

Jürgen Münch
Matias Vierimaa (Eds.)

LNCS 4034

Product-Focused Software Process Improvement

7th International Conference, PROFES 2006
Amsterdam, The Netherlands, June 2006
Proceedings



Springer

TP311-53

P964.4

2006

Jürgen Münch Matias Vierimaa (Eds.)

Product-Focused Software Process Improvement

7th International Conference, PROFES 2006
Amsterdam, The Netherlands, June 12-14, 2006
Proceedings



Springer



E200603633

Volume Editors

Jürgen Münch

Fraunhofer Institute for Experimental Software Engineering

Fraunhofer-Platz, 67663 Kaiserslautern, Germany

E-mail: Juergen.Muench@iese.fraunhofer.de

Matias Vierimaa

VTT Electronics

Kaitovayla 1, 90570 Oulu, Finland

E-mail: Matias.Vierimaa@vtt.fi

Library of Congress Control Number: 2006926730

CR Subject Classification (1998): D.2, K.6, K.4.2, J.1

LNCS Sublibrary: SL 2 – Programming and Software Engineering

ISSN 0302-9743

ISBN-10 3-540-34682-1 Springer Berlin Heidelberg New York

ISBN-13 978-3-540-34682-1 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media

springer.com

© Springer-Verlag Berlin Heidelberg 2006

Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper SPIN: 11767718 06/3142 5 4 3 2 1 0

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH-Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

University of Dortmund, Germany

Madhu Sudan

Massachusetts Institute of Technology, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Moshe Y. Vardi

Rice University, Houston, TX, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Preface

The 7th International Conference on Product Focused Software Process Improvement (PROFES 2006) brought together researchers and industrial practitioners for reporting new research results and exchanging experiences and findings in the area of process and product improvement. The focus of the conference was on understanding, evaluating, controlling, and improving the relationship between process improvement activities (such as the deployment of innovative defect detection processes) and their effects on products (such as improved product reliability and safety). Consequently, major topics of the conference included the evaluation of existing software process improvement (SPI) approaches in different contexts, the presentation of new or modified SPI approaches, and the relation between SPI and new development techniques or emerging application domains.

The need for SPI is being widely recognized. Current trends in software intensive systems such as increased distribution of software development and growing dependability on software-intensive systems in everyday life emphasize this need. This implies the establishment of advanced process improvement capabilities and an adequate understanding of the impact of the processes on the generated products, services, and business value in different situations. Recent trends enforce the establishment of such capabilities: more and more products are being developed in distributed, global environments with many customer-supplier relations in the development chain. Outsourcing, off-shoring, near-shoring, and in-sourcing aggravate this trend. In addition, systems are being built from multiple disciplines (such as electronics, mechanics, and software). Supporting such distributed and multi-disciplinary development requires well-understood and accurately implemented development process interfaces, process synchronization, and process evolution. In addition, more and more organizations are forced to adhere to regulatory constraints that require the existence of explicit processes and the demonstration of adherence to those processes. Examples are the IEC 61508 standard for safety-related systems, the tailoring of ECSS (European Cooperation for Space Standardization) software engineering standards for ground segments in ESA (European Space Agency), or the German national standard V-Model XT for systems used by public authorities. Adhering to those standards requires systematic evolution of the existing processes. Finally, market dynamics force organizations to adapt better and faster to changes in the development environment and to enforce innovations (e.g., increase of reliability levels). These process changes impose risk challenges for SPI approaches. Advanced SPI is required to support the assessment of the impact of process changes and the flexible adaptation of processes. Due to the fact that software development processes are human-based and depend on the development context (including domain characteristics, workforce capabilities, and organizational maturity), changes to these processes typically cause significant costs and should be considered carefully. Alternative improvement options need to be evaluated with respect to their implementation cost and their potential impact on business goals.

Currently, two types of SPI approaches are mainly used in practice: a) continuous SPI approaches (also referred to as problem-oriented approaches) and b) model-based SPI approaches (also referred to as solution-oriented approaches).

Continuous SPI approaches (such as the Quality Improvement Paradigm, PDCA, or Profes) focus on selected problems of a software development organization and usually involve improvement cycles based on an initial baseline. One important advantage of continuous approaches is that they focus on solving specific problems by analyzing the problem at hand, implementing and observing problem-focused improvement actions, and measuring the effects of the actions. The interpretation of the measurement data is used as input for further optimization of the solution. In addition, solving one problem typically reveals further improvement potential in related areas. Continuous approaches are focused and, therefore, it is difficult to create an overall awareness for quality issues in a very large software organization with thousands of employees.

Model-based SPI approaches (such as ISO/IEC 15504, CMMI, or BOOTSTRAP) compare the current processes and practices of a development organization against a reference model or a benchmark. They provide so-called capability maturity levels with different sets of processes and practices. These levels define an improvement roadmap. The advantage of such models is that they can be easily used to enforce an awareness for quality issues in large organizations because many developers are involved in the improvement of the maturity level. From the management point of view, reaching a specific capability level can be defined as a clear and assessable goal. One important disadvantage is that model-based SPI approaches typically do not assess the impact of processes on product characteristics and therefore cannot be used to analytically identify and tackle process problems that cause concrete product deficiencies. Typically, it is checked whether a process or practice is in place, but its impact on a business goal or its value for the organization is not evaluated. The practices of the reference models are usually of a generic type and based on hypothesis. Having a high maturity level does not mean that the organization is successful in fulfilling its business goals (such as an appropriate trade-off between time-to-market and product quality).

Continuous and model-based SPI approaches can be seen as being complementary: model-based approaches can be used to identify problem areas and potential improvement options, and continuous approaches can be used to implement and optimize solutions. Although continuous approaches can be successfully applied without having a high maturity level, model-based approaches usually require continuous improvement at a certain maturity level.

In practice, the typical question is no longer whether process improvement is necessary, but how to define and implement a strategy for introducing advanced process improvement step by step and how to evaluate its success. Along with this, many research questions need to be solved.

The technical program was selected by a committee of leading experts in software process modeling and software process improvement research. This year, 55 papers from 26 nations were submitted, with each paper receiving at least three reviews. The Program Committee met in Amsterdam for one full day in February 2006. The Program Committee finally selected 26 technical full papers. The topics indicate that software process improvement remains a vibrant research discipline of high interest for industry. Emerging technologies and application domains, a paradigm shift from software to system engineering in many domains (such as automotive or space), and the need for better decision support for software process improvement is reflected in these papers.

The technical program consisted of tracks-decision support, embedded software and system development, measurement, industrial experiences, process improvement, agile development practices, and product line engineering. In addition, a track with 12 selected short paper presentations was added in order to demonstrate the variety of approaches, to support the discussions, and to exchange experience. We were proud to have four keynote speakers, Jan Bosch, Jan Jaap Cannegieter, Michiel van Gnuchten, and Barbara Kitchenham, as well as interesting tutorials and co-located workshops.

We are thankful for the opportunity to serve as program co-chairs for this conference. The Program Committee members and reviewers provided excellent support in reviewing the papers. We are also grateful to the authors, presenters, and session chairs for their time and effort to make PROFES 2006 a success. The General Chair, Rini van Solingen, and the Steering Committee provided excellent guidance. We wish to thank the Fraunhofer Institute for Experimental Software Engineering (IESE), the Centrum for Wiskunde en Informatika (CWI), VTT, the University of Oulu, Drenthe University, and Eindhoven University of Technology for supporting the conference. We would like to thank the Organizing Committee and all the other supporters for making the event possible. Last but not least, many thanks to Timo Klein at IESE for copyediting this volume.

April 2006

Jürgen Münch
Matias Vierimaa

Conference Organization

General Chair

Rini van Solingen, Drenthe University (The Netherlands)

Program Co-chairs

Jürgen Münch, Fraunhofer IESE (Germany)
Matias Vierimaa, VTT Electronics (Finland)

Organizing Chair

Mark van den Brand, Hogeschool van Amsterdam and CWI (The Netherlands)

Tutorial Chair

Dirk Hamann, Fraunhofer IESE (Germany)

Industry Chair

Carol Dekkers, Quality Plus Technologies, Inc.

PR Chair

Pasi Kuvaja, University of Oulu (Finland)

Publicity Chairs

Central Europe:	Michael Ochs, Fraunhofer IESE (Germany)
Southern Europe:	Gerardo Canfora, University of Sannio at Benevento (Italy)
USA:	Ioana Rus, Fraunhofer Center-Maryland (USA)
Canada:	Dietmar Pfahl, University of Calgary (Canada)
Japan:	Kenichi Matumoto, NAIST (Japan)
Korea:	Ho-Won Jung, Korea University (Korea)
Finland:	Tua Huomo, VTT Electronics (Finland)
Scandinavia:	Tora Dyba, Chief Scientist, SINTEF (Norway)
Benelux:	Ko Doorns, Philips
France:	Pierre-Etienne Moreau, INRIA/LORIA Nancy (France)
Oceania:	Bernard Wong, University of Technology, Sydney (Australia)
South America:	Christiane Gresse van Wangenheim (Brazil)

Program Committee

Pekka Abrahamsson, VTT Electronics, Finland
Andreas Birk, SD&M, Germany
Mark van den Brand, HvA & CWI, The Netherlands
Gerardo Canfora, University of Sannio at Benevento, Italy
Reidar Conradi, NTNU, Norway
Paolo Donzelli, University of Maryland - College Park, USA
Tore Dybå, SINTEF, Norway
Martin Höst, Lund University, Sweden
Frank Houdek, DaimlerChrysler, Germany
Tua Huomo, VTT Electronics, Finland
Hajimu Iida, Nara Institute of Science & Technology, Japan
Katsuro Inoue, Osaka University, Japan
Yasushi Ishigai, IPA, Japan
Janne Järvinen, Solid Information Technology, Finland
Erik Johansson, Q-Labs, Sweden
Philip Johnson, University of Hawaii, USA
Natalia Juristo, Universidad Politecnica de Madrid, Spain
Haruhiko Kaiya, Shinshu University, Japan
Kari Käsälä, Nokia Research Center, Finland
Masafumi Katahira, JAXA, Japan
Pasi Kuvaja, University of Oulu, Finland
Makoto Matsushita, Osaka University, Japan
Kenichi Matsumoto, NAIST, Japan
Pierre-Etienne Moreau, INRIA/LORIA, France
Maurizio Morisio, University of Turin, Italy
Jürgen Münch, Fraunhofer IESE, Germany
Paolo Nesi, University of Florence, Italy
Risto Nevalainen, STTF, Finland
Mahmood Niazi, Keele University, UK
Michael Ochs, Fraunhofer IESE, Germany
Hideto Ogasawara, Toshiba, Japan
Dietmar Pfahl, University of Calgary, Canada
Teade Punter, LAQUISO, The Netherlands
Karl Reed, La Tobe University, Australia
Günther Ruhe, University of Calgary, Canada
Ioana Rus, Fraunhofer Center - Maryland, USA
Kurt Schneider, University of Hannover, Germany
Carolyn Seaman, UMBC, Baltimore, USA
Veikko Seppäen, Elektrobitt Ltd., Finland
Dag Sjöberg, University of Oslo, Norway
Matias Vierimaa, VTT Electronics, Finland
Otto Vinter, DELTA, Denmark
Giuseppe Visaggio, University of Bari, Italy
Hironori Washizaki, National Institute of Informatics, Japan
Isabella Wiecezorek, Federal Ministry of Research and Education, Germany

Claes Wohlin, Blekinge Institute of Technology, Sweden
Bernard Wong, University of Technology Sydney, Australia

External Reviewers

Silvia Acuña, University of Madrid, Spain
Fabio Bella, Fraunhofer IESE, Germany
Jens Heidrich, Fraunhofer IESE, Germany
Sira Vegas, University of Madrid, Spain
Stein Grimstad, University of Oslo, Norway

Lecture Notes in Computer Science

For information about Vols. 1–3920

please contact your bookseller or Springer

Vol. 4039: M. Morisio (Ed.), *Reuse of Off-the-Shelf Components*. XIII, 444 pages. 2006.

Vol. 4034: J. Münch, M. Vierimaa (Eds.), *Product-Focused Software Process Improvement*. XVII, 474 pages. 2006.

Vol. 4027: H.L. Larsen, G. Pasi, D. Ortiz-Arroyo, T. Andreassen, H. Christiansen (Eds.), *Flexible Query Answering Systems*. XVIII, 714 pages. 2006. (Sublibrary LNAI).

Vol. 4024: S. Donatelli, P. S. Thiagarajan (Eds.), *Petri Nets and Other Models of Concurrency - ICATPN 2006*. XI, 441 pages. 2006.

Vol. 4021: E. André, L. Dybkjær, W. Minker, H. Neumann, M. Weber (Eds.), *Perception and Interactive Technologies*. XI, 217 pages. 2006. (Sublibrary LNAI).

Vol. 4011: Y. Sure, J. Domingue (Eds.), *The Semantic Web: Research and Applications*. XIX, 726 pages. 2006.

Vol. 4010: S. Dunne, B. Stoddart (Eds.), *Unifying Theories of Programming*. VIII, 257 pages. 2006.

Vol. 4007: C. Álvarez, M. Serna (Eds.), *Experimental Algorithms*. XI, 329 pages. 2006.

Vol. 4006: L.M. Pinho, M. González Harbour (Eds.), *Reliable Software Technologies – Ada-Europe 2006*. XII, 241 pages. 2006.

Vol. 4004: S. Vaudenay (Ed.), *Advances in Cryptology - EUROCRYPT 2006*. XIV, 613 pages. 2006.

Vol. 4003: Y. Koucheryavy, J. Harju, V.B. Iversen (Eds.), *Next Generation Teletraffic and Wired/Wireless Advanced Networking*. XVI, 582 pages. 2006.

Vol. 4001: E. Dubois, K. Pohl (Eds.), *Advanced Information Systems Engineering*. XVI, 560 pages. 2006.

Vol. 3999: C. Kop, G. Fliedl, H.C. Mayr, E. Métais (Eds.), *Natural Language Processing and Information Systems*. XIII, 227 pages. 2006.

Vol. 3998: T. Calamoneri, I. Finocchi, G.F. Italiano (Eds.), *Algorithms and Complexity*. XII, 394 pages. 2006.

Vol. 3997: W. Grieskamp, C. Weise (Eds.), *Formal Approaches to Software Testing*. XII, 219 pages. 2006.

Vol. 3996: A. Keller, J.-P. Martin-Flatin (Eds.), *Self-Managed Networks, Systems, and Services*. X, 185 pages. 2006.

Vol. 3995: G. Müller (Ed.), *Emerging Trends in Information and Communication Security*. XX, 524 pages. 2006.

Vol. 3994: V.N. Alexandrov, G.D. van Albada, P.M.A. Sloot, J. Dongarra (Eds.), *Computational Science – ICCS 2006, Part IV*. XXXV, 1096 pages. 2006.

Vol. 3993: V.N. Alexandrov, G.D. van Albada, P.M.A. Sloot, J. Dongarra (Eds.), *Computational Science – ICCS 2006, Part III*. XXXVI, 1136 pages. 2006.

Vol. 3992: V.N. Alexandrov, G.D. van Albada, P.M.A. Sloot, J. Dongarra (Eds.), *Computational Science – ICCS 2006, Part II*. XXXV, 1122 pages. 2006.

Vol. 3991: V.N. Alexandrov, G.D. van Albada, P.M.A. Sloot, J. Dongarra (Eds.), *Computational Science – ICCS 2006, Part I*. LXXXI, 1096 pages. 2006.

Vol. 3990: J. C. Beck, B.M. Smith (Eds.), *Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems*. X, 301 pages. 2006.

Vol. 3989: J. Zhou, M. Yung, F. Bao, *Applied Cryptography and Network Security*. XIV, 488 pages. 2006.

Vol. 3987: M. Hazas, J. Krumm, T. Strang (Eds.), *Location- and Context-Awareness*. X, 289 pages. 2006.

Vol. 3986: K. Stølen, W.H. Winsborough, F. Martinelli, F. Massacci (Eds.), *Trust Management*. XIV, 474 pages. 2006.

Vol. 3984: M. Gavrilova, O. Gervasi, V. Kumar, C.J. K. Tan, D. Taniar, A. Laganà, Y. Mun, H. Choo (Eds.), *Computational Science and Its Applications - ICCSA 2006, Part V*. XXV, 1045 pages. 2006.

Vol. 3983: M. Gavrilova, O. Gervasi, V. Kumar, C.J. K. Tan, D. Taniar, A. Laganà, Y. Mun, H. Choo (Eds.), *Computational Science and Its Applications - ICCSA 2006, Part IV*. XXVI, 1191 pages. 2006.

Vol. 3982: M. Gavrilova, O. Gervasi, V. Kumar, C.J. K. Tan, D. Taniar, A. Laganà, Y. Mun, H. Choo (Eds.), *Computational Science and Its Applications - ICCSA 2006, Part III*. XXV, 1243 pages. 2006.

Vol. 3981: M. Gavrilova, O. Gervasi, V. Kumar, C.J. K. Tan, D. Taniar, A. Laganà, Y. Mun, H. Choo (Eds.), *Computational Science and Its Applications - ICCSA 2006, Part II*. XXVI, 1255 pages. 2006.

Vol. 3980: M. Gavrilova, O. Gervasi, V. Kumar, C.J. K. Tan, D. Taniar, A. Laganà, Y. Mun, H. Choo (Eds.), *Computational Science and Its Applications - ICCSA 2006, Part I*. LXXV, 1199 pages. 2006.

Vol. 3979: T.S. Huang, N. Sebe, M.S. Lew, V. Pavlović, M. Kölsch, A. Galata, B. Kisaćanin (Eds.), *Computer Vision in Human-Computer Interaction*. XII, 121 pages. 2006.

Vol. 3978: B. Hnich, M. Carlsson, F. Fages, F. Rossi (Eds.), *Recent Advances in Constraints*. VIII, 179 pages. 2006. (Sublibrary LNAI).

Vol. 3976: F. Boavida, T. Plagemann, B. Stiller, C. Westphal, E. Monteiro (Eds.), *Networking 2006. Networking Technologies, Services, and Protocols; Performance of Computer and Communication Networks; Mobile and Wireless Communications Systems*. XXVI, 1276 pages. 2006.

Vol. 3975: S. Mehrotra, D.D. Zeng, H. Chen, B. Thuraisingham, F.-Y. Wang (Eds.), *Intelligence and Security Informatics*. XXII, 772 pages. 2006.

- Vol. 3973: J. Wang, Z. Yi, J.M. Zurada, B.-L. Lu, H. Yin (Eds.), *Advances in Neural Networks* - ISSN 2006, Part III. XXIX, 1402 pages. 2006.
- Vol. 3972: J. Wang, Z. Yi, J.M. Zurada, B.-L. Lu, H. Yin (Eds.), *Advances in Neural Networks* - ISSN 2006, Part II. XXVII, 1444 pages. 2006.
- Vol. 3971: J. Wang, Z. Yi, J.M. Zurada, B.-L. Lu, H. Yin (Eds.), *Advances in Neural Networks* - ISSN 2006, Part I. LXVII, 1442 pages. 2006.
- Vol. 3970: T. Braun, G. Carle, S. Fahmy, Y. Koucheryavy (Eds.), *Wired/Wireless Internet Communications*. XIV, 350 pages. 2006.
- Vol. 3968: K.P. Fishkin, B. Schiele, P. Nixon, A. Quigley (Eds.), *Pervasive Computing*. XV, 402 pages. 2006.
- Vol. 3967: D. Grigoriev, J. Harrison, E.A. Hirsch (Eds.), *Computer Science – Theory and Applications*. XVI, 684 pages. 2006.
- Vol. 3966: Q. Wang, D. Pfahl, D.M. Raffo, P. Wernick (Eds.), *Software Process Change*. XIV, 356 pages. 2006.
- Vol. 3965: M. Bernardo, A. Cimatti (Eds.), *Formal Methods for Hardware Verification*. VII, 243 pages. 2006.
- Vol. 3964: M. Ü. Uyar, A.Y. Duale, M.A. Fecko (Eds.), *Testing of Communicating Systems*. XI, 373 pages. 2006.
- Vol. 3963: O. Dikenelli, M.-P. Gleizes, A. Ricci (Eds.), *Engineering Societies in the Agents World VI*. X, 303 pages. 2006. (Sublibrary LNAI).
- Vol. 3962: W. IJsselstein, Y. de Kort, C. Midden, B. Eggen, E. van den Hoven (Eds.), *Persuasive Technology*. XII, 216 pages. 2006.
- Vol. 3960: R. Vieira, P. Quaresma, M.d.G.V. Nunes, N.J. Mamede, C. Oliveira, M.C. Dias (Eds.), *Computational Processing of the Portuguese Language*. XII, 274 pages. 2006. (Sublibrary LNAI).
- Vol. 3959: J.-Y. Cai, S. B. Cooper, A. Li (Eds.), *Theory and Applications of Models of Computation*. XV, 794 pages. 2006.
- Vol. 3958: M. Yung, Y. Dodis, A. Kiayias, T. Malkin (Eds.), *Public Key Cryptography – PKC 2006*. XIV, 543 pages. 2006.
- Vol. 3956: G. Barthe, B. Grégoire, M. Huisman, J.-L. Lanet (Eds.), *Construction and Analysis of Safe, Secure, and Interoperable Smart Devices*. IX, 175 pages. 2006.
- Vol. 3955: G. Antoniou, G. Potamias, C. Spyropoulos, D. Plexousakis (Eds.), *Advances in Artificial Intelligence*. XVII, 611 pages. 2006. (Sublibrary LNAI).
- Vol. 3954: A. Leonardis, H. Bischof, A. Pinz (Eds.), *Computer Vision – ECCV 2006, Part IV*. XVII, 613 pages. 2006.
- Vol. 3953: A. Leonardis, H. Bischof, A. Pinz (Eds.), *Computer Vision – ECCV 2006, Part III*. XVII, 649 pages. 2006.
- Vol. 3952: A. Leonardis, H. Bischof, A. Pinz (Eds.), *Computer Vision – ECCV 2006, Part II*. XVII, 661 pages. 2006.
- Vol. 3951: A. Leonardis, H. Bischof, A. Pinz (Eds.), *Computer Vision – ECCV 2006, Part I*. XXXV, 639 pages. 2006.
- Vol. 3950: J.P. Müller, F. Zambonelli (Eds.), *Agent-Oriented Software Engineering VI*. XVI, 249 pages. 2006.
- Vol. 3947: Y.-C. Chung, J.E. Moreira (Eds.), *Advances in Grid and Pervasive Computing*. XXI, 667 pages. 2006.
- Vol. 3946: T.R. Roth-Berghofer, S. Schulz, D.B. Leake (Eds.), *Modeling and Retrieval of Context*. XI, 149 pages. 2006. (Sublibrary LNAI).
- Vol. 3945: M. Hagiya, P. Wadler (Eds.), *Functional and Logic Programming*. X, 295 pages. 2006.
- Vol. 3944: J. Quiñero-Candela, I. Dagan, B. Magnini, F. d'Alché-Buc (Eds.), *Machine Learning Challenges*. XIII, 462 pages. 2006. (Sublibrary LNAI).
- Vol. 3943: N. Gueffi, A. Savidis (Eds.), *Rapid Integration of Software Engineering Techniques*. X, 289 pages. 2006.
- Vol. 3942: Z. Pan, R. Aylett, H. Diener, X. Jin, S. Göbel, L. Li (Eds.), *Technologies for E-Learning and Digital Entertainment*. XXV, 1396 pages. 2006.
- Vol. 3941: S.W. Gilroy, M.D. Harrison (Eds.), *Interactive Systems*. XI, 267 pages. 2006.
- Vol. 3940: C. Saunders, M. Grobelnik, S. Gunn, J. Shawe-Taylor (Eds.), *Subspace, Latent Structure and Feature Selection*. X, 209 pages. 2006.
- Vol. 3939: C. Priami, L. Cardelli, S. Emmott (Eds.), *Transactions on Computational Systems Biology IV*. VII, 141 pages. 2006. (Sublibrary LNBI).
- Vol. 3936: M. Lalmas, A. MacFarlane, S. Rüger, A. Tombros, T. Tsikrika, A. Yavlinsky (Eds.), *Advances in Information Retrieval*. XIX, 584 pages. 2006.
- Vol. 3935: D. Won, S. Kim (Eds.), *Information Security and Cryptology – ICISC 2005*. XIV, 458 pages. 2006.
- Vol. 3934: J.A. Clark, R.F. Paige, F.A. C. Polack, P.J. Brooke (Eds.), *Security in Pervasive Computing*. X, 243 pages. 2006.
- Vol. 3933: F. Bonchi, J.-F. Boulicaut (Eds.), *Knowledge Discovery in Inductive Databases*. VIII, 251 pages. 2006.
- Vol. 3931: B. Apolloni, M. Marinaro, G. Nicosia, R. Tagliavalli, Neural Nets. XIII, 370 pages. 2006.
- Vol. 3930: D.S. Yeung, Z.-Q. Liu, X.-Z. Wang, H. Yan (Eds.), *Advances in Machine Learning and Cybernetics*. XXI, 1110 pages. 2006. (Sublibrary LNAI).
- Vol. 3929: W. MacCaull, M. Winter, I. Düntsch (Eds.), *Relational Methods in Computer Science*. VIII, 263 pages. 2006.
- Vol. 3928: J. Domingo-Ferrer, J. Posegga, D. Schreckling (Eds.), *Smart Card Research and Advanced Applications*. XI, 359 pages. 2006.
- Vol. 3927: J. Hespanha, A. Tiwari (Eds.), *Hybrid Systems: Computation and Control*. XII, 584 pages. 2006.
- Vol. 3925: A. Valmari (Ed.), *Model Checking Software*. X, 307 pages. 2006.
- Vol. 3924: P. Sestoft (Ed.), *Programming Languages and Systems*. XII, 343 pages. 2006.
- Vol. 3923: A. Mycroft, A. Zeller (Eds.), *Compiler Construction*. XIII, 277 pages. 2006.
- Vol. 3922: L. Baresi, R. Heckel (Eds.), *Fundamental Approaches to Software Engineering*. XIII, 427 pages. 2006.
- Vol. 3921: L. Aceto, A. Ingólfssdóttir (Eds.), *Foundations of Software Science and Computation Structures*. XV, 447 pages. 2006.

Table of Contents

Keynote Addresses

Processes and the Software Business <i>Michiel van Genuchten</i>	1
Controlling the Chaos of the CMMI Continuous Representation <i>Jan Jaap Cannegieter</i>	2
Evidence-Based Software Engineering and Systematic Literature Reviews <i>Barbara Kitchenham</i>	3
Expanding the Scope of Software Product Families: Problems and Alternative Approaches <i>Jan Bosch</i>	4

Decision Support

Defining the Process for Making Software System Modernization Decisions <i>Jarmo J. Ahonen, Henna Sivula, Jussi Koskinen, Heikki Lintinen, Tero Tilus, Irja Kankaanpää, Päivi Juutilainen</i>	5
Introducing Tool Support for Retrospective Analysis of Release Planning Decisions <i>Lena Karlsson, Björn Regnell</i>	19
A Qualitative Evaluation Method for Business Process Tools <i>Erika M. Nieto-Ariza, Guillermo Rodríguez-Ortiz, Javier Ortiz-Hernández</i>	34

Embedded Software and System Development

An Effective Source Code Review Process for Embedded Software <i>Masayuki Hirayama, Katsumi Ohno, Nao Kawai, Kichiro Tamaru, Hiroshi Monden</i>	47
Troubleshooting Large-Scale New Product Development Embedded Software Projects <i>Petri Kettunen</i>	61

Software Process Improvement with Agile Practices in a Large Telecom Company
Jussi Auvinen, Rasmus Back, Jeanette Heidenberg, Piia Hirkman, Luka Milovanov 79

Measurement

Assessing Software Product Maintainability Based on Class-Level Structural Measures
Hans Christian Benestad, Bente Anda, Erik Arisholm 94

Integrating Reuse Measurement Practices into the ERP Requirements Engineering Process
Maya Daneva 112

Process Definition and Project Tracking in Model Driven Engineering
Ivan Porres, María C. Valiente 127

Industrial Experiences

Difficulties in Establishing a Defect Management Process: A Case Study
Marko Jäntti, Tanja Toroi, Anne Eerola 142

A Case Study on the Success of Introducing General Non-construction Activities for Project Management and Planning Improvement
Topi Haapio, Jarmo J. Ahonen 151

The Concerns of Prototypers and Their Mitigating Practices: An Industrial Case-Study
Steve Counsell, Keith Phalp, Emilia Mendes, Stella Geddes 166

An Industrial Case Study on the Choice Between Language Customization Mechanisms
Miroslaw Staron, Claes Wohlin 177

Preliminary Results from a Survey of Multimedia Development Practices in Australia
Anne Hannington, Karl Reed 192

An ISO 9001:2000 Certificate and Quality Awards from Outside – What’s Inside? – A Case Study
Darja Šmite, Nils Brede Moe 208

Process Improvement

Implementing Software Process Improvement Initiatives: An Empirical Study

Mahmood Niazi, David Wilson, Didar Zowghi 222

Using Linear Regression Models to Analyse the Effect of Software Process Improvement

Joost Schalken, Sjaak Brinkkemper, Hans van Vliet 234

Taba Workstation: Supporting Software Process Deployment Based on CMMI and MR-MPS.BR

Mariano Montoni, Gleison Santos, Ana Regina Rocha, Sávio Figueiredo, Reinaldo Cabral, Rafael Barcellos, Ailton Barreto, Andréa Soares, Cristina Cerdeiral, Peter Lupo 249

Analysis of an Artifact Oriented Test Process Model and of Testing Aspects of CMMI

Paulo M.S. Bueno, Adalberto N. Crespo, Mario Jino 263

Agile Development Practices

The Impact of Pair Programming and Test-Driven Development on Package Dependencies in Object-Oriented Design — An Experiment

Lech Madeyski 278

Applying an Agility/Discipline Assessment for a Small Software Organisation

Philip S. Taylor, Des Greer, Paul Sage, Gerry Coleman, Kevin McDaid, Ian Lawthers, Ronan Corr 290

Lessons Learned from an XP Experiment with Students: Test-First Needs More Teachings

Thomas Flohr, Thorsten Schneider 305

An Empirical Study on Design Quality Improvement from Best-Practice Inspection and Pair Programming

Dietmar Winkler, Stefan Biffl 319

Product Line Engineering

A Variability-Centric Approach to Instantiating Core Assets in Product Line Engineering

Soo Ho Chang, Soo Dong Kim, Sung Yul Rhew 334

Improving the Development of e-Business Systems by Introducing
Process-Based Software Product Lines
Joachim Bayer, Mathias Kose, Alexis Ocampo 348

Assessing Requirements Compliance Scenarios in System Platform
Subcontracting
Björn Regnell, Hans O. Olsson, Staffan Mossberg 362

Short Papers

Software Inspections in Practice: Six Case Studies
Sami Kollanus, Jussi Koskinen 377

Productivity of Test Driven Development: A Controlled Experiment
with Professionals
*Gerardo Canfora, Aniello Cimitile, Felix Garcia, Mario Piattini,
Corrado Aaron Visaggio* 383

Results and Experiences from an Empirical Study of Fault Reports
in Industrial Projects
Jon Arvid Børretzen, Reidar Conradi 389

Software Process Improvement: A Road to Success
Mahmood Niazi 395

Characterization of Runaway Software Projects Using Association Rule
Mining
*Sousuke Amasaki, Yasuhiro Hamano, Osamu Mizuno,
Tohru Kikuno* 402

A Framework for Selecting Change Strategies in IT Organizations
Jan Pries-Heje, Otto Vinter 408

Building Software Process Line Architectures from Bottom Up
Hironori Washizaki 415

Refinement of Software Architectures by Recursive Model
Transformations
*Ricardo J. Machado, João M. Fernandes, Paula Monteiro,
Helena Rodrigues* 422

A UML-Based Process Meta-model Integrating a Rigorous Process
Patterns Definition
Hanh Nhi Tran, Bernard Coulette, Bich Thuy Dong 429

Ad Hoc Versus Systematic Planning of Software Releases – A Three-Staged Experiment <i>Gengshen Du, Jim McElroy, Guenther Ruhe</i>	435
---	-----

A Software Process Tailoring System Focusing to Quantitative Management Plans <i>Kazumasa Hikichi, Kyohei Fushida, Hajimu Iida, Ken'ichi Matsumoto</i>	441
--	-----

An Extreme Approach to Automating Software Development with CBD, PLE and MDA Integrated <i>Soo Dong Kim, Hyun Gi Min, Jin Sun Her, Soo Ho Chang</i>	447
---	-----

Workshops

Experiences and Methods from Integrating Evidence-Based Software Engineering into Education <i>Andreas Jedlitschka, Markus Ciolkowski</i>	453
---	-----

Workshop on Embedded Software Development in Collaboration <i>Pasi Kuvaja</i>	454
--	-----

Tutorials

Software Product Metrics – Goal-Oriented Software Product Measurement <i>Jürgen Münch, Dirk Hamann</i>	455
--	-----

Art and Science of System Release Planning <i>Günther Ruhe, Omolade Salu</i>	458
---	-----

Multiple Risk Management Process Supported by Ontology <i>Cristine Martins Gomes de Gusmão, Hermano Perrelli de Moura</i>	462
---	-----

Get Your Experience Factory Ready for the Next Decade: Ten Years After “How to Build and Run One” <i>Frank Bomarius, Raimund L. Feldmann</i>	466
--	-----

Author Index	473
---------------------------	-----