

Founding Editors

Gerhard Goos

Karlsruhe Institute of Technology, Karlsruhe, Germany

Juris Hartmanis

Cornell University, Ithaca, NY, USA

Editorial Board Members

Elisa Bertino

Purdue University, West Lafayette, IN, USA

Wen Gao

Peking University, Beijing, China

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Gerhard Woeginger 

RWTH Aachen, Aachen, Germany

Moti Yung

Columbia University, New York, NY, USA

More information about this series at <http://www.springer.com/series/7408>


Xavier Franch · Tomi Männistö ·
Silverio Martínez-Fernández (Eds.)


Product-Focused Software Process Improvement

20th International Conference, PROFES 2019
Barcelona, Spain, November 27–29, 2019
Proceedings

Editors

Xavier Franch 
Universitat Politècnica de Catalunya
Barcelona, Spain

Tomi Männistö 
University of Helsinki
Helsinki, Finland

Silverio Martínez-Fernández 
Fraunhofer Institute for Experimental
Software Engineering
Kaiserslautern, Germany

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-030-35332-2 ISBN 978-3-030-35333-9 (eBook)
<https://doi.org/10.1007/978-3-030-35333-9>

LNCS Sublibrary: SL2 – Programming and Software Engineering

© Springer Nature Switzerland AG 2019

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

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

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

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

Preface

On behalf of the PROFES Organizing Committee, we are proud to present the proceedings of the 20th International Conference on Product-Focused Software Process Improvement (PROFES 2019) held in Barcelona. The hosting institution was the Universitat Politècnica de Catalunya - BarcelonaTech in Spain. Since 1999, PROFES has established itself as one of the top recognized international process improvement conferences. In the spirit of the PROFES conference series, the main theme of PROFES 2019 was professional software process improvement (SPI) motivated by product, process, and service quality needs.

PROFES 2019 provided a premier forum for practitioners, researchers, and educators to present and discuss experiences, ideas, innovations, as well as concerns related to professional software development and process improvement driven by product and service quality needs. At PROFES 2019, solutions found in practice and relevant research results from academia were presented.

A committee of leading experts in software process improvement, software process modeling, and empirical software engineering selected the technical program. This year, 65 full research papers were submitted. At least three independent experts reviewed each paper. After thorough evaluation, 24 technical full papers were finally selected (37% acceptance rate). In addition, four out of nine industrial papers were selected to the program.

Furthermore, we received 30 short paper submissions. Each submission was reviewed by three members from the PROFES Program Committee. Based on the reviews and overall assessments, 11 short papers were accepted for presentation at the conference and for inclusion in the proceedings (37% acceptance ratio).

Continuing the open science policy in the previous PROFES 2017 and PROFES 2018, we encouraged and supported the authors of all accepted submissions to make their papers and research publicly available.

The topics addressed in this year's papers indicate that SPI is still a vibrant research discipline, but is also of high interest for industry. Several papers report on case studies or SPI-related experience gained in industry. The accepted papers of PROFES 2019 addressed, for example, the following topics:

- Continuous Delivery and Experimentation
- Software Testing
- Software Development
- Technical Debt
- Estimations
- Microservices

Since the beginning of the PROFES conference series, the purpose has been to highlight the most recent findings and novel results in the area of process improvement. We were proud to have Professor Neil Maiden (City, University of London) and

Jennifer Nerlich (Vogella), two renowned keynote speakers from research and industry, at the 2019 edition of PROFES.

Further relevant topics were added by the events co-located with PROFES 2019: the Third International Workshop on Managing Quality in Agile and Rapid Software Development Processes, the 4th International Workshop on Human Factors in Software Processes, and four tutorials addressing themes relevant to industry. The role of two European space co-chairs was added to the Organizing Committee. Responsibilities included providing an opportunity for researchers involved in ongoing and/or recently completed research projects (national, European, and international) related to the topics of the conference to present their projects and disseminate the objectives, deliverables, or outcome. Complementing the main scientific program, these events were included in the program to bring together researchers and representatives from industry by providing researchers with the opportunity to attend industry tutorials and providing practitioners with the latest research.

We are thankful for the opportunity to have served as chairs for this conference. The Program Committee members and reviewers provided excellent support in reviewing the papers. We are also grateful to all authors of submitted manuscripts, presenters, and session chairs for their time and effort in making PROFES 2019 a success. We would also like to thank the PROFES Steering Committee members for the guidance and support in the organization process. Furthermore, we thank everyone in the organization team as well as the student volunteers for making PROFES 2019 an experience that will live on in the participants' memory for years to come.

November 2019

Xavier Franch
Tomi Männistö
Silverio Martínez-Fernández

Organization

Organizing Committee

General Chair

Xavier Franch

Technical University of Catalunya, Spain

Program Co-chairs

Tomi Männistö

University of Helsinki, Finland

Silverio

Fraunhofer IESE, Germany

Martínez-Fernández

Short Paper Co-chairs

Oscar Dieste

Universidad Politécnica de Madrid, Spain

Pilar Rodríguez

University of Oulu, Finland

Industry Paper Chair

Danilo Caivano

SER & Practices, Italy

Workshop Co-chairs

Casper Lassenius

Aalto University, Finland

Andreas Vogelsang

Technical University of Berlin, Germany

Tutorial Co-chairs

Matthias Galster

University of Canterbury, New Zealand

Dietmar Pfahl

University of Tartu, Estonia

Journal-First Track Chair

Daniel Méndez Fernández

Blekinge Institute of Technology, Sweden,
and fortiss GmbH, Germany

European Project Space Co-chairs

Alessandra Bagnato

Softeam, France

Davide Fucci

HITeC – University of Hamburg, Germany

Organization Chair

Carme Quer

Technical University of Catalunya, Spain

Proceedings Co-chairs

Claudia Ayala	Technical University of Catalunya, Spain
Jordi Marco	Technical University of Catalunya, Spain

Social Media and Publicity Co-chairs

Marc Oriol	Technical University of Catalunya, Spain
Anna Maria Vollmer	Fraunhofer IESE, Germany

Webmaster

Carles Farré	Technical University of Catalunya, Spain
Maria José Salamea	Technical University of Catalunya, Spain

Contact Person

Dolors Costal	Technical University of Catalunya, Spain
---------------	--

Local Organization Team

Katarzyna Biesialska	Technical University of Catalunya, Spain
Xavier Burgués	Technical University of Catalunya, Spain
Cristina Gómez	Technical University of Catalunya, Spain
Lidia López	Technical University of Catalunya, Spain
Martí Manzano	Technical University of Catalunya, Spain
Cristina Palomares	Technical University of Catalunya, Spain

Program Committee

Full Research and Industry Papers Program Committee

Silvia Abrahao	Universitat Politècnica de València, Spain
Sousuke Amasaki	Okayama Prefectural University, Japan
Maria Teresa Baldassarre	University of Bari, Italy
Vita Santa Barletta	University of Bari, Italy
Stefan Biffl	Vienna University of Technology, Austria
Andreas Birk	SWPM, Germany
Luigi Buglione	Engineering Technology Services (ETS), Italy
Gerardo Canfora	University of Sannio, Italy
Bruno da Silva	California Polytechnic State University, USA
Maya Daneva	University of Twente, The Netherlands
Michal Dolezel	University of Economics – Prague, Czech Republic
Christof Ebert	Vector, Germany
Fabian Fagerholm	University of Helsinki, Finland
Davide Falessi	California Polytechnic State University, USA
Masud Fazal-Baqaie	Fraunhofer, Germany
Michael Felderer	University of Innsbruck, Austria
Davide Fucci	HITeC – University of Hamburg, Germany
Lina Garcés	University of São Paulo, Brazil

Carmine Gravino	University of Salerno, Italy
Daniel Graziotin	University of Stuttgart, Germany
Noriko Hanakawa	Hannan University, Japan
Frank Houdek	Daimler AG, Germany
Andrea Janes	Free University of Bolzano, Italy
Petar Jovanovic	Universitat Politècnica De Catalunya – Barcelona Tech, Spain
Oliver Karras	Leibniz Universität Hannover, Germany
Petri Kettunen	University of Helsinki, Finland
Jil Klünder	Leibniz Universität Hannover, Germany
Jingyue Li	Norwegian University of Science and Technology, Norway
Lidia López	Universitat Politècnica De Catalunya – Barcelona Tech, Spain
Stephen MacDonell	University of Otago, New Zealand
Kenichi Matsumoto	Nara Institute of Science and Technology (NAIST), Japan
Maurizio Morisio	Politecnico di Torino, Italy
Maleknaz Nayebi	Ecole Polytechnique de Montréal, Canada
Risto Nevalainen	Spinet Oy, Finland
Edson Oliveira Jr.	State University of Maringá, Brazil
Paolo Panaroni	INTECS, Italy
Dietmar Pfahl	University of Tartu, Estonia
Rudolf Ramler	Software Competence Center Hagenberg, Austria
Daniel Rodriguez	The University of Alcalá, Spain
Simone Romano	University of Basilicata, Italy
Bruno Rossi	Masaryk University, Czech Republic
Gleison Santos	Federal University of the State of Rio de Janeiro, Brazil
Giuseppe Scanniello	University of Basilicata, Italy
Klaus Schmid	University of Hildesheim, Germany
Kari Smolander	Lappeenranta University of Technology, Finland
Martin Solari	Universidad ORT, Uruguay
Michael Stupperich	Daimler AG, Germany
Guilherme Travassos	Federal University of Rio de Janeiro, Brazil
Rini Van Solingen	Delft University of Technology, The Netherlands
Antonio Vetrò	Politecnico di Torino, Italy
Stefan Wagner	University of Stuttgart, Germany
Hironori Washizaki	Waseda University, Japan
Dietmar Winkler	Vienna University of Technology, Austria

Short Papers Program Committee

Muhammad Ovais Ahmad	Karlstad University, Sweden
Elina Annanperä	University of Oulu, Finland
Beatriz Bernárdez Jiménez	Universidad de Sevilla, Spain
Dante Carrizo	University of Atacama, Chile

Jessica Díaz	Universidad Politécnica de Madrid, Spain
Efraín R. Fonseca C.	Universidad de las Fuerzas Armadas ESPE, Ecuador
Davide Fucci	HITeC — University of Hamburg, Germany
Vahid Garousi	Queen's University Belfast, UK
Itir Karac	University of Oulu, Finland
Kati Kuusinen	Technical University of Denmark, Denmark
Lucy Ellen Lwakatare	Chalmers University of Technology, Sweden
Marc Oriol	Universitat Politècnica de Catalunya, Spain
Simone Romano	University of Basilicata, Italy
Norsaremah Salleh	International Islamic University Malaysia, Malaysia
Davide Taibi	Tampere University of Technology, Finland
Xiaofeng Wang	Free University of Bozen–Bolzano, Italy

Additional Reviewers

Corrado Aaron Visaggio	Hong Guo
Monica Anastassiu	Nektaria Kaloudi
Justus Bogner	Vasileios Theodorou
Eliezer Dutra	Eugenio Zimeo
Jonas Fritzsch	

Intertwining Creative and Design Thinking Processes for Software Products (Keynote Abstract)

Neil Maiden

Cass Business School, City, University of London, 106 Bunhill Row, London
EC1Y 8TZ, UK
N.A.M.Maiden@city.ac.uk

Abstract. Most software development processes still pay little attention to creativity and creative thinking, even though creative outcomes are pre-requisites for innovation. The recent interest in design thinking methods places shifts the focus to both software products and processes, but still does not address the creativity deficit of most design thinking practices. This keynote presentation and paper proposes an alternative and more effective framing of design thinking – as situated uses of creativity techniques and design artefacts, opportunistically, in agile development processes. It will introduce the role of design thinking as creative thinking for specific ends. It will summarize common characteristics of high-performance design behaviours – behaviours that are often impeded by software development methods. It will then demonstrate, with multiple examples, how coupling creativity techniques with playful artefacts for design thinking can lead to original design outcomes, often more productively, than with existing software development processes and models.

Keywords: Software development • Software product • Creativity

1 Creativity, Design Thinking and Innovation

Creativity and creative thinking have emerged as essential capabilities of most businesses. It has become a strategic, macro-economic activity, replacing the focus on information at the end of the last century. The World Economic Forum identified it to be a top-three need for economic growth in the next decade, alongside complex problem solving and critical thinking. It is identified as a precondition for business success – for example an IBM survey of 1500 CEOs identified creativity as the leading need and differentiator in their businesses [3]. It is also recognized as a critical pre-condition to effective innovation, generating new forms of creative capitalism based on knowledge and talent. And as digital technologies have become critical to the functioning of many organizations, creativity assumes a more important role in the specification and design of these technologies. Unfortunately, few methods and techniques for software product development explicitly support creative thinking by developers or stakeholders.

Outside of software product development, creative thinking is core to early design activities. For example, the United Kingdom's Design Council defines design as shaping ideas to become practical and attractive propositions for users or customers, and it can be described as creativity deployed to a specific end. Design is both a creative and user-centred approach to problem solving that cuts across different professions, from art and design to engineering and architecture. As such, creativity is needed to generate new ideas that design can shape to become the practical and attractive propositions for users or customers [2].

To deliver more creative design processes over the last decade, design thinking has become accepted practice for many forms of product and service. Design thinking is a human-centred innovation process that involves observation, collaboration, fast learning, the visualization of ideas and rapid prototyping, all of which run concurrent to business analysis activities [4]. It has been successfully used in projects to design new workplaces, consumer products and even brands.

However, one criticism that can be leveled at most design thinking processes is the lack of explicit use of creativity techniques from creative problem solving communities. Indeed, we observe an increasing disconnect between design thinking and creative problem solving, and believe that new techniques and tools that bridge the outputs of these communities are needed. More connected creative problem solving and design thinking methods and techniques can impact on the development of many forms of service and product, including software products.

This keynote proposes an alternative and more effective framing of design thinking – as situated uses of creativity techniques and design artefacts, opportunistically, in agile and other software development processes. It will introduce the role of design thinking as creative thinking for specific ends. It will summarize common characteristics of high-performance design behaviours – behaviours that are often impeded by software development methods. It will then demonstrate, with multiple examples, how coupling creativity techniques such as constraint removal [5] and creativity triggers [1] with playful artefacts for design thinking such as storyboards and desktop walkthroughs [6] can lead to original design outcomes, often more productively, than with existing software development processes.

References

1. Burnay, C., Horkoff, J., Maiden, N.: Stimulating stakeholders' imagination: new creativity triggers for eliciting novel requirements. In: Proceedings of IEEE International Requirements Engineering Conference, 12–16 September 2016, Beijing, China (2016)
2. Design Council, Design for Innovation (2011). https://www.designcouncil.org.uk/sites/default/files/asset/document/DesignForInnovation_Dec2011.pdf
3. IBM, IBM Global CEO Study: Capitalizing on Complexity (2010)
4. Lockwood, T.: Design Thinking, Allworth Press, New York (2010)
5. Maiden, N.A.M., Robertson, S.: Integrated creativity into requirements processes: experiences with an air traffic management system. In: Proceedings of 13th IEEE International Conference on Requirements Engineering, 105–114. IEEE Computer Society Press (2015)
6. Stickdorn, M., Schneider, J.: This is Service Design Thinking, BIS Publishers (2010)

Contents

Testing

An Empirical Assessment on Affective Reactions of Novice Developers When Applying Test-Driven Development	3
<i>Simone Romano, Davide Fucci, Maria Teresa Baldassarre, Danilo Caivano, and Giuseppe Scanniello</i>	
Applying Surveys and Interviews in Software Test Tool Evaluation	20
<i>Päivi Raulamo-Jurvanen, Simo Hosio, and Mika V. Mäntylä</i>	
Test-Case Quality – Understanding Practitioners’ Perspectives	37
<i>Huynh Khanh Vi Tran, Nauman Bin Ali, Jürgen Börstler, and Michael Unterkalmsteiner</i>	
Test Reporting at a Large-Scale Austrian Logistics Organization: Lessons Learned and Improvement	53
<i>Dietmar Winkler, Kristof Meixner, Daniel Lehner, and Stefan Biffl</i>	

Software Development

Embracing Software Process Improvement in Automotive Through PISA Model	73
<i>Fabio Falcini and Giuseppe Lami</i>	
Establishing a User-Centered Design Process for Human-Machine Interfaces: Threats to Success	89
<i>Mario Winterer, Christian Salomon, Georg Buchgeher, Martin Zehethofer, and Alexandra Derntl</i>	
Combining QM+Strategies and OKR - Preliminary Results from a Participative Case Study in Industry	103
<i>Bianca Trinkenreich, Gleison Santos, Monalessa Perini Barcellos, and Tayana Conte</i>	
Software Development Practices and Frameworks Used in Spain and Costa Rica: A Survey and Comparative Analysis	112
<i>Ignacio Díaz-Oreiro, David Chaves, Brenda Aymerich, Julio C. Guzmán, Gustavo López, Marcela Genero, and Aurora Vizcaíno</i>	
Does the Migration of Cross-Platform Apps Towards the Android Platform Matter? An Approach and a User Study	120
<i>Maria Caulo, Rita Francese, Giuseppe Scanniello, and Antonio Spera</i>	

Software Knowledge Representation to Understand Software Systems	137
<i>Victoria Torres, Miriam Gil, and Vicente Pelechano</i>	
When NFR Templates Pay Back? A Study on Evolution of Catalog of NFR Templates.	145
<i>Sylvia Kopczyńska, Jerzy Nawrocki, and Mirosław Ochodek</i>	
Improving Quality of Data Exchange Files. An Industrial Case Study	161
<i>Günter Fleck, Michael Moser, and Josef Pichler</i>	
Containers in Software Development: A Systematic Mapping Study	176
<i>Mikael Koskinen, Tommi Mikkonen, and Pekka Abrahamsson</i>	
Technical Debt	
Empirical Analysis of Hidden Technical Debt Patterns in Machine Learning Software.	195
<i>Mohannad Alahdab and Gül Çalıklı</i>	
Constraining the Implementation Through Architectural Security Rules: An Expert Study	203
<i>Stefanie Jasser</i>	
Technical Debt and Waste in Non-functional Requirements Documentation: An Exploratory Study	220
<i>Gabriela Robiolo, Ezequiel Scott, Santiago Matalonga, and Michael Felderer</i>	
Technical Debt in Costa Rica: An InsignTD Survey Replication	236
<i>Alexia Pacheco, Gabriela Marín-Raventós, and Gustavo López</i>	
Estimations	
Exploring Preference of Chronological and Relevancy Filtering in Effort Estimation.	247
<i>Sousuke Amasaki</i>	
Automated Functional Size Measurement: A Multiple Case Study in the Industry	263
<i>Christian Quesada-López, Alexandra Martínez, Marcelo Jenkins, Luis Carlos Salas, and Juan Carlos Gómez</i>	
Can Expert Opinion Improve Effort Predictions When Exploiting Cross-Company Datasets? - A Case Study in a Small/Medium Company	280
<i>Filomena Ferrucci and Carmine Gravino</i>	

Continuous Delivery

Excellence in Exploratory Testing: Success Factors in Large-Scale Industry Projects	299
<i>Torvald Mårtensson, Antonio Martini, Daniel Ståhl, and Jan Bosch</i>	
Comparison Framework for Team-Based Communication Channels.	315
<i>Camila Costa Silva, Fabian Gilson, and Matthias Galster</i>	
DevOps in Practice – A Preliminary Analysis of Two Multinational Companies	323
<i>Jessica Díaz, Jorge E. Perez, Agustín Yague, Andrea Villegas, and Antonio de Antona</i>	
Implementing Ethics in AI: Initial Results of an Industrial Multiple Case Study.	331
<i>Ville Vakkuri, Kai-Kristian Kemell, and Pekka Abrahamsson</i>	

Agile

How Agile Is Hybrid Agile? An Analysis of the HELENA Data.	341
<i>John Noll and Sarah Beecham</i>	
Challenges of Scaled Agile for Safety-Critical Systems	350
<i>Jan-Philipp Steghöfer, Eric Knauss, Jennifer Horkoff, and Rebekka Wohlrab</i>	
On the Benefits of Corporate Hackathons for Software Ecosystems – A Systematic Mapping Study	367
<i>George Valença, Nycolas Lacerda, Maria Eduarda Rebelo, Carina Alves, and Cleidson R. B. de Souza</i>	
Agile in the Era of Digitalization: A Finnish Survey Study	383
<i>Petri Kettunen, Maarit Laanti, Fabian Fagerholm, and Tommi Mikkonen</i>	

Project Management

What's Hot in Product Roadmapping? Key Practices and Success Factors . . .	401
<i>Jürgen Münch, Stefan Trieflinger, and Dominic Lang</i>	
Integrating Data Protection into the Software Life Cycle	417
<i>Ralf Kneuper</i>	
Revisiting the Product Configuration Systems Development Procedure for Scrum Compliance: An i* Driven Process Fragment.	433
<i>Yves Wautelet, Sara Shafiee, and Samedi Heng</i>	

Microservices

Kuksa: A Cloud-Native Architecture for Enabling Continuous Delivery
in the Automotive Domain 455
Ahmad Banijamali, Pooyan Jamshidi, Pasi Kuvaja, and Markku Oivo

Inputs from a Model-Based Approach Towards the Specification
of Microservices Logical Architectures: An Experience Report 473
*Nuno Santos, Helena Rodrigues, Nuno Ferreira,
and Ricardo J. Machado*

A Modular Approach to Calculate Service-Based Maintainability
Metrics from Runtime Data of Microservices 489
*Justus Bogner, Steffen Schlinger, Stefan Wagner,
and Alfred Zimmermann*

Consumer-Driven Contract Tests for Microservices: A Case Study 497
Jyri Lehvä, Niko Mäkitalo, and Tommi Mikkonen

Continuous Experimentation

Data Driven Development: Challenges in Online, Embedded
and On-Premise Software 515
Helena Holmström Olsson and Jan Bosch

Continuous Experimentation for Software Organizations with Low Control
of Roadmap and a Large Distance to Users: An Exploratory Case Study 528
Robin Sveningson, David Issa Mattos, and Jan Bosch

Deep Unsupervised System Log Monitoring 545
Hubert Nourtel, Christophe Cerisara, and Samuel Cruz-Lara

Enablers and Inhibitors of Experimentation in Early-Stage
Software Startups 554
*Jorge Melegati, Rafael Chanin, Xiaofeng Wang, Afonso Sales,
and Rafael Prikladnicki*

European Project Space

European Project Space Papers for the PROFES 2019 - Summary 573
Alessandra Bagnato and Davide Fucci

Application of Computational Linguistics Techniques for Improving
Software Quality 577
*Amin Boudeffa, Antonin Abherve, Alessandra Bagnato, Cedric Thomas,
Martin Hamant, and Assad Montasser*

Monitoring ArchiMate Models for DataBio Project	583
<i>Kaïs Chaabouni, Alessandra Bagnato, and Antonio Garcia-Dominguez</i>	
Showcasing Modelio and pure:variants Integration in REVaMP² Project	590
<i>Alessandra Bagnato, Alexandre Beaufays, Etienne Brosse, Kaïs Chaabouni, Uwe Ryssel, Michael Schulze, and Andrey Sadovykh</i>	
DECODER - DEveloper COmpanion for Documented and annotatEd code Reference	596
<i>Victoria Torres, Miriam Gil, and Vicente Pelechano</i>	
DECIDE: DevOps for Trusted, Portable and Interoperable Multi-cloud Applications Towards the Digital Single Market	602
<i>Leire Orue-Echevarria, Juncal Alonso, Marisa Escalante, Kyriakos Stefanidis, and Lorenzo Blasi</i>	
Q-Rapids: Quality-Aware Rapid Software Development – An H2020 Project	608
<i>Lidia López and Marc Oriol</i>	
IMPRESS: Improving Engagement in Software Engineering Courses Through Gamification	613
<i>Tanja E. J. Vos, I. S. W. B. Prasetya, Gordon Fraser, Ivan Martínez-Ortiz, Ivan Perez-Colado, Rui Prada, José Rocha, and António Rito Silva</i>	
Software Governance in a Large European Project - GÉANT Case Study . . .	620
<i>Marcin Wolski and Toby Rodwell</i>	
AMASS: A Large-Scale European Project to Improve the Assurance and Certification of Cyber-Physical Systems.	626
<i>Jose Luis de la Vara, Eugenio Parra, Alejandra Ruiz, and Barbara Gallina</i>	
3rd International Workshop on Managing Quality in Agile and Rapid Software Development Processes (QuASD)	
Do Internal Software Quality Tools Measure Validated Metrics?	637
<i>Mayra Nilson, Vard Antinyan, and Lucas Gren</i>	
A Unique Value that Synthesizes the Quality Level of a Product Architecture: Outcome of a Quality Attributes Requirements Evaluation Method	649
<i>Mariana Falco and Gabriela Robiolo</i>	
Comparison of Agile Maturity Models.	661
<i>Anna Schmitt, Sven Theobald, and Philipp Diebold</i>	

4th International Workshop on Human Factors in Software Development Processes (HuFo)

Dealing with Comprehension and Bugs in Native and Cross-Platform Apps: A Controlled Experiment	677
<i>Maria Caulo, Rita Francese, Giuseppe Scanniello, and Antonio Spera</i>	
Understanding How and When Human Factors Are Used in the Software Process: A Text-Mining Based Literature Review	694
<i>Mercedes Ruiz and Davide Salanitri</i>	
Working Conditions for Software Developers in Colombia: An Effort-Reward-Imbalance-Based Study	709
<i>Judy Moreno, Jairo Aponte, and Mario Linares-Vásquez</i>	
Towards a Better Understanding of Team-Driven Dynamics in Agile Software Projects: A Characterization and Visualization Support in JIRA. . . .	725
<i>Fabian Kortum, Oliver Karras, Jil Klünder, and Kurt Schneider</i>	
Evaluating the Utility of the Usability Model for Software Development Process and Practice.	741
<i>Diego Fontdevila, Marcela Genero, Alejandro Oliveros, and Nicolás Paez</i>	
Short Tutorials	
PROFES 2019: Tutorial Summary.	761
<i>Matthias Galster and Dietmar Pfahl</i>	
DevOps Practices Tutorial	764
<i>Nicolás Paez</i>	
Conformance Checking: Relating Processes and Models: A Tutorial for Researchers and Practitioners	766
<i>Josep Carmona</i>	
Benefitting from Grey Literature in Software Engineering Research (Tutorial Summary).	768
<i>Michael Felderer, Vahid Garousi, Mika Mäntylä, and Austen Rainer</i>	
Tutorial: Data Preparation – Tackle the Most Effort-Prone Phase in Data Projects	770
<i>Adam Trendowicz, Julien Siebert, and Andreas Jedlitschka</i>	
Author Index	773