

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board:

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

Oscar Nierstrasz

University of Berne, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

Dortmund University, Germany

Demetri Terzopoulos

New York University, NY, USA

Doug Tygar

University of California at Berkeley, CA, USA

Moshe Y. Vardi

Rice University, Houston, TX, USA

Springer

Berlin

Heidelberg

New York

Hong Kong

London

Milan

Paris

Tokyo

Frank Bomarius Hajimu Iida (Eds.)

Product Focused Software Process Improvement

5th International Conference, PROFES 2004
Kansai Science City, Japan, April 5-8, 2004
Proceedings



Springer

Volume Editors

Frank Bomarius

Fraunhofer Institute for Experimental Software Engineering
Sauerwiesen 6, 67661 Kaiserslautern, Germany

E-mail: frank.bomarius@iese.fraunhofer.de

Hajimu Iida

Information Technology Center, Nara Institute of Science and Technology
Takayama-cho 8916-5, Ikoma City, Nara 630-01, Japan

E-mail: iida@itc.aist-nara.ac.jp

Library of Congress Control Number: 2004102972

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

ISSN 0302-9743

ISBN 3-540-21421-6 Springer-Verlag 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-Verlag. Violations are liable for prosecution under the German Copyright Law.

Springer-Verlag is a part of Springer Science+Business Media

springeronline.com

© Springer-Verlag Berlin Heidelberg 2004

Printed in Germany

Typesetting: Camera-ready by author, data conversion by PTP-Berlin, Protago-TeX-Production GmbH
Printed on acid-free paper SPIN: 10994818 06/3142 5 4 3 2 1 0

Preface

On behalf of the PROFES organizing committee we are proud to present to you the proceedings of the 5th International Conference on Product Focused Software Process Improvement (PROFES 2004), held in Kansai Science City, Japan.

Since 1999, PROFES has established itself as one of the recognized international process improvement conferences. In 2004 the conference left Europe for the first time and moved to Japan. Japan and its neighboring countries are intensifying their efforts to improve software engineering excellence, so it was a logical step to select Japan as the venue for PROFES 2004.

The purpose of the conference is to bring to light the most recent findings and results in the area and to stimulate discussion between researchers, experienced professionals, and technology providers. The large number of participants coming from industry confirms that the conference provides a variety of up-to-date topics and tackles industry problems. The main theme of PROFES is professional software process improvement (SPI) motivated by product and service quality needs. SPI is facilitated by software process assessment, software measurement, process modeling, and technology transfer. It has become a practical tool for quality software engineering and management. The conference addresses both the solutions found in practice and the relevant research results from academia. This is reflected in the 41 full papers, which are a balanced mix of academic papers as well as industrial experience reports.

The business of developing new applications like mobile and Internet services or enhancing the functionality of a variety of products using embedded software is maturing and meeting the harsh business realities. The necessity for professional software development, quality, and cost effectiveness is becoming evident and there is a need to spread SPI beyond its traditional areas. Some of accepted papers focus especially on the latest activities in Japanese software engineering, which is facing new challenges in developing new types of software in new ways, such as mobile networking embedded software in ever shorter time.

We wish to thank the Nara Institute of Science and Technology (NAIST), Fraunhofer IESE, University of Osaka, VTT Electronics for supporting the conference. We are also grateful to the authors for high-quality papers, the program committee for their hard work in reviewing the papers, the organizing committee for making the event possible, and all the numerous supporters including Software Engineers Association of Japan who helped in organizing this conference.

Last, but not least, many thanks to Patrick Leibbrand at Fraunhofer IESE for copyediting this volume, Dr. Masahide Nakamura at NAIST for developing PROFES 2004 web pages, Gaby Klein at IESE, and Junko Inui at NAIST for helping in the organization of this conference.

January 2004

Frank Bomarius
Hajimu Iida

Conference Organization

General Chair

Seija Komi-Sirvio, VTT Electronics (Finland)

Organizing Chair

Ken'ichi Matsumoto, Nara Institute of Science and Technology (Japan)

Program Co-chairs

Frank Bomarius, Fraunhofer IESE (Germany)

Hajimu Iida, Nara Institute of Science and Technology (Japan)

Tutorial, Workshop, Panel Chair

Shinji Kusumoto, Osaka University (Japan)

Publicity Chairs

Europe: Pekka Abrahamsson, VTT Electronics (Finland)

USA: Ioana Rus, Fraunhofer Center - Maryland

Japan: Yasunari Takagi, OMRON
Takeshi Hayama, NTT Data

PROFES Advisor

Markku Oivo, University of Oulu (Finland)

Program Committee

Andreas Birk, SD&M (Germany)
Reidar Conradi, NTNU (Norway)
Paolo Donzelli, University of Maryland - College Park (USA)
Ilkka Haikala, Tampere University of Technology (Finland)
Tua Huomo, Cybelius Software (Finland)
Katsuro Inoue, University of Osaka (Japan)
Janne Jarvinen, Solid Information Technology (Finland)
Ross Jeffery, University of New South Wales (Australia)
Erik Johansson, Q-Labs (Sweden)
Natalia Juristo, Universidad Politecnica de Madrid (Spain)
Haruhiko Kaiya, Shinshu University (Japan)
Kari Kansala, Nokia Research Center (Finland)
Toshihiro Komiyama, NEC (Japan)
Jaana Kuula, Lapinliitto (Finland)
Pasi Kuvaja, University of Oulu (Finland)
Mikael Lindval, Fraunhofer Center –Maryland (USA)
Makoto Matsushita, Osaka University (Japan)
Kenichi Matumoto, NAIST (Japan)
Maurizio Morisio, University of Torino (Italy)
Kumiyo Nakakoji, University of Tokyo (Japan)
Paolo Nesi, University of Florence (Italy)
Risto Nevalainen, STTF (Finland)
Hideto Ogasawara, Toshiba (Japan)
Markku Oivo, University of Oulu (Finland)
Paivi Parviainen, VTT Electronics (Finland)
Teade Punter, Fraunhofer IESE (Germany)
Karl Reed, La Trobe University (Australia)
Harri Reiman, Ericsson (Sweden)
Günther Ruhe, University of Calgary (Canada)
Iona Rus, Fraunhofer Center –Maryland (USA)
Kurt Schneider, University of Hannover (Germany)
Carolyn Seaman, UMBC, Baltimore (USA)
Veikko Seppanen, University of Oulu (Finland)
Forrest Shull, Fraunhofer Center –Maryland (USA)
Dag Sjoeborg, University of Oslo (Norway)
Reijo Sulonen, Helsinki University of Technology (Finland)
Rini van Solingen, CMG (The Netherlands)
Matias Vierimaa, VTT Electronics (Finland)
Otto Vinter, DELTA (Denmark)
Giuseppe Visaggio, University of Bari (Italy)
Yingxu Wang, University of Calgary (Canada)
Hironori Washizaki, Waseda University (Japan)
Isabella Wiczorek, Federal Ministry of Research and Education (Germany)
Claes Wohlin, Blekinge Institute of Technology (Sweden)

We would also like to thank the following persons who helped in reviewing the papers: Silvia T. Acuña, Oscar Dieste, Christian Bunse, Klaus Schmid, Alf Inge Wang, Ralf Kalmar, Davide Rogai, Pierfrancesco Bellini, Ivan Bruno, Maria Teresa Baldassarre, Danilo Caivano, Aderemi Adewumi, Nguyen Cong Vu, Stein Grimstad, Erik Arisholm, June Verner, Felicia Kurniawati, Barbara Kitchenham, Ming Huo

Table of Contents

Software Process Improvement

A Model for the Implementation of Software Process Improvement: An Empirical Study	1
<i>Mahmood Niazi, David Wilson, Didar Zowghi, Bernard Wong</i>	
Does Use of Development Model Affect Estimation Accuracy and Bias?	17
<i>Kjetil Moløkken, Anette C. Lien, Magne Jørgensen, Sinan S. Tanilkan, Hans Gallis, Siw E. Hove</i>	
Managing Software Process Improvement (SPI) through Statistical Process Control (SPC)	30
<i>Teresa Baldassarre, Nicola Boffoli, Danilo Caivano, Giuseppe Visaggio</i>	
Towards Hypotheses on Creativity in Software Development	47
<i>Mingyang Gu, Xin Tong</i>	
Using Software Inspection as a Catalyst for SPI in a Small Company	62
<i>Lasse Harjuma, Ilkka Tervonen, Pekka Vuorio</i>	
Comparing Global (Multi-site) SPI Program Activities to SPI Program Models	76
<i>Atte Kinnula, Marianne Kinnula</i>	
Starting SPI from Software Configuration Management: A Fast Approach for an Organization to Realize the Benefits of SPI	92
<i>Kunihiko Ikeda, Yasuyuki Akamatsu</i>	

Software Quality

Evaluating the Calmness of Ubiquitous Applications	105
<i>Jukka Riekk, Pekka Isomursu, Minna Isomursu</i>	
Quality Attributes in Mobile Web Application Development	120
<i>Axel Priestersbach, Thomas Springer</i>	
Introducing Quality System in Small and Medium Enterprises: An Experience Report	131
<i>Lerina Aversano, Gerardo Canfora, Giovanni Capasso, Giuseppe A. Di Lucca, Corrado A. Visaggio</i>	

Measurement

Definition and Empirical Validation of Metrics for Software Process Models	146
<i>Félix García, Francisco Ruiz, Mario Piattini</i>	
Multiview Framework for Goal Oriented Measurement Plan Design	159
<i>Pasquale Ardimento, Maria Teresa Baldassarre, Danilo Caivano, Giuseppe Visaggio</i>	
Eliminating Over-Confidence in Software Development Effort Estimates	174
<i>Magne Jørgensen, Kjetil Moløkken</i>	
Measuring the Object-Oriented Properties in Small Sized C++ Programs – An Empirical Investigation	185
<i>S. Kanmani, V. Rhymend Uthariaraj, V. Sankaranarayanan, P. Thambidurai</i>	

Methods and Tools

An Empirical Investigation on the Impact of Training-by-Examples on Inspection Performance	203
<i>Atiq Chowdhury, Lesley Pek Wee Land</i>	
Refactoring Support Based on Code Clone Analysis	220
<i>Yoshiki Higo, Toshihiro Kamiya, Shinji Kusumoto, Katsuro Inoue</i>	
Introducing the Next Generation of Software Inspection Tools	234
<i>Henrik Hedberg</i>	
Intelligent Support for Software Release Planning	248
<i>Amandeep, Günther Ruhe, Mark Stanford</i>	

Experimental Software Engineering

An Empirical Evaluation of Predicting Runaway Software Projects Using Bayesian Classification	263
<i>Osamu Mizuno, Takanari Hamasaki, Yasunari Takagi, Tohru Kikuno</i>	
Effort Estimation Based on Collaborative Filtering	274
<i>Naoki Ohsugi, Masateru Tsunoda, Akito Monden, Ken-ichi Matsumoto</i>	
Effective Software Project Management Education through Simulation Models: An Externally Replicated Experiment	287
<i>D. Rodríguez, M. Satpathy, Dietmar Pfahl</i>	

Software Engineering Research Strategy: Combining Experimental and Explorative Research (EER)	302
<i>Markku Oivo, Pasi Kuvaja, Petri Pulli, Jouni Similä</i>	

Industrial Experiences

Automatic Measurement at Nokia Mobile Phones: A Case of SDL Based Software Development	318
<i>Minna Pikkarainen, Matias Vierimaa, Hannu Tanner, Raija Suikki</i>	
Using a Reference Application with Design Patterns to Produce Industrial Software	333
<i>Marek Vokáč, Oluf Jensen</i>	
Using RUP for Process-Oriented Organisations	348
<i>João M. Fernandes, Francisco J. Duarte</i>	
Web-Based System Development: Status in the Norwegian IT Organizations	363
<i>Jianyun Zhou, Tor Stålhane</i>	

Agile Methods

Achieving CMMI Level 2 with Enhanced Extreme Programming Approach	378
<i>Tuomo Kähkönen, Pekka Abrahamsson</i>	
Usability Assessment of an Extreme Programming Project: Close Co-operation with the Customer Does Not Equal to Good Usability	393
<i>Timo Jokela, Pekka Abrahamsson</i>	
Empirical Evaluation of Agile Software Development: The Controlled Case Study Approach	408
<i>Outi Salo, Pekka Abrahamsson</i>	
Good-Enough Software Process in Nokia	424
<i>Kari Käsälä</i>	
An Ideal Process Model for Agile Methods	431
<i>Marcello Visconti, Curtis R. Cook</i>	
Experimental Development of a Prototype for Mobile Environmental Information Systems (MEIS)	442
<i>Ari Keronen, Mauri Myllyaho, Pasi Alatalo, Markku Oivo, Harri Antikainen, Jarmo Rusanen</i>	

Software Process Assessment

Selecting CMMI Appraisal Classes Based on Maturity and Openness 457
Stig Larsson, Fredrik Ekdahl

Combining Capability Assessment and Value Engineering:
 A BOOTSTRAP Example 471
Pasi Ojala

Assessing the State of Software Documentation Practices 485
Marcello Visconti, Curtis R. Cook

Requirements Engineering

Requirements Prioritization Challenges in Practice 497
Laura Lehtola, Marjo Kauppinen, Sari Kujala

A Requirement Elicitation Method in Collaborative Software
 Development Community 509
Masatoshi Shimakage, Atsuo Hazeyama

Development of a Normative Package for Safety-Critical Software
 Using Formal Regulatory Requirements 523
Sergiy A. Vilkomir, Aditya K. Ghose

Software Reuse / COTS

A Study of Developer Attitude to Component Reuse
 in Three IT Companies 538
*Jingyue Li, Reidar Conradi, Parastoo Mohagheghi, Odd Are Sæhle,
 Øivind Wang, Erlend Naalsund, Ole Anders Walseth*

Managing COTS Components Using a Six Sigma-Based Process 553
Alejandra Cechich, Mario Piattini

Using Dynamic Modeling and Simulation to Improve
 the COTS Software Process 568
Mercedes Ruiz, Isabel Ramos, Miguel Toro

Author Index 583