

Communications
in Computer and Information Science

172

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Systems, Software and Services Process Improvement

18th European Conference, EuroSPI 2011
Roskilde, Denmark, June 27-29, 2011
Proceedings

Volume Editors

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ISSN 1865-0929
ISBN 978-3-642-22205-4
DOI 10.1007/978-3-642-22206-1
Springer Heidelberg Dordrecht London New York

e-ISSN 1865-0937
e-ISBN 978-3-642-22206-1

Library of Congress Control Number: 2011930517

CR Subject Classification (1998): D.2, K.6, H.4, F.3, C.2, D.3, H.5, J.1

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

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

Systems, Software and Services Process Improvement – 18th European Conference, EuroSPI² 2011, June 27–29, 2011

This textbook comprises the proceedings of the 18th EuroSPI Conference, held during June 27-29, 2011 in Roskilde, Denmark.

Since EuroSPI 2010 we extended the scope of the conference from software process improvement to systems, software and service-based process improvement. EMIRAcle is the institution for research in manufacturing and innovation, which came out as a result of the largest network of excellence for innovation in manufacturing in Europe. EMIRAcle key representatives joined the EuroSPI community, and papers as well as case studies for process improvement on systems and product level will be included in future.

Since 2008 EuroSPI partners have packaged SPI knowledge in job role training and established a European certification association (www.ecqa.org) to transport this knowledge Europe-wide using standardized certification and exam processes.

Another addition in to Roskilde 2011 conference was that results from the Danish SourceIT conference were presented in two sessions at the conference.

Conferences were held in Dublin (Ireland) in 1994, in Vienna (Austria) in 1995, in Budapest (Hungary) in 1997, in Gothenburg (Sweden) in 1998, in Pori (Finland) in 1999, in Copenhagen (Denmark) in 2000, in Limerick (Ireland) in 2001, in Nuremberg (Germany) in 2002, in Graz (Austria) in 2003, in Trondheim (Norway) in 2004, in Budapest (Hungary) in 2005, in Joensuu (Finland) in 2006, in Potsdam (Germany) in 2007, in Dublin (Ireland) in 2008, in Alcala (Spain) in 2009, and in Grenoble (France) in 2010.

EuroSPI is an initiative with the following major action lines <http://www.eurospi.net>:

- Establishing an annual EuroSPI conference supported by Software Process Improvement networks from different EU countries.
- Establishing an Internet-based knowledge library, newsletters, and a set of proceedings and recommended books.
- Establishing an effective team of national representatives (from each EU country) growing step by step into more countries of Europe.
- Establishing a European Qualification Framework for a pool of professions related with SPI and management. This is supported by European certificates and examination systems.

EuroSPI has established a newsletter series (newsletter.eurospi.net), the SPI Manifesto (SPI = Systems, Software and Services Process Improvement), an experience library (library.eurospi.net) to be continuously extended over the years

and made available to all attendees, and a Europe-wide certification for qualifications in the SPI area (www.ecqa.org, European Certification and Qualification Association).

A typical characterization of EuroSPI is reflected in a statement made by a company: “... *the biggest value of EuroSPI lies in its function as a European knowledge and experience exchange mechanism for SPI and innovation.*”

Since its beginning in 1994 in Dublin, the EuroSPI initiative has outlined that there is no single silver bullet with which to solve SPI issues, but that you need to understand a combination of different SPI methods and approaches to achieve concrete benefits. Therefore each proceedings volume covers a variety of different topics, and at the conference we discuss potential synergies and the combined use of such methods and approaches. These proceedings contain selected research papers for six topics:

- Section I: SPI and Assessment
- Section II: SPI and Implementation
- Section III: SPI and Improvement Methods
- Section IV: SPI and Organization
- Section V: SPI and People/Teams
- Section VI: SPI and Reuse
- Section VII: Selected Key Notes for SPI Implementation

Section I presents studies on SPI and assessment. The authors provide different insights and additions into the assessment process. Mejia et al. present a multi-model workflow for assessing the solicitation and supplier agreement development process area of the CMMI-ACQ model. Mesquida and Pichaco look at best practices for IT service management. And Kasurinen et al. describe a self-assessment framework to be used with the new ISO/IEC 29119 test standard where the first results of use indicate that it is a very viable approach especially when combined with a maturity level-based approach.

Section II presents three papers on implementation issues in relation to SPI. First, Jäntti et al. use a case study to explain how to improve the deployment of IT service management processes. The explanation is that one should focus on understanding and training as well as dividing the implementation into smaller phases and milestones. Second, Kuhrman et al. provide insight into the usage style, ratings, and tempers of project managers working with a newer German government standard software development process for IT projects. Third, Sivakumar et al. present an approach improving verification and validation in the medical device domain.

Section III presents three papers more specifically dealing with implementation methods. Clarke and O'Connor look at the motivation for conducting SPI by providing further evidence of its positive impact. More specifically, they present a holistic scorecard (HSC) that can be used to examine business success systematically. Then Stettina and Heijstek propose a five-dimensional tool to foster self-reflection in agile software development teams. This paper also provides an account of using the tool with 79 individuals and 8 international Scrum teams showing that the tool is quite useful. Finally, Aysolmaz and Demirörs present an

SPI methodology with many details on life cycle, tasks, approaches, resources, tools, roles, participation of groups, and process assets, which has been tested in 10 organizations.

Section IV presents studies on SPI in relation to organizations. Lepmets et al. describe the results of an international survey showing that process assessment contributes positively to the internalization of process improvement goals. Neumann et al. investigate the importance of idea generation and idea sources in relation to innovation management for an organization. The investigation is based on a case study showing that more, and better, idea sources can boost innovation. Polgár and Biró describe the application of usability methodology for software process improvement and formulate specific ideas on how to adapt concrete usability improvement methods.

Section V presents studies on people and teams in relation to SPI. First, Basri and O'Connor explore the dynamics of software development teams – such as structure, process, communication, learning and sharing—and its impact on SPI. Second, Yilmaz and O'Connor use structural equation modelling for an empirical investigation of productivity enabling social factors in the software process. Third, Ringstad et al. argue for the use of diagnosis and action planning to improve teamwork in agile software development.

Section VI presents three papers on SPI and reuse. Valdes et al. describe a reusable process model called Tutelkan for enabling SPI in small settings. O'Leary and Richardson show a process model for product derivation coming out of several iterative development cycles and evaluated with both academic and industrial sources. Finally, Leitner and Kreiner investigate whether flexible product architecture conceptually is the same as flexible product line (PL) architecture. As a result they define what they call an 'agile continuum' emphasizing that there is no clear point in time when the product line process is finished and the product life cycle starts

Section VII presents selected key notes from EuroSPI workshops concerning the future of SPI. From 2010 onwards EuroSPI invites recognized key researchers to publish new future directions of SPI.

Four invited papers illustrate that SPI can beneficially be implemented in very small organizations. Caballero et al. discuss how SCRUM can be implemented in a small SME. O'Connor and Laporte illustrate how ISO/IEC 29110 can be used to support the improvement needs of VSEs, while Mas and Mesquida present a tool to manage SPI in SMEs. Finally, McCaffery et al. provide a practical case study from the medical device sector.

Further invited papers illustrate that SPI has a direct impact on the innovation competencies of an organization. SPI helps to create continuous learning organizations. Kishida describes how SPI can help form innovative software projects, Messnarz et al. describe a future vision of SPI and innovation networking strategies in Europe, and Riel aims at pinpointing new innovation management challenges that have evolved in product development and manufacturing industries.

Two invited papers discuss how the new functional safety standards influence the longer standing SPI initiatives and how the existing paradigms have to be extended to cover functional safety aspects as well. Ovi Bachmann et al. illustrate the implementation on a case study in automotive industry, and Messnarz et al. show step by step how an ISO 15504-based improvement program is extended towards covering functional safety concepts.

Recommended Further Reading

In [1] the proceedings of three EuroSPI² conferences were integrated into one book edited by 30 experts in Europe. The proceedings of EuroSPI² 2005, 2006, 2007, 2008, and 2009 have been published by Springer in [2], [3], [4], [5], [6] and [7], respectively.

June 2011

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References

1. Messnarz, R., Tully, C. (eds.): Better Software Practice for Business Benefit – Principles and Experience, 409 pages. IEEE Computer Society Press, Los Alamitos (1999)
2. Richardson, I., Abrahamsson, P., Messnarz, R. (eds.): Software Process Improvement. LNCS, vol. 3792, p. 213. Springer, Heidelberg (2005)
3. Richardson, I., Runeson, P., Messnarz, R. (eds.): Software Process Improvement. LNCS, vol. 4257, pp. 11–13. Springer, Heidelberg (2006)
4. Abrahamsson, P., Baddoo, N., Margaria, T., Messnarz, R. (eds.): Software Process Improvement. LNCS, vol. 4764, pp. 1–6. Springer, Heidelberg (2007)
5. O'Connor, R.V., Baddoo, N., Smolander, K., Messnarz, R. (eds): Software Process Improvement. CCIS, vol. 16, Springer, Heidelberg (2008).
6. O'Connor, R.V., Baddoo, N., Gallego C., Rejas Muslera R., Smolander, K., Messnarz, R. (eds): Software Process Improvement. CCIS, vol. 42, Springer, Heidelberg (2009).
7. Riel A., O'Connor, R.V. Tichkiewitch S., Messnarz, R. (eds): Software, System, and Service Process Improvement. CCIS, vol. 99, Springer, Heidelberg (2010).

Organization

Board Members

EuroSPI Board Members represent centers or networks of SPI excellence having extensive experience with SPI. The board members collaborate with different European SPINS (Software Process Improvement Networks). The following six organizations have been members of the conference board for the last 10 years:

- ASQ, <http://www.asq.org>
- ASQF, <http://www.asqf.de>
- DELTA, <http://www.delta.dk>
- ISCN, <http://www.iscn.com>
- SINTEF, <http://www.sintef.no>
- STTF, <http://www.sttf.fi>

EuroSPI Scientific Program Committee

EuroSPI established an international committee of selected well-known experts in SPI who are willing to be mentioned in the program and to review a set of papers each year. The list below represents the Research Program Committee members. EuroSPI² also has a separate Industrial Program Committee responsible for the industry/experience contributions.

Ambriola Vincenzo	Università di Pisa, Italy
Biffi Stefan	University of Technology Vienna, Austria
Biró Miklós	Dennis Gabor College, Hungary
Buglione Luigi	Engineering Ingegneria Informatica S.p.A., Italy
Calvo-Manzano Villalon José Antonio	Universidad Politecnica de Madrid, Spain
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Riel Andreas	Grenoble Institute of Technology, Laboratory G-SCOP, France
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General Chair

Richard Messnarz

Scientific Chairs

Rory V. O'Connor
Jan Pries-Heje

All three Chairs, the General and the Research Chairs, have quite a complementary and interesting profile. Dr. Messnarz works in close collaboration with Austrian research institutions (universities of applied sciences) and large German automotive companies.

Dr. Rory O'Connor is a senior lecturer in Dublin City University and a senior researcher with Lero, the Irish Software Engineering Centre. His main research interests center on software processes and SPI in relation to small and very small organizations. Jan Pries-Heje is Professor in Information Systems at Roskilde

University. He is past President of the Association of Information Systems in Scandinavia (IRIS). Jan serves as the Danish National Representative to IFIP Technical Committee 8 on Information Systems where he is also Vice-Chair. Jan is currently Associate Editor for *MIS Quarterly*, *Information Systems Journal*, and *Business and Information Systems*; three of the best journals in the field of IS.

The experience portfolio of the Chairs covers different market segments, different sizes of organizations, and different SPI approaches. This strengthens the fundamental principle of EuroSPI² to cover a variety of different markets, experiences, and approaches.

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