu Lily, University of Toronto, Canada
Singh Vishal, Aalto University, Finland
Smajver Ivica, University of Zagreb, Croatia
Snider Chris, University of Bristol, United Kingdom
Söderberg Rikard, Chalmers University of Technology, Sweden
Sosa Ricardo, Auckland University of Technology, New Zealand
Spee James, University of Redlands, United States of America
Stal-Le Cardinal Julie, CentraleSupélec, France
Stanković Tino, ETH Zurich, Switzerland
Stappers Pieter Jan, Delft University of Technology, Netherlands
Stark Rainer, Technical University of Berlin, Germany
Stauffer Larry, University of Idaho, United States of America
Steinert Martin, Norwegian University of Science and Technology, Norway
Stetter Ralf, Hochschule Ravensburg-Weingarten, Germany
Stevanović Milan, Markot.tel, Croatia
Subrahmanian Eswaran, Carnegie Mellon University, United States of America
Summers Joshua, Clemson University, United States of America
Sundin Erik, Linköping University, Sweden
Škec Stanko, University of Zagreb, Croatia
Štorga Mario, University of Zagreb, Croatia
Tan James Ah Kat, Ngee Ann Polytechnic, Singapore
Taura Toshiharu, Kobe University, Japan
Tečec Ribarić Zlatka, Končar - Electrical Engineering Institute Inc., Croatia
Thallemer Axel, National University of Singapore, Singapore
Thoben Klaus-Dieter, University of Bremen, Germany
Thompson Mary Kathryn, GE Additive, United States of America
Thomson Avril, University of Strathclyde, United Kingdom
Törnlind Peter, Luleå University of Technology, Sweden
Troussier Nadege, University of Technology of Troyes, France
Tyl Benjamin, APESA, France
Udiljak Toma, University of Zagreb, Croatia
Vajna Sandor, Otto von Guericke University Magdeburg, Germany
Van der Loos Hendrik, The University of British Columbia, Canada
Venkataraman Srinivasan, Indian Institute of Technology Delhi, India
Vietor Thomas, TU Braunschweig, Germany
Vignoli Matteo, University of Modena and Reggio Emilia, Italy
Vishnoi Upasna, Marvell Semiconductor Inc., United States of America
Vrdoljak Milan, University of Zagreb, Croatia
Vučašinović Nikola, University of Ljubljana, Slovenia
Wartzack Sandro, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany
Weber Christian, Technical University of Ilmenau, Germany
Weiss Menachem P., Technion - Israel Institute of Technology, Israel
Wendrich Robert, University of Twente, Netherlands
Whitfield Robert Ian, University of Strathclyde, United Kingdom
Whitney Daniel, Massachusetts Institute of Technology, United States of America
Wynn David, The University of Auckland, New Zealand
Yang Maria, Massachusetts Institute of Technology, United States of America
Yannou Bernard, CentraleSupélec, France
Zimmermann Markus, Technical University of Munich, Germany
Žavbi Roman, University of Ljubljana, Slovenia
Žeželj Dragan, University of Zagreb, Croatia





The *Information Era* has reached a tipping point, a moment where digital technologies have irreversibly permeated all facets of products and society, with design as the linchpin of this change. After a century of design research, pluralism and imagination define the way of thinking and the way forward. Design encapsulates the knowledge within and across disciplines, with overlapping theories and models of design. The DESIGN Conference proceedings present an essential collection of design research as a broad, multidisciplinary area that evolved from a consolidation of problem-solving methodologies and became a scientific domain in itself. Design research redefines the processes, the products and our behaviour in a whole host of applications, ranging from simple one-time-use products to complex systems-of-systems, services and the society at large. The move towards new business models like PSS, the trend to sharing products and the new, innovative products redefine users' behaviour on an individual level, but the interconnectedness of products and society imbues this process with a greater social impact than ever before. At the same time, the speed of change and turnover, never before seen in production processes, makes design research more demanding and broader than ever. Data Analytics and the Internet of Things allow for a dialogue between designer, production and users in real time. Advances in AI research and progress in additive manufacturing present the design process and design research with new challenges. In response, design research is becoming not only more fundamental, but also more applicable. Within this dichotomy lie the keys to reshaping our presence and charting a path to our future.

The design research presented at the DESIGN 2018 conference reflects predominantly the interests and experiences of design researchers and practitioners connected with academia. The papers presented epitomise the current state-of-the-art in design research. In places, they also re-examine questions that have been discussed before but in new contexts. And some of the papers readdress those questions that have been answered only partially. Understanding that design cannot, in all its complexity, be modelled or formally designated within one autonomous theory or model,



the research results presented will be subjected to constant examination and redefinition. Through papers selected for the DESIGN conference, the authors strive to improve design projects and processes with new methods, practices, competencies, information and communication technologies. A question that permeates all the work selected is how the changing landscape of production and product use influences engineering design methodologies and tools, both in practice and in the science of design. The programme of DESIGN 2018 is the result of a joint effort between authors, Programme Chairs, Organising team, and the reviewers in the Scientific Advisory Board. This year, Professor John Clarkson from the University of Cambridge joined the Programme Chairs, sharing his knowledge and expertise. We would like to express our gratitude to all the authors who have submitted their papers and all the reviewers who have helped Programme Chairs to select the submitted research reports to ensure an outstanding conference experience for all the participants. A special thank you goes to all authors and Session Chairs, who will make this experience possible. The DESIGN 2018 proceedings are structured in six virtual volumes, according to research topics. Design theory and research methods and Design support tools are clustered in the first volume. The next two volumes, with potential for practical impact, cover research in Design organisation and management, Design processes, Design practice and Design methods. Design information and knowledge and Innovation are the topics of the fourth volume. Research in Human behaviour in design, Industrial design and Design education are collected in the fifth volume while the Sociotechnical issues in design and System engineering design topics complete the six-volume DESIGN 2018 proceedings. Social sciences provide us with the notion of a ‘tipping point’ as a moment at which a series of small changes or incidents become significant enough to cause a larger, more important change. DESIGN 2018 aims to provide participants with a series of insights into design research and practice that will help them navigate and shape the tipping point of the information age.

Dorian Marjanović

P. John Clarkson

Udo Lindemann

Tim McAloone

Christian Weber

TABLE OF CONTENTS

VOLUME 1

1. DESIGN THEORY AND RESEARCH METHODOLOGY

THE WORLD IS COMPLEX THEREFORE OUR RESEARCH IS NEEDED - USING DATA MINING FOR LITERATURE REVIEWS	1
<i>Albers A., Bursac N., Butenko V., Marthaler F., Zhang Q. (Germany)</i>	
LIVE-LABS AS REAL-WORLD VALIDATION ENVIRONMENTS FOR DESIGN METHODS	13
<i>Albers A., Walter B., Wilmsen M., Bursac N. (Germany)</i>	
DESIGN METHODOLOGY: WHERE DO YOU GO?	25
<i>Badke-Schaub P., Voute E. (The Netherlands)</i>	
REAL-TIME CODING METHOD FOR CAPTURE OF ARTEFACT-CENTRIC INTERACTIONS IN CO-CREATIVE DESIGN SESSIONS	33
<i>Ben Guefrache F., Masclet C., Prudhomme G., Cascini G., O'Hare J. A. (France)</i>	
FORMAL SYSTEM FOR THE EXPRESSION OF TARGET-ORIENTED DESIGN HEURISTICS	45
<i>Bonvoisin J., Buchert T., Stark R. (United Kingdom)</i>	
UNCOVERING DESIGN TOPICS BY VISUALIZING AND INTERPRETING KEYWORD DATA	57
<i>Lei N., Faust O., Rosen D. W., Sherkat N. (United Kingdom)</i>	
A PRODUCT SUCCESS SCALE FOR SUPPORTING RESEARCH IN ENGINEERING DESIGN	69
<i>Maccioni L., Borgianni Y. (Italy)</i>	
COMPARATIVE ANALYSIS OF RESEARCH FOR INDUSTRIAL DESIGN AND ENGINEERING DESIGN BASED ON MULTISPACE DESIGN MODEL	81
<i>Sakae Y., Mukai S., Sato K., Matsuoka Y. (Japan)</i>	
USE OF ANALOGY IN DESIGN TEAMS: STEPS TOWARDS A COMPUTATIONAL MODEL AND CONCEPTUAL INSIGHTS	91
<i>Singh V., Casakin H. (Finland)</i>	
NATURAL AND INTUITIVE GESTURE INTERACTION FOR 3D OBJECT MANIPULATION IN CONCEPTUAL DESIGN	103
<i>Vuletic T., Duffy A., Hay L., McTeague C. P., Campbell G., Choo P. L., Grealy M. (United Kingdom)</i>	
A QUALITATIVE INVENTORY OF USER INTEGRATION METHODS AND THEIR USAGE IN PRODUCT DEVELOPMENT RESEARCH AND PRACTICE	115
<i>Wallisch A., Paetzold K. (Germany)</i>	
LIVING LABS AS A METHODOLOGY FOR SERVICE DESIGN - AN ANALYSIS BASED ON CASES AND DISCUSSIONS FROM A SYSTEMS APPROACH VIEWPOINT	127
<i>Yasuoka M., Akasaka F., Kimura A., Ihara M. (Japan)</i>	

2. DESIGN SUPPORT TOOLS

INDEATE 3.0: AN ONTOLOGY BASED, GENERIC DESIGN PROCESS GUIDANCE WEB-TOOL	137
<i>Acharya S., Chatty T., Ranjan B. S. C., Ghadge K., Bharath P. A., Chakrabarti A. (India)</i>	
COLLABORATIVE DESIGN: LINKING METHODS, COMMUNICATION TOOLS AND COMPETENCIES TO PROCESSES	149
<i>Bavendiek A.-K., Huth T., Inkermann D., Paulsen H., Vietor T., Kauffeld S. (Germany)</i>	

MODEL-DRIVEN VALUE ASSESSMENT: A CASE FROM THE FOOD PACKAGING INDUSTRY	161
<i>Bertoni M., Chowdhery S. A., Bellini A. (Sweden)</i>	
MODEL-DRIVEN DECISION ARENA: AN AEROSPACE CASE STUDY	171
<i>Bertoni M., Wall J., Bertoni A. (Sweden)</i>	
VIRTUAL AND MIXED PROTOTYPING TECHNIQUES AND TECHNOLOGIES FOR CONSUMER PRODUCT DESIGN WITHIN A BLENDED LEARNING DESIGN ENVIRONMENT.....	183
<i>Bordegoni M., Ferrise F., Wendrich R., Barone S. (Italy)</i>	
MODELLING THE RELATIONSHIP BETWEEN DESIGN ACTIVITY AND COMPUTER-SUPPORTED COLLABORATIVE DESIGN FACTORS.....	193
<i>Brisco R., Whitfield R. I., Grierson H. (United Kingdom)</i>	
A TOOL FOR IDEALISATION OF CAD MODELS.....	205
<i>Burić M., Marjanović D. (Croatia)</i>	
NEW INTEGRATIVE APPROACH TO EXISTING DESIGN FOR ASSEMBLY (DFA) METHODOLOGIES: APPLICATION ON ELEVATOR COMPONENTS.....	215
<i>Cabello Ulloa M. J., Remirez Jauregui A., Zulaika Munain I., Areitioaurtena Oiartzun M., Retolaza Ojanguren I., Campos Insunza M. A., Martínez Noguera F. (Spain)</i>	
A METHODICAL APPROACH FOR THE TECHNOLOGICAL ASSESSMENT OF JOINING TECHNOLOGIES - OPTIMIZED DECISION-MAKING IN CAR BODY DEVELOPMENT	225
<i>Choudry S. A., Haass S., Alber U., Landgrebe D. (Germany)</i>	
DEVELOPMENT OF A METHODOLOGY FOR ROBUST EVALUATION OF PERCEIVED QUALITY OF VEHICLE BODY PANEL GAPS	237
<i>Duraiswamy V., Campean F., Harris S., Munive-Hernandez J. E. (United Kingdom)</i>	
TRACEABILITY OF DECISIONS IN PRODUCT REALIZATION PROCESSES OF CUSTOM ENGINEERED PRODUCTS.....	249
<i>Elgh F. P. W., Johansson J., Pookrkiyany M., Stolt R., Raudberget D. (Sweden)</i>	
GEOMETRIC SUBSTITUTE MODELS FOR EFFICIENT SCALING OF DIMENSIONS DURING VEHICLE ARCHITECTURE DESIGN.....	261
<i>Felgenhauer M., Angerer C., Marksteiner R., Schneider F., Lienkamp M. (Germany)</i>	
DEVELOPMENT OF A NEW SIMULATION-BASED PLATFORM FOR PRODUCT AND SERVICE CUSTOMER CO-DESIGN USING AI	273
<i>Feng Y., Kataoka I., Yoshida J., Nonaka N. (Japan)</i>	
AN INITIAL PROTOTYPE OF A TOOL FOR DEFINING VALUE PROPOSITION IN THE PRODUCT-SERVICE SYSTEM (PSS) DESIGN	281
<i>Fernandes S. d. C., Rosa M., Queiroz C., Rozenfeld H. (Brazil)</i>	
CONTINUOUS INTEGRATION OF MODEL VALIDATION INTO PRODUCT DEVELOPMENT.....	293
<i>Forsteneichner C., Paetzold K., Metschkoll M. (Germany)</i>	
GOAL SETTING IN SUSTAINABLE BUILDING RENOVATION – EARLY PROTOTYPE DESIGN AND TESTING OF A NEW DECISION SUPPORT TOOL	305
<i>Gade A. N., Jensen R. L., Larsen T. S., Nissen S. B. (Denmark)</i>	
EXAMINING THE SOLUTION BIAS OF CONSTRUCTION KITS	315
<i>Gopsill J. (United Kingdom)</i>	
SEMI-AUTOMATIZED ASSESSMENT OF REQUIREMENT INTERRELATIONS	325
<i>Graessler I., Scholle P., Hentze J., Oleff C. (Germany)</i>	

AN ASSESSMENT OF METHODS TO SUPPORT THE DESIGN OF FUTURE ROBUST MODULAR PRODUCT ARCHITECTURES	335
<i>Greve E., Krause D. (Germany)</i>	
CAPTURING SYNCHRONOUS COLLABORATIVE DESIGN ACTIVITIES: A STATE-OF-THE-ART TECHNOLOGY REVIEW	347
<i>Hall M., McMahon C. A., Bermell-Garcia P., Johansson A., Ravindranath R. (United Kingdom)</i>	
KNOWLEDGE-BASED MANUFACTURING: A PROPOSAL TO MANAGE MANUFACTURING RULES.....	359
<i>Marra M., Pasquarelli C., Lazoi M., Corallo A., Micchetti F. (Italy)</i>	
SUPPORT OF SEARCHING FOR SOLUTIONS BY AUTOMATED STRUCTURAL OPTIMIZATION	369
<i>Meyer A. W., Vajna S. (Germany)</i>	
ANALYSIS OF CO-DESIGN SCENARIOS AND ACTIVITIES FOR THE DEVELOPMENT OF A SPATIAL-AUGMENTED REALITY DESIGN PLATFORM.....	381
<i>Morosi F., Carli I., Caruso G., Cascini G., Dhokia V., Ben Guefrache F. (Italy)</i>	
SUPPORTING DESIGN TASKS THROUGH CONSTRAINT SATISFACTION TOOLS	393
<i>Nardelli M., Cicconi P., Raffaeli R., Germani M. (Italy)</i>	
EXPLORING THE PERFORMANCE OF AUGMENTED REALITY TECHNOLOGIES IN CO-CREATIVE SESSIONS: INITIAL RESULTS FROM CONTROLLED EXPERIMENTS	405
<i>O'Hare J. A., Dekoninck E., Giunta L., Boujut J.-F., Becattini N. (United Kingdom)</i>	
COLOURED PETRI NETS MODEL OF DESIGNERS COLLABORATION IN ITERATIVE RESOLVING OF COUPLED DESIGN PARAMETERS	417
<i>Pavković N., Vlah L., Juranić J., Kuzmić N. (Croatia)</i>	
A METAHEURISTIC FOR SOLUTION SPACE MODELLING	429
<i>Poulain B., Naumann T., Stal-Le Cardinal J., Anderer J. (France)</i>	
DESIGN AUTOMATION STATE OF PRACTICE - POTENTIAL AND OPPORTUNITIES	441
<i>Rigger E., Vosgien T. (Austria)</i>	
PERCEIVED QUALITY OF THE SPLIT-LINE DESIGN AND QUALITY	453
<i>Striegel S. S., Zielinski D. (Germany)</i>	
ON KNOWLEDGE MATURITY AND BIASED NATURE OF STAGED DECISION MAKING IN A HIGH CONSEQUENCE INDUSTRY	465
<i>Svensson M., Bertoni A., Lanander M. (Sweden)</i>	
INTEGRATING THE KNOWLEDGE ABOUT FUNCTIONAL INTERDEPENDENCIES INTO A PARAMETER MANAGEMENT APPROACH.....	477
<i>Toepfer F., Naumann T., Anderer J., Vajna S. (Germany)</i>	
LEANIFICATION OF THE ENGINEERING PROCESS FOR CUSTOMIZED ROAD SAFETY PRODUCTS.....	487
<i>Ulonska S., Welo T., Rølvåg T. (Norway)</i>	
DESIGN FOR COMPOSITES: TAILOR-MADE, BIO-INSPIRED TOPOLOGY OPTIMIZATION FOR FIBER-REINFORCED PLASTICS.....	499
<i>Voelkl H., Wartzack S. (Germany)</i>	
CONCEPTION OF A CROWDSOURCING TOOL TO SUPPORT INDUSTRIAL DESIGN DECISIONS	511
<i>Wiesner M., Vajna S. (Germany)</i>	

TABLE OF CONTENTS

VOLUME 2

3. DESIGN ORGANISATION AND MANAGEMENT

ANALYSIS OF ENGINEERING CHANGE REQUESTS USING MARKOV CHAINS.....	523
<i>Arnarsson I. Ö., Gustavsson E., Malmqvist J., Jirstrand M. (Sweden)</i>	
CODING SCHEMES FOR THE ANALYSIS OF ICT SUPPORTED CO-CREATIVE DESIGN SESSIONS	533
<i>Becattini N., Cascini G., O'Hare J. A., Masclet C. (Italy)</i>	
MASTERING EXECUTION: FOUR GENERATIONS OF THINK.MAKE.START. AT A CORPORATION	545
<i>Böhmer A. I., Lindemann U. (Germany)</i>	
DESIGN THINKING CAPABILITY MODEL (DTCM): A FRAMEWORK TO MAP OUT DESIGN THINKING CAPACITY IN BUSINESS ORGANISATIONS	557
<i>De Paula D., Dobrigkeit F., Cormican K. (Ireland)</i>	
PUTTING THEORY TO PRACTICE: REFLECTIONS ON THE INTEGRATION OF PRODUCT DESIGN ASPECTS IN AAL PROJECTS	567
<i>Dittenberger S. (Austria)</i>	
CROWDSOURCING IN PRODUCT DEVELOPMENT: CURRENT STATE AND FUTURE RESEARCH DIRECTIONS.....	579
<i>Forbes H. L., Schaefer D. (United Kingdom)</i>	
ENGINEERING CHANGE MANAGEMENT FROM THE VIEWPOINT OF CORPORATE REPUTATION	589
<i>Honkisch C. A., Pessoa M. V. P., Henseler J. (The Netherlands)</i>	
DESIGNING HUMAN-ROBOT COLLABORATIONS IN INDUSTRY 4.0: EXPLORATIVE CASE STUDIES	601
<i>Kadir B. A., Broberg O., Souza da Conceição C. (Denmark)</i>	
MODELLING CHANGE WITH AN INTEGRATED APPROACH TO MANUFACTURING SYSTEM DESIGN.....	611
<i>Olmez H., Hassannezhad M., Ball N., Clarkson P. J. (United Kingdom)</i>	
VALUE CREATION MECHANISMS IN PRODUCT VARIETY DEVELOPMENT	623
<i>Pakkanen J. T., Juuti T. S., Lehtonen T. A. (Finland)</i>	
ASSESSING THE VALUE OF RADICAL TECHNOLOGY ALTERNATIVES AT SYSTEM LEVEL	633
<i>Panarotto M., Isaksson O., Asp L. (Sweden)</i>	
LEAN OFFICE: STUDY ON THE APPLICABILITY OF THE CONCEPT IN A DESIGN COMPANY	643
<i>Sastre R. M., Saurin T. A., Echeveste M. E. S., de Paula I. C., Lucena R. (Brazil)</i>	
SUSTAINABILITY RISK MANAGEMENT FOR PRODUCT INNOVATION.....	655
<i>Schulte J., Hallstedt S. I. (Sweden)</i>	
TAILORING RISK MANAGEMENT IN DESIGN	667
<i>Tegeltija M., Oehmen J., McMahon C. A., Maier A., Kozin I., Škec S. (Denmark)</i>	
HUMAN CENTRICITY IN INTEGRATED DESIGN ENGINEERING	679
<i>Urakami J., Vajna S. (Germany)</i>	

SUPPORTING PRODUCT DEVELOPMENT AT TECH STARTUPS WITH LEAN PRODUCT DEVELOPMENT: CHALLENGES AND OPPORTUNITIES.....	691
<i>Van Der Braak M., Jauregui Becker J. M., Pessoa M. V. P. (The Netherlands)</i>	
MAKING PARTNERSHIPS WORK: INTEGRATIVE OPEN SYSTEM DESIGN FOR A NEW GENERATION OF COMPLEX INFRASTRUCTURE SCHEMES	703
<i>Witz P., Oehmen J. (Denmark)</i>	
4. DESIGN PROCESSES	
AGILE METHOD DEVELOPMENT: A LIVE-LAB CASE STUDY ON PRODUCT PROPERTIES FOR PROCESS PLANNING	713
<i>Albers A., Bursac N., Eckert C. M., Walter B., Wilmsen M., Heimicke J. (Germany)</i>	
SIMULATION-SUPPORTED PARTICIPATIVE PROCESSES IMPROVEMENT IN ENGINEERING DESIGN.....	725
<i>Becerril L., Lindemann U. (Germany)</i>	
INTEGRATED SYSTEM DESIGN OF A MODULAR, AUTONOMOUS, AERIAL AND GROUND VEHICLE FLEET FOR DISASTER RELIEF MISSIONS - A CASE STUDY	735
<i>Gärtner A. C., Ferriero D., Bayrak A. E., Papalambros P. Y. (United States of America)</i>	
V-MODELS FOR INTERDISCIPLINARY SYSTEMS ENGINEERING	747
<i>Graessler I., Hentze J., Bruckmann T. (Germany)</i>	
EXTENDED DESIGN ASSETS ENABLING AUTOMATED TOOL DEVELOPMENT AS A PART OF A PRODUCT PLATFORM APPROACH.....	757
<i>Heikkinen T. M. D., Johansson J., Elgh F. P. W. (Sweden)</i>	
SUPPORTING TAILORING OF COMPLEX PRODUCT DEVELOPMENT PROCESSES: AN APPROACH BASED ON STRUCTURAL MODELLING AND ANALYSIS.....	769
<i>Hollauer C., Langner M., Lindemann U. (Germany)</i>	
MARGINS LEADING TO OVER-CAPACITY	781
<i>Jones D. A., Eckert C. M., Gericke K. (United Kingdom)</i>	
THE CHARACTERISTICS OF SUCCESSFUL MEANING CONSTRUCTION IN DESIGN TEAMS	793
<i>Knudsen L. S., Tollestrup C., Haase L. M. (Denmark)</i>	
EVALUATION OF PRODUCT DEVELOPMENT: A COMPARATIVE CASE STUDY	805
<i>Koehler N., Močibov P., Naumann T., Vajna S. (Germany)</i>	
PRODUCT VARIETY AND VARIETY IN PRODUCTION.....	817
<i>Landahl J., Johannesson H. (Sweden)</i>	
SUPPORTING ENGINEERS IN LIGHTWEIGHT DESIGN: THE ENERGY DISTRIBUTION ANALYSIS (EDA).....	829
<i>Laufer F., Roth D., Binz H. (Germany)</i>	
ASSESSING INCREASED PRODUCT LINE COMMONALITY'S EFFECT ON ASSEMBLY PRODUCTIVITY AND PRODUCT QUALITY	841
<i>Løkkegaard M., Mortensen N. H., Jensen L. S., Christensen C. K. F. (Denmark)</i>	
ADDRESSING TEAM BASED INNOVATION FOR SMALL FIRMS - CREATE, BUILD, TEST & LEARN	849
<i>Lugnet J., Wenngren J., Ericson Å. (Sweden)</i>	
EMPIRICAL STUDY OF REQUIREMENTS ENGINEERING IN CROSS DOMAIN DEVELOPMENT	857
<i>Nilsson S., Buffoni L., Sandahl K., Johansson H., Tahir Sheikh B. (Sweden)</i>	

CHANGES AND SENTIMENT: A LONGITUDINAL EMAIL ANALYSIS OF A LARGE DESIGN PROJECT.....	869
<i>Piccolo S. A., Wilberg J., Lindemann U., Maier A. (Denmark)</i>	
KNOWLEDGE IN ENGINEERING DESIGN: A SYSTEMATIC LITERATURE REVIEW ON ARTIFACTS AND IT SYSTEMS	881
<i>Preidel M., Wang W. M., Exner K., Stark R. (Germany)</i>	
AGILITY FACTORS AND THEIR IMPACT ON PRODUCT DEVELOPMENT PERFORMANCE	893
<i>Rebentisch E., Conforto E. C., Schuh G., Riesener M., Kantelberg J., Amaral D. C., Januszek S. (Germany)</i>	
IMPROVEMENT OPPORTUNITIES FOR THE COLLABORATION OF DESIGN AND SIMULATION DEPARTMENTS - AN INTERVIEW STUDY	905
<i>Schweigert-Recksiek S., Lindemann U. (Germany)</i>	
A PRODUCT PLANNING FRAMEWORK FOR MASS-CUSTOMISATION IN CONSTRUCTION.....	917
<i>Wee T. P. Y., Aurisicchio M. (United Kingdom)</i>	
PRODUCT ARCHITECTURE TRANSITION IN AN EVOLVING MULTI-BRAND ORGANISATION.....	929
<i>Williamsson D., Sellgren U., Söderberg A. (Sweden)</i>	
PARAMETRIC MOVEMENT SYNTHESIS: TOWARDS VIRTUAL OPTIMISATION OF MAN-MACHINE INTERACTION IN ENGINEERING DESIGN	941
<i>Wolf A., Wartzack S. (Germany)</i>	

TABLE OF CONTENTS

VOLUME 3

5. DESIGN METHODS

WHEN LIFECYCLE COST ANALYSIS ENABLES STRATEGIC DESIGN CONSIDERATIONS	953
<i>Altavilla S., Montagna F. (Italy)</i>	
ASSURANCE OF THE SYSTEM RELIABILITY OF A GEARBOX CONSIDERING PRIOR KNOWLEDGE	965
<i>Bartholdt M., Grundler A., Bollmann M., Bertsche B. (Germany)</i>	
DEVELOPMENT OF A BIOINSPIRED APPROACH FOR THE DESIGN OF KINEMATIC CHAINS	975
<i>Bartz M., Gößling R., Remus R., Bender B. (Germany)</i>	
USING THE NEW WORKING SPACE MODEL FOR THE DEVELOPMENT OF HYGIENIC PRODUCTS.....	985
<i>Beetz J.-P., Schlemmer P. D., Kloberdanz H., Kirchner E. (Germany)</i>	
IMPACT ON DESIGN WHEN INTRODUCING ADDITIVE MANUFACTURING IN SPACE APPLICATIONS	997
<i>Borgue O., Panarotto M., Isaksson O. (Sweden)</i>	
INVESTIGATING ON THE RE-USE OF CONCEPTUAL DESIGN REPRESENTATIONS	1009
<i>Cascini G., Fiorineschi L., Rotini F. (Italy)</i>	
A REVIEW OF MAKING IN THE CONTEXT OF DIGITAL FABRICATION TOOLS	1021
<i>Corsini L., Moultrie J. (United Kingdom)</i>	
CLASSIFICATION OF BIO-DESIGN APPLICATIONS: TOWARDS A DESIGN METHODOLOGY	1031
<i>Esat R., Ahmed-Kristensen S. (United Kingdom)</i>	
TOWARD A DESIGN APPROACH FOR INDUSTRIAL INDOOR LOCATION-BASED SERVICES (I ² LBS)	1043
<i>Falkowski T., Günther M., Jürgenhake C., Anacker H., Dumitrescu R. (Germany)</i>	
AN EXPLORATORY STUDY ON THE USE OF NEW DESIGN METHODS IN DESIGN CONSULTANCIES.....	1055
<i>Filippi A., Suarez Madrigal A., Eisenbart B., Gericke K. (The Netherlands)</i>	
ISSUES RELATED TO MISSING ATTRIBUTES IN A-POSTERIORI NOVELTY ASSESSMENTS	1067
<i>Fiorineschi L., Frillici F. S., Rotini F. (Italy)</i>	
A-POSTERIORI NOVELTY ASSESSMENTS FOR SEQUENTIAL DESIGN SESSIONS.....	1079
<i>Fiorineschi L., Frillici F. S., Rotini F. (Italy)</i>	
SUPPORTING SYSTEMATIC CONCEPTUAL DESIGN WITH TRIZ	1091
<i>Fiorineschi L., Frillici F. S., Rotini F. (Italy)</i>	
THE INFLUENCE OF MATERIAL PROPERTY VARIANCES AND PRINTING TOLERANCES ON THE MECHANICAL BEHAVIOR OF AN ADDITIVELY MANUFACTURED META-MATERIAL TANK TRACK BACKER PAD	1103
<i>Franklin S., Fadel G., Li G., Coutris N. (United States of America)</i>	
DEFICITS IN THE SELECTION OF JOINING PROCESSES FOR CAR BODY DESIGN	1115
<i>Garrelts E., Fabis D., Roth D., Werz M., Binz H., Weihe S. (Germany)</i>	

HOW DO C&C ² -MODELS IMPROVE EFFICIENCY, COMPREHENSIBILITY AND SCOPE IN FAILURE ANALYSIS - AN EMPIRICAL STUDY BASED ON TWO LIVE-LABS	1127
<i>Gladysz B., Albers A. (Germany)</i>	
AUGMENTED DSM SEQUENCING TO SUPPORT PRODUCT DEVELOPMENT PLANNING	1139
<i>Göhlich D., Hildebrand S., Schellert D. D. (Germany)</i>	
ROLE OF BIOLOGISTS IN BIOMIMETIC DESIGN PROCESSES: PRELIMINARY RESULTS	1149
<i>Graeff E., Maranzana N., Aoussat A. (France)</i>	
HOW TO DESIGN METHODS FOR APPLICATION - EMPIRICAL INSIGHTS FROM INDUSTRY	1161
<i>Guertler M. R. (Australia)</i>	
PROTOTYPING IN MECHATRONIC PRODUCT DEVELOPMENT: HOW PROTOTYPE FIDELITY LEVELS AFFECT USER DESIGN INPUT	1173
<i>Jensen L. S., Nissen L., Bilde N., Özkil A. G. (Denmark)</i>	
EARLY PHASE EVALUATION OF ADDITIVE MANUFACTURING TECHNOLOGIES WITHIN AN INTEGRATED PRODUCT AND PRODUCTION ENGINEERING APPROACH.....	1185
<i>Kaspar J., Stoffels P., Schneberger J.-H., Vielhaber M. (Germany)</i>	
DEVELOPMENT OF A RAPID CO-PROTOTYPING ENVIRONMENT FOR INDUSTRIAL SERVICES.....	1197
<i>Lammi M. E., Helo P. T., Arrasvuori J. H., Yli-Viitala P. L., Pekkala J., Peltonen S. L. (Finland)</i>	
THE IMPLEMENTATION OF AN INDUSTRIAL ROBOT DESIGN TEMPLATE FOR CUSTOMER PARTICIPATION DESIGN.....	1209
<i>Li J., Nie Y., Zhang X., Wang K., Tong S., Eynard B. (People's Republic of China)</i>	
EVALUATING DESIGN HEURISTICS FOR ADDITIVE MANUFACTURING AS AN EXPLORATIVE WORKSHOP METHOD	1221
<i>Lindwall A., Törlind P. (Sweden)</i>	
CAN DESIGN THINKING MITIGATE CRITICAL STRATEGY IMPLEMENTATION RISKS?	1233
<i>Lund Strom L. C., Willumsen P. L., Oehmen J., Heck J. (Denmark)</i>	
EIGHT KEY STRATEGIES FOR SUCCESSFUL STAKEHOLDER INVOLVEMENT IN DESIGN.....	1245
<i>Manrique S. W., Simons D. P., Eisenbart B., Gericke K. (The Netherlands)</i>	
CHARACTERISING THE AFFORDANCES AND LIMITATIONS OF COMMON PROTOTYPING TECHNIQUES TO SUPPORT THE EARLY STAGES OF PRODUCT DEVELOPMENT	1257
<i>Mathias D., Hicks B., Snider C., Ranscombe C. (United Kingdom)</i>	
RE-DESIGN AND RE-MANUFACTURING OF DISCONTINUED SPARE PARTS IMPLEMENTING ADDITIVE MANUFACTURING IN THE MILITARY FIELD	1269
<i>Montero J., Paetzold K., Bleckmann M., Holtmannspoetter J. (Germany)</i>	
INVENTIVE PRODUCT DESIGN FOCUSING ON PHYSICAL CAUSAL RELATIONSHIPS CAUSING TRADE-OFFS BETWEEN FUNCTIONS	1279
<i>Oizumi K., Aoyama K. (Japan)</i>	
MEET AURA: A STUDY ON HOW ITERATIVE DESIGN METHODOLOGIES AND USER PARTICIPATION HELP IMPROVE RESULTS IN TECHNOLOGY DRIVEN PILOT PROJECTS	1289
<i>Pérez García M., Saffón López S. (Spain)</i>	
A NEW FRAMEWORK FOR CONSTRUCTION PROJECT DEFINITION STAGE	1301
<i>Pikas E., Oehmen J., Koskela L., Thuesen C. (Estonia)</i>	
A METHOD FOR A DETAILED ANALYSIS OF VERIFICATION AND VALIDATION PROCESSES IN PRODUCT DEVELOPMENT.....	1313
<i>Schönwald J., Fleskes J., Forsteneichner C., Paetzold K. (Germany)</i>	

METHOD FOR THE DEVELOPMENT OF EARLY PROTOTYPES OF MECHATRONIC MACHINE ELEMENTS BASED ON THEIR CRITICAL PROPERTIES.....	1325
<i>Schork S., Kirchner E. (Germany)</i>	
CHALLENGES IN THE DEFINITION AND PRIORITISATION OF REQUIREMENTS: A CASE STUDY	1337
<i>Song Y.-W., Windheim M., Bender B. (Germany)</i>	
EVALUATION OF TAF AGILE FRAMEWORK BASED ON THE DEVELOPMENT OF AN INNOVATIVE EMERGENCY WEARABLE FOR SENIORS	1345
<i>Spreiter L., Böhmer A. I., Lindemann U. (Germany)</i>	
DESIGN EXPLORATION OF BIOMORPHIC FREEFORM UNIT CELLS FOR ADDITIVELY MANUFACTURED LATTICE STRUCTURES UNDER COMPRESSIVE LOADS	1357
<i>Thallemer A., Kostadinov A., Fam A., Teo A. (Singapore)</i>	
DESIGN FOR ADDITIVE MANUFACTURING: MAPPING OF PRODUCT FUNCTIONS	1369
<i>Valjak F., Bajčetić N., Lukić M. (Croatia)</i>	
ADDITIVE MANUFACTURING FROM A STRATEGIC SUSTAINABILITY PERSPECTIVE	1381
<i>Villamil C., Nylander J., Hallstedt S. I., Schulte J., Watz M. (Sweden)</i>	
LESSONS LEARNT IN DESIGNING TRANSPORTATION SOLUTIONS FOR ELDERLY PEOPLE FOLLOWING A PARTICIPATORY APPROACH	1393
<i>Wallisch A., Maccioni L., Trautmann L., Ostermeyer E., Borgianni Y., Borg J. C. (Germany)</i>	
INTEGRATING SUSTAINABILITY IN PRODUCT REQUIREMENTS.....	1405
<i>Watz M., Hallstedt S. I. (Sweden)</i>	
CONTENT AND FUNCTIONS OF AN INTERNET-BASED PLATFORM FOR SUPPORTING DEVELOPMENT OF ADDITIVELY MANUFACTURED PARTS	1417
<i>Weiss F., Roth D., Binz H. (Germany)</i>	
A METHOD FOR FUNCTION INTEGRITY DIAGNOSIS AND DOCUMENTATION: FIDD.....	1429
<i>Wichmann R. L., Gericke K., Eisenbart B., Moser H. (Australia)</i>	
DERIVING A USE PHASE DATA STRATEGY FOR CONNECTED PRODUCTS: A PROCESS MODEL	1441
<i>Wilberg J., Fahrmeier L., Hollauer C., Omer M. (Germany)</i>	
DEVELOPMENT OF A CATALOGUE SUPPORTING IDEA GENERATION FOR INTERNET OF THINGS USE CASES.....	1453
<i>Wilberg J., Lau K., Nützel T., Hollauer C., Omer M. (Germany)</i>	
USING THE POTENTIALS OF ADDITIVE MANUFACTURING BY A SYSTEMATIC LINKAGE OF THE MANUFACTURING PROCESS TO PRODUCT DESIGN	1465
<i>Würtenberger J., Reichwein J., Kirchner E. (Germany)</i>	
TOP-DOWN DESIGN COMPUTING BASED ON NON-MANIFOLD POLYHEDRA FROM FUNCTION-TO-FORM MAPPING.....	1477
<i>Xu Z.-G., Zhu J.-F., Su K.-Y., Liu W.-M. (People's Republic of China)</i>	
RESEARCH FOR RELIEF OF DISCOMFORT OF SOUND USER INTERFACE (SUI)	1489
<i>Yang W. (Japan)</i>	

TABLE OF CONTENTS

VOLUME 4

6. DESIGN INFORMATION AND KNOWLEDGE

A NEW MODEL FOR CAPTURING DESIGN INFORMATION WITH AN AIM TO AID CHANGE PROPAGATION ASSESSMENT AND SUBSEQUENT REDESIGN	1499
Brahma A., Wynn D. C. (New Zealand)	
TOWARDS A FRAMEWORK FOR ENGINEERING BIG DATA: AN AUTOMOTIVE SYSTEMS PERSPECTIVE.....	1511
Byrne T. J., Campean F., Neagu D. (United Kingdom)	
GENERATIVE HERITAGE: DRIVING GENERATIVITY THROUGH KNOWLEDGE STRUCTURES IN CREATIVE INDUSTRIES. LESSONS FROM CUISINE.....	1523
Carvajal Pérez D., Araud A., Chaperon V., Le Masson P., Weil B. (France)	
AN ONTOLOGICAL FRAMEWORK TO LINK MARKETING AND DESIGN	1535
Casagrande-Seretti A., Montagna F. (Italy)	
A DIGITAL TWIN FOR ROOT CAUSE ANALYSIS AND PRODUCT QUALITY MONITORING.....	1547
Detzner A., Eigner M. (Germany)	
A NORMATIVE APPROACH FOR IDENTIFYING DECISION PROPAGATION PATHS IN COMPLEX SYSTEMS.....	1559
Hassannezhad M., Clarkson P. J. (United Kingdom)	
GRAPH DATABASES FOR EXPLOITING USE PHASE DATA IN PRODUCT-SERVICE-SYSTEM DEVELOPMENT: A METHODOLOGY TO SUPPORT IMPLEMENTATION	1571
Hollauer C., Shalumov B., Wilberg J., Omer M. (Germany)	
THE DESIGN OF VISUAL INFORMATION OBJECTS IN THREE-DIMENSIONAL VIRTUAL ENVIRONMENTS FOR ENGINEERING INFORMATION NAVIGATION.....	1583
Jones D. E., Snider C., Yon J., Gopsill J., Xie Y., Chanchevrier N., Hicks B. (United Kingdom)	
ONTOLOGY-BASED APPROACH FOR THE USE OF INTENTIONAL FORGETTING IN PRODUCT DEVELOPMENT	1595
Kügler P., Kestel P., Schon C., Marian M., Schleich B., Staab S., Wartzack S. (Germany)	
HOW MUCH KNOWLEDGE MANAGEMENT IS HIDDEN IN DESIGN METHODS?.....	1607
Laukemann A., Roth D., Binz H. (Germany)	
KNOWLEDGE-BASED SUPPORT DURING DESIGN OPTIMIZATION USING FLANGES AS AN EXAMPLE.....	1619
Loibl A., Andrae R., Köhler P. (Germany)	
CONCEPTUAL FRAMEWORK FOR ANALYSING KNOWLEDGE DYNAMICS IN ENGINEERING SCIENCE.....	1631
Märten A., Jenek J. F. W., Wang W. M., Fleck C., Meyer H., Stark R., Ammon S. (Germany)	
PREDICTION OF THE RESIDUAL LIFE OF A COMPONENT UNDER INTENSIVE RANDOM DYNAMIC LOADING WITHIN THE SCOPE OF TECHNICAL INHERITANCE.....	1643
Mozgova I., Yanchevskyi I., Lachmayer R. (Germany)	
BIG DATA ANALYSIS AS A NEW APPROACH FOR USABILITY ATTRIBUTES EVALUATION OF USER INTERFACES: AN AUTOMOTIVE INDUSTRY CONTEXT	1651
Orlovska J., Wickman C., Söderberg R. (Sweden)	

A PROPOSITION OF A KNOWLEDGE ELICITATION METHODOLOGY FOR CRASH SIMULATION DIAGNOSIS SUPPORT SYSTEM	1663
<i>Rousselon Fatfouta N., Stal-Le Cardinal J., Royer C. (France)</i>	
CROWD-BASED DATA-DRIVEN HYPOTHESIS GENERATION FROM DATA AND THE ORGANISATION OF PARTICIPATIVE SCIENTIFIC PROCESS	1673
<i>Sitruk Y., Kazakçı A. (France)</i>	
DATA OBJECTS: DESIGN PRINCIPLES FOR DATA PHYSICALISATION.....	1685
<i>Sosa R., Gerrard V., Esparza A., Torres R., Napper R. (New Zealand)</i>	
CHOOSING THE RIGHT TOOLS AND PRACTICES TO DESIGN A KNOWLEDGE MANAGEMENT SYSTEM IN A SME.....	1697
<i>Tapissier E., Mantelet F., Aoussat A. (France)</i>	
DATA DRIVEN DESIGN SELECTION AND GENERATION - AN INDUSTRIAL CASE STUDY ON ELECTRIC MOTORS	1709
<i>Tüchsen J., Pop A. C., Koch M., Schleich B., Wartzack S. (Germany)</i>	
THE DESCRIPTIONS AND ABSTRACTIONS OF A MULTIDISCIPLINARY SYSTEM: FROM GOALS TO STRUCTURE VIA COUPLING FRAMEWORK	1721
<i>Uddin A. (United Kingdom)</i>	
APPLICATION OF KNOWLEDGE MANAGEMENT SYSTEM TO INJECTION MOLD DESIGN AND MANUFACTURING IN SMALL ENTERPRISES	1733
<i>Vukašinović N., Vasić D., Tavčar J. (Slovenia)</i>	
INFORMATION FEEDBACK IN PRODUCT DEVELOPMENT: ANALYSING PRACTICAL CASES	1745
<i>Wellsandt S., Thoben K.-D., Klein P. (Germany)</i>	
SCALING OF STRUCTURAL COMPONENTS BY KNOWLEDGE-BASED ENGINEERING METHODS	1757
<i>Wolniak P., Sauthoff B., Lachmayer R. (Germany)</i>	
EXECUTABLE COST-SENSITIVE PRODUCT DEVELOPMENT OF A SELF-BALANCING TWO-WHEEL SCOOTER WITH GRAPH-BASED DESIGN LANGUAGES	1769
<i>Wünsch F., Ramsaier M., Breckle T., Stetter R., Till M., Rudolph S. (Germany)</i>	

7. DESIGN INNOVATION

FRAMING STRATEGIC VALUE THROUGH DESIGN-LED INNOVATION PRACTICE.....	1781
<i>Bailey M., Spencer N., Smith N., Aftab M., Knott C., Sams P. (United Kingdom)</i>	
GETTING INSPIRATION OR CREATING INSPIRATION? THE ROLE OF KNOWLEDGE STRUCTURES IN IDEA GENERATION	1793
<i>Brun J., Le Masson P., Weil B. (United States of America)</i>	
INTEGRATING INDIVIDUAL KNOWLEDGE INTO INNOVATION PROCESSES OF R&D ALLIANCES	1805
<i>Canik Y., Fain N., Bohemia E., Telalbasic I., Tewes V. (United Kingdom)</i>	
A COMPUTATIONAL APPROACH FOR COMBINATIONAL CREATIVITY IN DESIGN	1815
<i>Chen L., Wang P., Shi F., Han J., Childs P. R. N. (United Kingdom)</i>	
RE-USE OF ENGINEERING DESIGN RATIONALE IN FINNISH SME PROJECT BASED INDUSTRY 1825	
<i>Ellman A., Paronen J., Juuti T. S., Tiainen T. (Finland)</i>	
IDENTIFYING DISRUPTIVE TECHNOLOGIES: HORIZON SCANNING IN THE EARLY STAGES OF DESIGN.....	1833
<i>Ernstsen S. K., Thuesen C., Larsen L. R., Maier A. (Denmark)</i>	

INDUSTRY-LED CORPORATE START-UP ACCELERATOR DESIGN: LESSONS LEARNED IN A MARITIME PORT COMPLEX	1845
<i>Garcia-Herrera C., Perkmann M., Childs P. R. N. (United Kingdom)</i>	
THE CONCEPTUAL DISTANCES BETWEEN IDEAS IN COMBINATIONAL CREATIVITY	1857
<i>Han J., Shi F., Park D., Chen L., Childs P. R. N. (United Kingdom)</i>	
DERIVATION OF CRITERIA FOR RADICAL PRODUCT IDEAS	1867
<i>Herrmann T., Roth D., Binz H. (Germany)</i>	
ANALYZING RID METHODOLOGY THROUGH THE LENS OF INNOVATIVE ABDUCTION	1879
<i>Lamé G., Yannou B., Cluzel F. (France)</i>	
FRAMING NEW PRODUCT INNOVATIONS: HOW TO MAKE SENSE OF INTERNAL AND EXTERNAL INSIGHTS?.....	1891
<i>Laursen L. N., Haase L. M. (Denmark)</i>	
COMPETITIVE CAPABILITY ASSESSMENT OF INDUSTRIAL COMPANIES WITHIN THE FRAMEWORK OF ADVANCED INNOVATION DESIGN APPROACH	1903
<i>Livotov P. (Germany)</i>	
ANALYSING OPEN INNOVATION INTEGRATION TO PRODUCT DEVELOPMENT PROCESSES WITHIN THE BRAZILIAN AUTOMOTIVE INDUSTRY	1915
<i>Marin R. O., Kaminski P. C. (Brazil)</i>	
THE FUNCTION OF CO-CREATION IN DYNAMIC MECHANISM OF INTERSUBJECTIVITY FORMATION AMONG INDIVIDUALS	1925
<i>Matsumae A., Nagai Y. (Japan)</i>	
PRODUCT DEVELOPMENT CHALLENGES FOR SPACE SUB-SYSTEM MANUFACTURERS.....	1937
<i>Öhrwall Rönnbäck A. B., Isaksson O. (Sweden)</i>	
HOW TO FOSTER INNOVATION? FINDINGS AND HYPOTHESES FOR COLLABORATIONS BETWEEN RESEARCH AND INDUSTRY	1945
<i>Şahin T., Cudok A., Rapp S., Inkermann D., Albers A., Wattenberg F., Bursac N., Vietor T. (Germany)</i>	
PROPOSITION OF GUIDELINES FOR ASSESSING INNOVATION IN THE DESIGN AND PRODUCTION OF PAPERBOARD CONSUMER PACKAGING.....	1957
<i>Sastre R. M., de Paula I. C., Echeveste M. E. S. (Brazil)</i>	
DESIGN PRINCIPLES FOR CREATIVE SPACES.....	1969
<i>Thoring K., Mueller R. M., Desmet P., Badke-Schaub P. (The Netherlands)</i>	

TABLE OF CONTENTS

VOLUME 5

8. HUMAN BEHAVIOUR AND DESIGN

THE BEHAVIOURAL DESIGN SOLUTION SPACE: EXAMINING THE DISTRIBUTION OF IDEAS GENERATED BY EXPERT BEHAVIOURAL DESIGNERS.....	1981
<i>Bay Brix Nielsen C. K. E., Cash P., Daalhuizen J. (Denmark)</i>	
MEASURING DESIGN THINKING MINDSET	1991
<i>Dosi C., Rosati F., Vignoli M. (Italy)</i>	
STEERING A SHIP - INVESTIGATING AFFECTIVE STATE AND WORKLOAD IN SHIP SIMULATIONS	2003
<i>Dybvik H., Wulvik A., Steinert M. (Norway)</i>	
FURTHER DEVELOPMENT OF AN AGILE TECHNIQUE TOOLBOX FOR MECHATRONIC PRODUCT DEVELOPMENT	2015
<i>Goevert K., Lindemann U. (Germany)</i>	
MEASUREMENT OF BRAIN ACTIVITIES OF IDEA GENERATION (SKETCH).....	2027
<i>Kato T., Okada H., Izu Y. (Japan)</i>	
NOVICE DESIGNER'S LACK OF AWARENESS TO CYBERSECURITY AND DATA VULNERABILITY IN NEW CONCEPT DEVELOPMENT OF MOBILE SENSING DEVICES	2035
<i>Kim E., Jensen M. B., Poreh D., Agogino A. M. (United States of America)</i>	
DESIGNERS' IDENTITY: SKILLS' SELF-PERCEPTION AND EXPECTATION IN DESIGN STUDENTS	2045
<i>Kunrath K., Cash P., Li-Ying J. (Denmark)</i>	
AGILE BEYOND SOFTWARE - A STUDY OF A LARGE SCALE AGILE INITIATIVE	2055
<i>Lindlöf L., Furuhjelm J. (Sweden)</i>	
CPM/PDD AS AN INTEGRATED PRODUCT AND PROCESS MODEL FOR A DESIGN-THINKING BASED, AGILE PRODUCT DEVELOPMENT PROCESS	2063
<i>Luedeke T. F., Köhler C., Conrad J., Grashiller M., Ruf T., Sailer A., Vielhaber M. (Germany)</i>	
VERBAL ENGAGEMENT IN TEAMS SOLVING A CONCEPTUAL DESIGN TASK	2075
<i>Martinec T., Horvat N., Škoc S., Štorga M. (Croatia)</i>	
INSIGHTS INTO DESIGN CONCEPT SIMILARITY JUDGEMENTS	2087
<i>McTeague C. P., Duffy A., Hay L., Vuletic T., Campbell G., Choo P. L., Grealy M. (United Kingdom)</i>	
EXPLORATION OF COGNITIVE DESIGN BEHAVIOUR DURING DESIGN CRITIQUES	2099
<i>Milovanovic J., Gero J. S. (France)</i>	
DEFINING AGILE CULTURE USING TOPIC MODELLING	2111
<i>Rebentisch E., Schuh G., Dölle C., Mattern C., Abel H. (Germany)</i>	
EXPECTED VS. REAL EFFECTS OF AGILE DEVELOPMENT OF PHYSICAL PRODUCTS: APPORTIONING THE HYPE.....	2121
<i>Schmidt T. S., Weiss S., Paetzold K. (Germany)</i>	
COMPREHENDING THE DESIGNER'S SKETCH & IMPLICATIONS FOR COMMUNICATION	2133
<i>Self J. A. (Republic of Korea)</i>	

USING THE FIVE FACTOR MODEL TO STUDY PERSONALITY CONVERGENCE ON STUDENT ENGINEERING DESIGN TEAMS	2145
Stidham H., Summers J., Shuffler M. (<i>United States of America</i>)	
THINKING STYLES IN PRODUCT OPPORTUNITY RECOGNITION - A RATHER ENTREPRENEURIAL POINT OF VIEW	2155
Zagorac Z., Marxt C. (<i>Switzerland</i>)	
9. INDUSTRIAL DESIGN	
EVALUATING THE IMPACT OF DESIGN AFFORDANCES IN PRESCHOOL CHILDREN'S TOY PREFERENCES	2165
Balzan E., Farrugia P., Casha O., Wodehouse A. (<i>Malta</i>)	
SIMULATING MULTISENSORY WINE TASTING EXPERIENCE	2177
Carulli M., Bordegoni M., Ferrise F., Gallace A., Gustafsson M., Pfuhl T. (<i>Italy</i>)	
APPROXIMATION OF THE USER BEHAVIOUR IN A FULLY AUTOMATED VEHICLE REFERRING TO A STATIONARY PROTOTYPE-BASED RESEARCH STUDY	2187
Fitzen F., Amereller M., Paetzold K. (<i>Germany</i>)	
THE ROLE OF USER-CENTRED DESIGN IN SMART WEARABLE SYSTEMS DESIGN PROCESS	2197
Francés-Morcillo L., Morer-Camo P., Rodríguez-Ferradas M. I., Cazón-Martín A. (<i>Spain</i>)	
AESTHETIC INTERACTION CONSISTENCY: EXPLORING THE FOUNDATION FOR STATIC AND DYNAMIC AESTHETICS.....	2209
Gonzalez I., Val E., Justel D., Iriarte I., Lasa G. (<i>Spain</i>)	
MUSEUM EXPERIENCE DESIGN BASED ON MULTI-SENSORY TRANSFORMATION APPROACH	2221
Harada T., Hideyoshi Y., Gressier-Soudan E., Jean C. (<i>France</i>)	
SHAPING PRODUCTS: DIFFERENCES BETWEEN EXPERT AND NOVICE INDUSTRIAL DESIGNERS.....	2229
Jagtap S. (<i>Sweden</i>)	
NEW EYES OF ID - HOW TO PREPARE NEW INDUSTRIAL REVOLUTION AS INDUSTRIAL DESIGNER.....	2241
Jung E. C., Choi J. M., Sim Y. (<i>Republic of Korea</i>)	
EXPLORING NEW FUNCTIONALITIES IN CULTURAL HERITAGE SPACES - DESIGNING DIFFERENT MUSEUM TRAILS WITH LOW COST TECHNOLOGIES	2251
Khan S., Rosa S., Germak C. (<i>Italy</i>)	
SETTING THE SCENE: A NEW PROPOSAL FOR VISUALIZING AND ESTABLISHING 3-DIMENSIONAL PERSONAS AS A MANAGEMENT TOOL	2263
Koscher A., Dittenberger S. (<i>Austria</i>)	
TRI-WHEEL STAIR WALKER: DESIGN PROPOSAL OF AUXILIARY WALKER USABLE AT DISTRICT INCLUDING STAIRWAY	2275
Le M., Jung E.-C. (<i>Republic of Korea</i>)	
AESTHETIC PRODUCT INTERACTION: THE NECESSITY OF CONSISTENCY BETWEEN FUNCTION & EMOTION	2287
Lee K., Self J. A., Hong H. (<i>Republic of Korea</i>)	
DESIGNING A LIFE SITUATION TOOL IN CO-CREATIVITY: PROPOSAL FOR A TOOL ADAPTED TO FABLABS.....	2299
Lobbé J., Bazzaro F., Sagot J.-C. (<i>France</i>)	

MATCHLINK - A MULTI-SENSORIAL GAME FOR PERSONS WITH DEMENTIA.....	2311
<i>Seah C. E. L., Tan M. T. K. B. (Singapore)</i>	
ROBOT ERGONOMICS: TOWARDS HUMAN-CENTRED AND ROBOT-INCLUSIVE DESIGN.....	2323
<i>Sosa R., Montiel M., Sandoval E. B., Mohan R. E. (New Zealand)</i>	
ASSESSING USER NEEDS BY EXPLORING DAILY ACTIONS OF ELDERLY PEOPLE IN THEIR HOME ENVIRONMENT IN CHILE	2335
<i>Wallisch A., Stieg T., Paetzold K., Briede J. C. (Germany)</i>	
DESIGN OPTIMIZATION FOR INTERACTIVE PARENT-CHILD CLOTHING: INTEGRATION OF IOT TECHNOLOGY ENTITIES AND EMOTIONAL VIRTUAL BODIES	2347
<i>Wang W. Z., Nagai Y., Fang Y., Qiao C. X., Chen Y. P. (Japan)</i>	
INTRODUCING AN EVALUATION FRAMEWORK FOR WEARABLE DEVICES DESIGN: EXPLAIN REASONS OF LOW USER ADOPTION.....	2357
<i>Wang Y., Yu S., Wang J., Ma N., Liu Z. (People's Republic of China)</i>	
TOUCH, TOUCH, TOUCH, SENSORIAL COGNITIVE SKILLS SENSITIZED THROUGH TACTILITY AND TANGIBILITY	2369
<i>Wendrich R. (The Netherlands)</i>	

10. DESIGN EDUCATION

REFLECTING ON THE EMPLOYABILITY ADEQUACY OF COMPETENCIES TAUGHT IN DESIGN HIGH EDUCATION SYSTEM.....	2381
<i>Almendra R. A., Falcão G. A. (Portugal)</i>	
CREATIVITY UNDER PRESSURE: USING DISTANT SEMANTIC FIELDS FOR FAST ACTIVATION OF DIVERGENT THINKING IN ENGINEERING STUDENTS	2391
<i>Beghelli A., Prieto P. (Chile)</i>	
ENGAGING STUDENTS WHILE TEACHING DESIGN TOPICS ACROSS DIVERSE PROJECTS.....	2403
<i>Benjamin S., Anderson J. (United States of America)</i>	
DO BETTER SKETCHERS BECOME BETTER PRODUCT DESIGNERS?	2411
<i>Corremans J. A. M., Vaes K. R., Coppieters W. (Belgium)</i>	
CREATIVE PATH TO PRACTICAL KNOWLEDGE - CASE OF A TRIPLE HELIX FRAMEWORK	2421
<i>Čok V., Fain N., Žavbi R., Vukašinović N. (Slovenia)</i>	
INTRODUCING SUSTAINABILITY IN ENGINEERING DESIGN EDUCATION: A CASE STUDY USING ANALYSIS OF IMPACTS DURING THE DESIGN FOR SUSTAINABILITY (AID-DS)	2429
<i>Esparragoza I. E., Mesa J. A., Maury H. E. (United States of America)</i>	
RETHINKING DESIGN EDUCATION FOR THE MULTICULTURAL GENERATION.....	2441
<i>Huang T., Scott A., Lu Q., Sui T. (United States of America)</i>	
ANALYSIS OF ECODESIGN AND SUSTAINABLE DESIGN IN HIGHER EDUCATION	2451
<i>Kattwinkel D., Song Y.-W., Bender B. (Germany)</i>	
THE IMPACT OF DESIGN BRIEFS ON CREATIVITY: A STUDY ON MEASURING STUDENT DESIGNERS OUTCOMES.....	2461
<i>Koronis G., Silva A., Kang J. (Singapore)</i>	
FACILITATING NEED FINDING AND PROBLEM FORMULATION DURING COOPERATIVE WORK TERMS THROUGH VIRTUAL INSTRUCTION - PILOT IMPLEMENTATION RESULTS.....	2473
<i>Nespoli O., Hurst A., Russell J. (Canada)</i>	

THE CHALLENGES OF TEACHING SUSTAINABLE SYSTEM DESIGN	2485
<i>Pineda A. F. V., Jørgensen U. (Denmark)</i>	
DISCURSIVE ENGINEERING DESIGN: A SPECULATIVE FRAMEWORK FOR DESIGNING TECHNOLOGICAL INNOVATION.....	2495
<i>Rebola C. B., Gonsher I. (United States of America)</i>	
FAIL EARLY, FAIL OFTEN: EXPLORING STANFORD'S ME310 COURSE AS A BASIS TO IMPROVE INNOVATION OUTPOST EFFICACY	2505
<i>Stenholm D., Moore D., Leifer L., Bergsjö D. (Sweden)</i>	
IDEAL IDEATION: A FRAMEWORK FOR THE MANAGEMENT OF SKETCH INHIBITION AMONG UNDERGRADUATE DESIGNERS	2517
<i>Thurlow L., Ford P. (United Kingdom)</i>	
RECONCEPTUALIZING DESIGN RISK MANAGEMENT AS A LEARNING STRATEGY	2529
<i>Willumsen P. L., Oehmen J., Ernstsen S. K. (Denmark)</i>	
INSIGHTS ON HOW METACOGNITION INFLUENCES KNOWLEDGE APPLICATION IN PRODUCT DESIGN EDUCATION.....	2541
<i>Zhang Y., Bohemia E., McCardle J. (United Kingdom)</i>	
MANUFACTURING TECHNOLOGY-BASED APPROACH TO TEACHING ENGINEERING DRAWING	2553
<i>Žeželj D., Miler D. (Croatia)</i>	

TABLE OF CONTENTS

VOLUME 6

11. SOCIOTECHNICAL ISSUES IN DESIGN

ECO-DESIGN IN THE PUPPET WORLD, A CO-LEARNING PROCESS.....	2563
<i>Allais R., Tyl B., Postel J., Fleury R. (France)</i>	
THE APPRAISAL OF SUSTAINABLE MATERIALS	2575
<i>Bahrudin F. I., Aurisicchio M. (United Kingdom)</i>	
MODEL-BASED DECISION SUPPORT FOR VALUE AND SUSTAINABILITY ASSESSMENT:	
APPLYING MACHINE LEARNING IN AEROSPACE PRODUCT DEVELOPMENT	2585
<i>Bertoni A., Dasari S. K., Hallstedt S. I., Andersson P. (Sweden)</i>	
A KNOWLEDGE-BASED AND MULTI-USER PLATFORM FOR PRESCRIBING CUSTOM-MADE INSOLES	2597
<i>Brunzini A., Mandolini M., Germani M., Nester C. J., Williams A. E. (Italy)</i>	
DECISION SUPPORT TOOL TO DERIVE SUSTAINABLE PRODUCT CONFIGURATIONS AS A BASIS FOR CONCEPTUAL DESIGN	2609
<i>Buchert T., Stark R. (Germany)</i>	
CORPORATE REQUIREMENT CULTURE IN DEVELOPMENT OF A LARGE SCALE MEDICAL SYSTEM: A CASE STUDY	2621
<i>DelSpina B., Gilliam S., Summers J., Morkos B. (United States of America)</i>	
WHAT DESIGN PRACTICES DO PROFESSIONALS USE FOR SUSTAINABILITY AND INNOVATION?	2633
<i>Faludi J., Agogino A. M. (United States of America)</i>	
PERSONAS FOR POLICY-MAKING AND HEALTHCARE DESIGN	2645
<i>Gonzalez de Heredia A., Goodman-Deane J., Waller S., Clarkson P. J., Justel D., Iriarte I., Hernández J. (Spain)</i>	
DESIGN AND FRUGAL INNOVATIONS: THREE ROLES OF RESOURCE-POOR PEOPLE	2657
<i>Jagtap S., Larsson T. (Sweden)</i>	
DESIGNING MENTAL HEALTH DELIVERY SYSTEMS: DESCRIBING THE RELATIONSHIP BETWEEN SYSTEM COMPONENTS	2669
<i>Komashie A., Clarkson P. J. (United Kingdom)</i>	
POSITION PAPER: ON DESIGN RESEARCH ENGAGING WITH HEALTHCARE SYSTEMS	2681
<i>Lamé G. (United Kingdom)</i>	
UNDERSTAND SUSTAINABLE PACKAGING DESIGN IN PRACTICE	2693
<i>Ma X., Moultrie J. (United Kingdom)</i>	
TOWARD A SUPPORTIVE ECO-INNOVATION PLATFORM BASED ON ECO-IDEATION STIMULATION MESO-MECHANISMS AND ECO-INNOVATION CASES	2705
<i>Pham C. C., Vallet F., Tyl B., Pialot O., Eynard B. (France)</i>	
EXPLORING THE SYNERGISTIC RELATIONSHIPS OF CIRCULAR BUSINESS MODEL DEVELOPMENT AND PRODUCT DESIGN	2715
<i>Pieroni M., Pigosso D., McAloone T. (Denmark)</i>	
PRODUCT DESIGN FOR A CIRCULAR ECONOMY: FUNCTIONAL RECOVERY ON FOCUS	2727
<i>Pozo Arcos B., Balkenende A. R., Bakker C. A., Sundin E. (Sweden)</i>	

LINKING ECODESIGN CAPABILITIES TO CORPORATE PERFORMANCE: PROPOSAL OF A SIMULATION-BASED APPROACH	2739
<i>Rodrigues V. P., Pigosso D., McAloone T. (Denmark)</i>	
WORKSHOP METHOD FOR EARLY SUSTAINABLE PRODUCT DEVELOPMENT	2751
<i>Schulte J., Hallstedt S. I. (Sweden)</i>	
HOW TO SELECT APPROPRIATE STIMULATION MECHANISMS TO PERFORM AN ECO-IDEATION SESSION?.....	2763
<i>Tyl B., Vallet F., Pialot O. (France)</i>	
DESIGN FOR HEALTH: TOWARDS COLLABORATIVE CARE.....	2775
<i>Valentin-Hjorth J. F., Patou F., Syhler N., Dominguez H., Maier A. (Denmark)</i>	
FRUGAL INNOVATION IN COMPLEX SYSTEMS: EVIDENCE FROM NUCLEAR REACTOR DESIGN AND DEVELOPMENT IN INDIA	2787
<i>Verma A. (United States of America)</i>	
12. SYSTEMS ENGINEERING AND DESIGN	
SYSTEM OF SYSTEMS APPROACH FOR THE DESCRIPTION AND CHARACTERIZATION OF VALIDATION ENVIRONMENTS	2799
<i>Albers A., Mandel C., Yan S., Behrendt M. (Germany)</i>	
TOWARDS SYSTEMATIC INCONSISTENCY IDENTIFICATION FOR PRODUCT SERVICE SYSTEMS.....	2811
<i>Basirati M. R., Zou M., Bauer H., Kattner N., Reinhart G., Lindemann U., Böhm M., Kremer H., Vogel-Heuser B. (Germany)</i>	
FRAMING THE CONCEPT OF AUTONOMY IN SYSTEM DESIGN.....	2821
<i>Beernaert T. F., Bayrak A. E., Etman L. F. P., Papalambros P. Y. (The Netherlands)</i>	
SYNTHESIS OF FUNCTIONAL MODELS FROM USE CASES USING THE SYSTEM STATE FLOW DIAGRAM: A NESTED SYSTEMS APPROACH	2833
<i>Campean F., Yildirim U., Henshall E. (United Kingdom)</i>	
ANALYSIS OF SAFETY REQUIREMENTS EVOLUTION IN THE TRANSITION OF LAND TRANSPORTATION SYSTEMS TOWARD AUTONOMY	2845
<i>Damak Y., Jankovic M., Leroy Y., Yannou B. (France)</i>	
THE KSCM AS PART OF A HOLISTIC METHODOLOGY FOR THE DEVELOPMENT OF CYBERTRONIC SYSTEMS IN THE CONTEXT OF ENGINEERING 4.0	2855
<i>Dickopf T., Eigner M., Apostolov H. (Germany)</i>	
WORLDS APART AND CLOSE TOGETHER: RELATING MECHATRONICS AND PROJECT MANAGEMENT RESEARCH	2867
<i>Flening E., Jerbrant A. (Sweden)</i>	
TOWARDS A DESIGN-METHOD SELECTION FRAMEWORK FOR MULTIDISCIPLINARY PRODUCT DEVELOPMENT	2879
<i>Guérineau B., Rivest L., Bricogne M., Durupt A., Eynard B. (France)</i>	
PRODUCT SERVICE SYSTEM DESIGN IN A SYSTEM OF SYSTEMS CONTEXT: A LITERATURE SURVEY	2891
<i>Hein A. M., Poulain B., Jankovic M., Chazal Y., Fakhfakh S. (France)</i>	
SYSML BEHAVIOUR MODELS FOR DESCRIPTION OF VIRTUAL REALITY ENVIRONMENTS FOR EARLY EVALUATION OF A PRODUCT	2903
<i>Mahboob A., Husung S., Weber C., Liebal A., Krömker H. (Germany)</i>	

A DESIGN PROCESS MANAGEMENT METHOD FOR PRODUCT-SERVICE SYSTEMS	2913
<i>Minato S., Idei Y., Mitake Y., Shimomura Y. (Japan)</i>	
DETAILED CONCEPT OF THE SYSML LIGHTWEIGHT VISUALIZATION IN PDM SYSTEMS	2925
<i>Nigischer C., Gerhard D. (Austria)</i>	
EVALUATION METHOD IN ENERGY EFFICIENT DESIGN OF COOLING PLANTS	2937
<i>Osman K., Tomaš Ž., Pervan D. (Croatia)</i>	
PLANNING OF SMART SERVICES BASED ON A REFERENCE ARCHITECTURE	2949
<i>Rabe M., Asmar L., Kühn A., Dumitrescu R. (Germany)</i>	
TOWARDS SYSTEMATIC DESIGN OF CYBER-PHYSICAL PRODUCT-SERVICE SYSTEMS	2961
<i>Rizvi M. A. K., Chew E. (Australia)</i>	
SPECIFICATION TECHNIQUE FOR AUGMENTED REALITY BASED PRODUCT SERVICE SYSTEMS.....	2975
<i>Röltgen D., Wortmann F., Anacker H., Dumitrescu R. (Germany)</i>	
IMPLEMENTATION OF SYSTEMS MODELING LANGUAGE (SYSML) IN CONSIDERATION OF THE CONSENS APPROACH	2987
<i>Salehi V., Florian G., Taha J. (Germany)</i>	
DEEP LEARNING IN SHEET-BULK METAL FORMING PART DESIGN.....	2999
<i>Sauer C., Schleich B., Wartzack S. (Germany)</i>	
BALL BEARINGS AS SENSORS FOR SYSTEMATICAL COMBINATION OF LOAD AND FAILURE MONITORING.....	3011
<i>Schirra T., Martin G., Vogel S., Kirchner E. (Germany)</i>	
AN APPROACH FOR THE IMPLEMENTATION OF THE DIGITAL TWIN IN THE AUTOMOTIVE WIRING HARNESS FIELD	3023
<i>Tharma R., Winter R., Eigner M. (Germany)</i>	
ROBUST DESIGN FOR MECHATRONIC MACHINE ELEMENTS - HOW ROBUST DESIGN ENABLES THE APPLICATION OF MECHATRONIC SHAFT-HUB CONNECTION	3033
<i>Vogel S., Martin G., Schirra T., Kirchner E. (Germany)</i>	
MATURITY MODEL-BASED PLANNING OF CYBER-PHYSICAL SYSTEMS IN THE MACHINERY AND PLANT ENGINEERING INDUSTRY	3041
<i>Westermann T., Dumitrescu R. (Germany)</i>	
RESILIENT DESIGN PROPERTIES OF A DRIVERLESS TRANSPORT SYSTEM.....	3053
<i>Wied M., Oehmen J., Welo T. (Denmark)</i>	
RESEARCH ON INTELLIGENT DESIGN AND ACCURATE MODELLING OF SPIRAL BEVEL GEARS BASED ON FUNCTION-TO-FORM MAPPING.....	3063
<i>Xu Z.-G., Su K.-Y., Zhu J.-F., Liu W.-M. (People's Republic of China)</i>	

INDEX

A

Abel H. 2111
Acharya S. 137
Aftab M. 1781
Agogino A. M. 2035, 2633
Ahmed-Kristensen S. 1031
Akasaka F. 127
Alber U. 225
Albers A. 1, 13, 713, 1127, 1945, 2799
Allais R. 2563
Almendra R. A. 2381
Altavilla S. 953
Amaral D. C. 893
Amereller M. 2187
Ammon S. 1631
Anacker H. 1043, 2975
Anderer J. 429, 477
Anderson J. 2403
Andersson P. 2585
Andrae R. 1619
Angerer C. 261
Aoussat A. 1149, 1697
Aoyama K. 1279
Apostolov H. 2855
Araud A. 1523
Arcitoaurtena Oiartzun M. 215
Arnarsson Í. Ö. 523
Arrasvuori J. H. 1197
Asmar L. 2949
Asp L. 633
Aurisicchio M. 917, 2575

B

Badke-Schaub P. 25, 1969
Bahrudin F. I. 2575
Bailey M. 1781
Bakker C. A. 2727
Balkenende A. R. 2727
Ball N. 611
Balzan E. 2165
Barone S. 183
Bartholdt M. 965
Bartz M. 975
Basirati M. R. 2811
Bauer H. 2811
Bavendiek A.-K. 149
Bay Brix Nielsen C. K. E. 1981

Bayrak A. E. 735, 2821
Bazzaro F. 2299
Becattini N. 405, 533
Becerril L. 725
Beernaert T. F. 2821
Beetz J.-P. 985
Beghellì A. 2391
Behrendt M. 2799
Bellini A. 161
Ben Guefrache F. 33, 381
Bender B. 975, 1337, 2451
Benjamin S. 2403
Bergsjö D. 2505
Bermell-Garcia P. 347
Bertoni A. 171, 465, 2585
Bertoni M. 161, 171
Bertsche B. 965
Bharath P. A. 137
Bilde N. 1173
Binz H. 829, 1115, 1417, 1607, 1867
Bleckmann M. 1269
Bohemia E. 1805, 2541
BöhM M. 2811
Böhmer A. I. 545, 1345
Bojčetić N. 1369
Bollmann M. 965
Bonvoisin J. 45
Bordegoni M. 183, 2177
Borg J. C. 1393
Borgianni Y. 69, 1393
Borgue O. 997
Boujut J.-F. 405
Brahma A. 1499
Breckle T. 1769
Bricogne M. 2879
Briede J. C. 2335
Brisco R. 193
Broberg O. 601
Bruckmann T. 747
Brun J. 1793
Brunzini A. 2597
Buchert T. 45, 2609
Buffoni L. 857
Burić M. 205
Bursac N. 1, 13, 713, 1945
Butenko V. 1
Byrne T. J. 1511

C

- Cabello Ulloa M. J.** 215
Campbell G. 103, 2087
Campean F. 237, 1511, 2833
Campos Insunza M. A. 215
Canik Y. 1805
Carli I. 381
Carulli M. 2177
Caruso G. 381
Carvajal Pérez D. 1523
Casagrande-Seretti A. 1535
Casakin H. 91
Cascini G. 33, 381, 533, 1009
Cash P. 1981, 2045
Casha O. 2165
Cazón-Martín A. 2197
Chakrabarti A. 137
Chanchevrier N. 1583
Chaperon V. 1523
Chatty T. 137
Chazal Y. 2891
Chen L. 1815, 1857
Chen Y. P. 2347
Chew E. 2961
Childs P. R. N. 1815, 1845, 1857
Choi J. M. 2241
Choo P. L. 103, 2087
Choudry S. A. 225
Chowdhery S. A. 161
Christensen C. K. F. 841
Cicconi P. 393
Clarkson P. J. 611, 1559, 2645, 2669
Cluzel F. 1879
Conforto E. C. 893
Conrad J. 2063
Coppiepers W. 2411
Corallo A. 359
Cormican K. 557
Corremans J. A. M. 2411
Corsini L. 1021
Coutris N. 1103
Cudok A. 1945
-
- Č**
-
- Čok V.** 2421
-
- D**
-
- Daalhuizen J.** 1981
Damak Y. 2845
Dasari S. K. 2585

De Paula D. 557

- de Paula I. C.** 643, 1957
Dekoninck E. 405
DelSpina B. 2621
Desmet P. 1969
Detzner A. 1547
Dhokia V. 381
Dickopf T. 2855
Dittenberger S. 567, 2263
Dobrigkeit F. 557
Dölle C. 2111
Dominguez H. 2775
Dosi C. 1991
Duffy A. 103, 2087
Dumitrescu R. 1043, 2949, 2975, 3041
Duraiswamy V. 237
Durupt A. 2879
Dybvik H. 2003

E

- Echeveste M. E. S.** 643, 1957
Eckert C. M. 713, 781
Eigner M. 1547, 2855, 3023
Eisenbart B. 1055, 1245, 1429
Elgh F. P. W. 249, 757
Ellman A. 1825
Ericsen Å. 849
Ernstsen S. K. 1833, 2529
Esat R. 1031
Esparragoza I. E. 2429
Esparza A. 1685
Etman L. F. P. 2821
Exner K. 881
Eynard B. 1209, 2705, 2879

F

- Fabis D.** 1115
Fadel G. 1103
Fahrmeier L. 1441
Fain N. 1805, 2421
Fakhfakh S. 2891
Falcão G. A. 2381
Falkowski T. 1043
Faludi J. 2633
Fam A. 1357
Fang Y. 2347
Farrugia P. 2165
Faust O. 57
Felgenhauer M. 261
Feng Y. 273
Fernandes S. d. C. 281

Ferriero D. 735
Ferrise F. 183, 2177
Filippi A. 1055
Fiorineschi L. 1009, 1067, 1079, 1091
Fitzen F. 2187
Fleck C. 1631
Flening E. 2867
Fleskes J. 1313
Fleury R. 2563
Florian G. 2987
Forbes H. L. 579
Ford P. 2517
Forsteneichner C. 293, 1313
Francés-Morcillo L. 2197
Franklin S. 1103
Frillieci F. S. 1067, 1079, 1091
Furuholm J. 2055

G

Gade A. N. 305
Gallace A. 2177
Garcia-Herrera C. 1845
Garrelts E. 1115
Gärtner A. C. 735
Gerhard D. 2925
Gericke K. 781, 1055, 1245, 1429
Germak C. 2251
Germani M. 393, 2597
Gero J. S. 2099
Gerrard V. 1685
Ghadge K. 137
Gilliam S. 2621
Giunta L. 405
Gladysz B. 1127
Goevert K. 2015
Göhlich D. 1139
Gonsher I. 2495
Gonzalez de Heredia A. 2645
Gonzalez I. 2209
Goodman-Deane J. 2645
Gopsill J. 315, 1583
Gößling R. 975
Graeff E. 1149
Graessler I. 325, 747
Grashiller M. 2063
Grealy M. 103, 2087
Gressier-Soudan E. 2221
Greve E. 335
Grierson H. 193
Grundler A. 965

Guérineau B. 2879
Guertler M. R. 1161
Günther M. 1043
Gustafsson M. 2177
Gustavsson E. 523

H

Haase L. M. 793, 1891
Haass S. 225
Hall M. 347
Hallstedt S. I. 655, 1381, 1405, 2585, 2751
Han J. 1815, 1857
Harada T. 2221
Harris S. 237
Hassannezhad M. 611, 1559
Hay L. 103, 2087
Heck J. 1233
Heikkinen T. M. D. 757
Heimicke J. 713
Hein A. M. 2891
Helo P. T. 1197
Henseler J. 589
Henshall E. 2833
Hentze J. 325, 747
Hernández J. 2645
Herrmann T. 1867
Hicks B. 1257, 1583
Hideyoshi Y. 2221
Hildebrand S. 1139
Hollauer C. 769, 1441, 1453, 1571
Holtmannspoetter J. 1269
Hong H. 2287
Honkisch C. A. 589
Horvat N. 2075
Huang T. 2441
Hurst A. 2473
Husung S. 2903
Huth T. 149

I

Idei Y. 2913
Ihara M. 127
Inkermann D. 149, 1945
Iriarte I. 2209, 2645
Isaksson O. 633, 997, 1937
Izu Y. 2027

J

Jagtap S. 2229, 2657
Jankovic M. 2845, 2891
Januszek S. 893

Jauregui Becker J. M. 691
Jean C. 2221
Jenek J. F. W. 1631
Jensen L. S. 841, 1173
Jensen M. B. 2035
Jensen R. L. 305
Jerbrant A. 2867
Jirstrand M. 523
Johannesson H. 817
Johansson A. 347
Johansson H. 857
Johansson J. 249, 757
Jones D. A. 781
Jones D. E. 1583
Jørgensen U. 2485
Jung E.-C. 2241, 2275
Juranić J. 417
Jürgenhake C. 1043
Justel D. 2209, 2645
Juuti T. S. 623, 1825

K

Kadir B. A. 601
Kaminski P. C. 1915
Kang J. 2461
Kantelberg J. 893
Kaspar J. 1185
Kataoka I. 273
Kato T. 2027
Kattner N. 2811
Kattwinkel D. 2451
Kauffeld S. 149
Kazakçı A. 1673
Kestel P. 1595
Khan S. 2251
Kim E. 2035
Kimura A. 127
Kirchner E. 985, 1325, 1465, 3011, 3033
Klein P. 1745
Kloberdanz H. 985
Knott C. 1781
Knudsen L. S. 793
Koch M. 1709
Koehler N. 805
Köhler C. 2063
Köhler P. 1619
Komashie A. 2669
Koronis G. 2461
Koscher A. 2263
Koskela L. 1301

Kostadinov A. 1357
Kozin I. 667
Krause D. 335
Kremar H. 2811
Krömker H. 2903
Kügler P. 1595
Kühn A. 2949
Kunrath K. 2045
Kuzmić N. 417

L

Lachmayer R. 1643, 1757
Lamé G. 1879, 2681
Lammi M. E. 1197
Lanander M. 465
Landahl J. 817
Landgrebe D. 225
Langner M. 769
Larsen L. R. 1833
Larsen T. S. 305
Larsson T. 2657
Lasa G. 2209
Lau K. 1453
Laufer F. 829
Laukemann A. 1607
Laursen L. N. 1891
Lazoi M. 359
Le M. 2275
Le Masson P. 1523, 1793
Lee K. 2287
Lehtonen T. A. 623
Lei N. 57
Leifer L. 2505
Leroy Y. 2845
Li G. 1103
Li J. 1209
Liebal A. 2903
Lienkamp M. 261
Lindemann U. 545, 725, 769, 869, 905, 1345,
2015, 2811
Lindlöf L. 2055
Lindwall A. 1221
Liu W.-M. 1477, 3063
Liu Z. 2357
Livotov P. 1903
Li-Ying J. 2045
Lobbé J. 2299
Loibl A. 1619
Løkkegaard M. 841
Lu Q. 2441
Lucena R. 643

Luedeke T. F. 2063
Lugnet J. 849
Lukić M. 1369
Lund Strøm L. C. 1233

M

Ma N. 2357
Ma X. 2693
Maccioni L. 69, 1393
Mahboob A. 2903
Maier A. 667, 869, 1833, 2775
Malmqvist J. 523
Mandel C. 2799
Mandolini M. 2597
Manrique S. W. 1245
Mantelet F. 1697
Maranzana N. 1149
Marian M. 1595
Marin R. O. 1915
Marjanović D. 205
Marksteiner R. 261
Marra M. 359
Märten A. 1631
Marthaler F. 1
Martin G. 3011, 3033
Martinec T. 2075
Martínez Noguera F. 215
Marxt C. 2155
Masclet C. 33, 533
Mathias D. 1257
Matsumae A. 1925
Matsuoka Y. 81
Mattern C. 2111
Maury H. E. 2429
McAloone T. 2715, 2739
McCardle J. 2541
McMahon C. A. 347, 667
McTeague C. P. 103, 2087
Mesa J. A. 2429
Metschkoll M. 293
Meyer A. W. 369
Meyer H. 1631
Micchetti F. 359
Miler D. 2553
Milovanovic J. 2099
Minato S. 2913
Mitake Y. 2913
Močibov P. 805
Mohan R. E. 2323
Montagna F. 953, 1535

Montero J. 1269
Montiel M. 2323
Moore D. 2505
Morer-Camo P. 2197
Morkos B. 2621
Morosi F. 381
Mortensen N. H. 841
Moser H. 1429
Moultrie J. 1021, 2693
Mozgová I. 1643
Mueller R. M. 1969
Mukai S. 81
Munive-Hernandez J. E. 237

N

Nagai Y. 1925, 2347
Napper R. 1685
Nardelli M. 393
Naumann T. 429, 477, 805
Neagu D. 1511
Nespoli O. 2473
Nester C. J. 2597
Nie Y. 1209
Nigischer C. 2925
Nilsson S. 857
Nissen L. 1173
Nissen S. B. 305
Nonaka N. 273
Nützel T. 1453
Nylander J. 1381

O

Oehmen J. 667, 703, 1233, 1301, 2529, 3053
O'Hare J. A. 33, 405, 533
Oizumi K. 1279
Okada H. 2027
Oleff C. 325
Olmez H. 611
Omer M. 1441, 1453, 1571
Orlovska J. 1651
Osman K. 2937
Ostermeyer E. 1393

Ö

Öhrwall Rönnbäck A. B. 1937
Özkil A. G. 1173

P

Paetzold K. 115, 293, 1269, 1313, 2121, 2187,
2335
Pakkanen J. T. 623
Panarotto M. 633, 997

Papalambros P. Y. 735, 2821
Park D. 1857
Paronen J. 1825
Pascarelli C. 359
Patou F. 2775
Paulsen H. 149
Pavković N. 417
Pekkala J. 1197
Peltonen S. L. 1197
Pérez García M. 1289
Perkmann M. 1845
Pervan D. 2937
Pessoa M. V. P. 589, 691
Pfuhl T. 2177
Pham C. C. 2705
Pialot O. 2705, 2763
Piccolo S. A. 869
Pieroni M. 2715
Pigosso D. 2715, 2739
Pikas E. 1301
Pineda A. F. V. 2485
Pookrkiyan M. 249
Pop A. C. 1709
Poreh D. 2035
Postel J. 2563
Poulain B. 429, 2891
Pozo Arcos B. 2727
Preidel M. 881
Prieto P. 2391
Prudhomme G. 33

Q

Qiao C. X. 2347
Queiroz C. 281

R

Rabe M. 2949
Raffaeli R. 393
Ramsaier M. 1769
Ranjan B. S. C. 137
Ranscombe C. 1257
Rapp S. 1945
Raudberget D. 249
Ravindranath R. 347
Rebentisch E. 893, 2111
Rebola C. B. 2495
Reichwein J. 1465
Reinhart G. 2811
Remirez Jauregui A. 215
Remus R. 975
Retolaza Ojanguren I. 215

Riesener M. 893
Rigger E. 441
Rivest L. 2879
Rizvi M. A. K. 2961
Rodrigues V. P. 2739
Rodríguez-Ferradas M. I. 2197
Röltgen D. 2975
Rølvåg T. 487
Rosa M. 281
Rosa S. 2251
Rosati F. 1991
Rosen D. W. 57
Roth D. 829, 1115, 1417, 1607, 1867
Rotini F. 1009, 1067, 1079, 1091
Rousselon Fatfouta N. 1663
Royer C. 1663
Rozenfeld H. 281
Rudolph S. 1769
Ruf T. 2063
Russell J. 2473

S

Saffón López S. 1289
Sagot J.-C. 2299
Şahin T. 1945
Sailer A. 2063
Sakae Y. 81
Salehi V. 2987
Sams P. 1781
Sandahl K. 857
Sandoval E. B. 2323
Sastre R. M. 643, 1957
Sato K. 81
Sauer C. 2999
Saurin T. A. 643
Sauthoff B. 1757
Schaefer D. 579
Schellert D. D. 1139
Schirra T. 3011, 3033
Schleich B. 1595, 1709, 2999
Schlemmer P. D. 985
Schmidt T. S. 2121
Schneberger J.-H. 1185
Schneider F. 261
Scholle P. 325
Schon C. 1595
Schönwald J. 1313
Schork S. 1325
Schuh G. 893, 2111
Schulte J. 655, 1381, 2751

Schweigert-Recksiek S. 905
Scott A. 2441
Seah C. E. L. 2311
Self J. A. 2133, 2287
Sellgren U. 929
Shalumov B. 1571
Sherkat N. 57
Shi F. 1815, 1857
Shimomura Y. 2913
Shuffler M. 2145
Silva A. 2461
Sim Y. 2241
Simons D. P. 1245
Singh V. 91
Sitruk Y. 1673
Smith N. 1781
Snider C. 1257, 1583
Söderberg A. 929
Söderberg R. 1651
Song Y.-W. 1337, 2451
Sosa R. 1685, 2323
Souza da Conceição C. 601
Spencer N. 1781
Spreiter L. 1345
Staab S. 1595
Stal-Le Cardinal J. 429, 1663
Stark R. 45, 881, 1631, 2609
Steinert M. 2003
Stenholm D. 2505
Stetter R. 1769
Stidham H. 2145
Stieg T. 2335
Stoffels P. 1185
Stolt R. 249
Striegel S. S. 453
Su K.-Y. 1477, 3063
Suarez Madrigal A. 1055
Sui T. 2441
Summers J. 2145, 2621
Sundin E. 2727
Svensson M. 465
Sybler N. 2775
Š
Škec S. 667, 2075
Štorga M. 2075

T

Taha J. 2987
Tahir Sheikh B. 857
Tan M. T. K. B. 2311

Tapissier E. 1697
Tavčar J. 1733
Tegeltija M. 667
Telalbasic I. 1805
Teo A. 1357
Tewes V. 1805
Thallemer A. 1357
Tharma R. 3023
Thoben K.-D. 1745
Thoring K. 1969
Thuesen C. 1301, 1833
Thurlow L. 2517
Tiainen T. 1825
Till M. 1769
Toepfer F. 477
Tollestrup C. 793
Tomas Ž. 2937
Tong S. 1209
Törnlind P. 1221
Torres R. 1685
Trautmann L. 1393
Tüchsen J. 1709
Tyl B. 2563, 2705, 2763

U

Uddin A. 1721
Ulonska S. 487
Urakami J. 679

V

Vaes K. R. 2411
Vajna S. 369, 477, 511, 679, 805
Val E. 2209
Valentin-Hjorth J. F. 2775
Valjak F. 1369
Vallet F. 2705, 2763
Van Der Braak M. 691
Vasić D. 1733
Verma A. 2787
Vielhaber M. 1185, 2063
Victor T. 149, 1945
Vignoli M. 1991
Villamil C. 1381
Vlah L. 417
Voelkl H. 499
Vogel S. 3011, 3033
Vogel-Heuser B. 2811
Vosgien T. 441
Voute E. 25
Vukašinović N. 1733, 2421
Vuletic T. 103, 2087

W

- Wall J. 171
Waller S. 2645
Wallisch A. 115, 1393, 2335
Walter B. 13, 713
Wang J. 2357
Wang K. 1209
Wang P. 1815
Wang W. M. 881, 1631
Wang W. Z. 2347
Wang Y. 2357
Wartzack S. 499, 941, 1595, 1709, 2999
Wattenberg F. 1945
Watz M. 1381, 1405
Weber C. 2903
Wee T. P. Y. 917
Weihe S. 1115
Weil B. 1523, 1793
Weiss F. 1417
Weiss S. 2121
Wellsandt S. 1745
Welo T. 487, 3053
Wendrich R. 183, 2369
Wenngren J. 849
Werz M. 1115
Westermann T. 3041
Whitfield R. I. 193
Wichmann R. L. 1429
Wickman C. 1651
Wied M. 3053
Wiesner M. 511
Wilberg J. 869, 1441, 1453, 1571
Williams A. E. 2597
Williamsson D. 929
Willumsen P. L. 1233, 2529
Wilmsen M. 13, 713
Windheim M. 1337
Winter R. 3023
Witz P. 703
Wodehouse A. 2165
Wolf A. 941
Wolniak P. 1757
Wortmann F. 2975
Wulvik A. 2003
Wünsch F. 1769
Würtenberger J. 1465
Wynn D. C. 1499

X

- Xie Y. 1583
Xu Z.-G. 1477, 3063

Y

- Yan S. 2799
Yanchevskyi I. 1643
Yang W. 1489
Yannou B. 1879, 2845
Yasuoka M. 127
Yildirim U. 2833
Yli-Viitala P. L. 1197
Yon J. 1583
Yoshida J. 273
Yu S. 2357

Z

- Zagorac Z. 2155
Zhang Q. 1
Zhang X. 1209
Zhang Y. 2541
Zhu J.-F. 1477, 3063
Zielinski D. 453
Zou M. 2811
Zulaika Munain I. 215

Ž

- Žavbi R. 2421
Žeželj D. 2553