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* This monograph will be also published in Spanish (full issue printed; summary, abstracts and some articles online) by **Novática**, journal of the Spanish CEPIs society ATI (*Asociación de Técnicos de Informática*) at <<http://www.ati.es/novatica/>>, and in Italian (online edition only, containing summary abstracts and some articles) by the Italian CEPIs society ALSI (*Associazione nazionale Laureati in Scienze dell'informazione e Informatica*) and the Italian IT portal Tecnoteca at <<http://www.tecnoteca.it/>>.

Presentation

Software Process Technology: Improving Software Project Management and Product Quality

Francisco Ruiz-González and Gerardo Canfora

1 Introduction

One of the main lines of work on the enhancement of software product quality is the study and improvement of the processes by which software is developed and maintained. This statement is based on the assumption that there is a direct correlation between a quality process and product quality. The area of study in the field of software engineering addressing this problem is known as “Software Process Technology” (SPT), or simply “Software Process” (SP).

Research into SPT as a separate discipline began in the 80s (*International Software Process Workshop, European Workshop on Software Process Technology, Journal of Software Process Technology: Improvement and Practice,...*), but it is only in the last 5 or 6 years that it has acquired a certain maturity in terms of its real use in software engineering projects. The first important contribution of SPT was to confirm that the development and maintenance of software are complex processes which require a collective and creative effort. Thus the quality of a software product is heavily dependent on the people, the organisation and the procedures involved in creating, delivering and maintaining it.

2 The Contents of This Monograph

This monograph issue opens with the article “*Software Process: Characteristics, Technology and Environments*” which the authors of this presentation have written as an introduction to the topic. It deals with three essential aspects: software process specific characteristics; the justification of SPT as a way of providing integrated support to both production and management processes; and Software Engineering Environments (SEEs). In the last point, we stress the different dimensions of software tool integration within an SEE and the proposed process orientation for SEEs (Process-centred Software Engineering Environment, PSEE).

“*Key Issues and New Challenges in Software Process Technology*” was written by **Jean-Claude Derniame** and **Flavio Oquendo** (both have played major roles in the EWSPT – European Workshop on Software Process Technology – series of conferences). It is an analysis of the evolution and results of this field over its twenty years of existence and the key unresolved challenges SPT has today: the support of typical agile processes, open source software, and worldwide software development (globalization). The first part is an introduction to SPT – which complements this introductory article – including a generic process framework and the relationship between SPT and process maturity.

The Guest Editors

Francisco Ruiz-González has a PhD in Computer Science from the *Universidad de Castilla-La Mancha (UCLM)*, Spain, and an MSc in Chemistry-Physics from the *Universidad Complutense de Madrid*, Spain. He is a full time Associate Professor of the Dept. of Computer Science at UCLM in Ciudad Real, Spain. He was the Dean of the Faculty of Computer Science between 1993 and 2000. Previously, he was the Director of Computer Services at the aforementioned university (1985-1989) and he has also worked in private companies as an analyst-programmer and project manager. He is a member of the Alarcos Research Group, <<http://alarcos.inf-cr.uclm.es/english/>>. His current research interests include software process technology and modelling, software maintenance, and methodologies for software projects planning and management. He has also worked in the fields of GIS (Geographical Information Systems), educational software systems and deductive databases. He has written eight books and fourteen chapters on the abovementioned topics and he has published 90 papers in Spanish and international journals and conferences. He has sat on nine programme committees and seven organizing committees and he belongs to several scientific and professional associations: ACM, IEEE-CS,

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As a demonstration of the industrial maturity that SPT is reaching, "A Taxonomy of Software Engineering Environment Services: The Upcoming ISO/IEC Standard 15940", by **Dan Hyung Lee** and **Juan Garbajosa-Sopeña**, presents us the future ISO standard of which they are co-editors. The authors classify, enumerate and define all the possible services that a SEE can provide to give automatic support to the various processes of software life cycle.

The close relationship between business models used by the software industry and processes that are carried out during software development and maintenance makes the reflections, analyses and explanations put forward by **Alfonso Fugetta** in "Open Source and Free Software: A New Model for The Software Development Process?" highly interesting, useful and illuminating.

The next two articles refer to SP modelling. In "Applying The Basic Principles of Model Engineering to The Field of Process Engineering", **Jean Bézivin** and **Erwan Breton** introduce model-driven system engineering, presenting the MDA (Model-Driven Architecture) proposed by OMG (Object Management Group) whose aim is to separate platform-independent aspects from the platform-dependent aspects in the design of software system architecture. As proof of the strength of this new "model-driven" development paradigm, the authors show how it can be applied to processes using a non-MDA based COTS (Commercial Off-The-Shelf) software, MS-Project, demonstrating that this approach enables us to design and build more general solutions.

In "Software Process Modelling Languages Based on UML", **Pere Botella i López**, **Xavier Franch-Gutiérrez** and **Josep M. Ribó-Balust** introduce the reader to Process Modelling Languages (PMLs). In particular they analyse the possibilities of UML (Unified Modelling Language) to model the structural and behavioural aspects of processes, and present two PMLs, namely SPEM and PROMENADE, that take advantage of this notation to model software processes.

Focusing on another interest point, the next two articles are devoted to technological aspects of SEEs. In "Supporting the

Software Process in A Process-centred Software Engineering Environment", **Hans-Ulrich Kobialka** carries out a systematic study of the process support requirements a PSEE should satisfy, and proposes a list of ingredients (groups of services) to this end. The author presents the mechanisms available in LMP ALADYN for process automation (triggers, task patterns, constraints, etc.) and impact control (permissions).

The article "Managing Distributed Projects in GENESIS" was written by **Lerina Aversano**, **Andrea De Lucia**, **Matteo Gaeta**, **Pierluigi Ritrovato**, and **Maria-Luisa Villani**. They propose an approach and an environment to support the management of distributed software projects allowing the definition and enactment of software process models in a decentralized and autonomous multi-site manner.

In "Software Process Measurement", **Félix García-Rubio**, **Francisco Ruiz-González**, and **Mario Piattini-Velthuis**, argue the importance of measuring SPs to be able to carry out evaluation and improvement. The authors identify the measurable entities of a SP and, as a use case, they present a set of metrics that can be used to estimate the maintainability of a process model.

It is usual for a process to pass through various adaptations due to the different operational contexts in which the process is performed. These adaptations involve the creation of distinct versions from the same generic process which are known as specialized processes. In "Process Diversity and how Practitioners Can Manage It", **Danilo Caivano** and **Corrado Aaron Visaggio** present a framework based on process patterns to manage and to maintain all these different process models. The application of this framework to software system maintenance is also included as a case study.

We hope this collection of articles (thanks must go the authors for their valuable contributions) provides an introduction to and an overview of Software Process Technology. We believe that, by means of automation and the integration of various engineering and managerial processes, this field can be a major help to software engineers in years to come.

Useful References on SPT

These references, additional to the ones included in the papers this monography consists of, enlarge the field of Software Process Technology for readers interested in knowing more about this matter.

Associations

- ISPA – International Software Process Association. <<http://www.ece.utexas.edu/~perry/prof/ispa/>>.

Books

- A. Fuggetta and A. Wolf (eds). Software Process, Vol 4, Trends in Software. J. Wiley & Sons (USA), 1996. <<http://serl.cs.colorado.edu/~alw/doc/Trends.html>>.
- J. C. Derniame, B. A. Kaba, & D. Wastell (eds.). Software Process: Principles, Methodology and Technology. Springer-Verlag, serie LNCS n° 1500, 1999.
- B. Westfechtel. Models and Tools for Managing Development Processes. Springer-Verlag, serie LNCS n° 1646, 1999.

Journals

- Journal of Software Process Improvement and Practice. Quarterly journal published by Wiley. <<http://www.wiley.com/WileyCDA/WileyTitle/productCd-SPIP.html>>.

Conferences & Events

- EWSPT – European Workshop on Software Process Technology. Scientific biennial workshop whose ninth edition took place in Helsinki, Finland, in September 2003. Proceedings: <<http://www2.springeronline.com/sgw/cda/frontpage/0,11855,5-40109-22-7063147-0,00.html>>.

- ICSPi – International Conference on Software Process Improvement. Its second edition was held in Washington DC, USA, in June 2004. <<http://www.icspi.com/>>.
- PROFES – International Conference on Product Focused Software Process Improvement. Its fifth edition was held in Kansai Science City, Japan, in April 2004. <<http://www.vtt.fi/ele/profes2004/>>.

Web Sites

- Capability Maturity Models. University of Carnegie Mellon, Software Engineering Institute (EE.UU.). <<http://www.sei.cmu.edu/cmm/cmms/cmms.html>>.
- Graphical Development Process Assistant. University of Bremen, Germany. <<http://www.informatik.uni-bremen.de/uniform/vm97/>>. Specialized web site that includes over 6.000 pages on this topic, including concepts and definitions, process models, environments, standards, methodologies, process elements, SPT modelling classes and approaches, projects, tools and classified bibliographic about all the above.

Papers

- V. Ambriola, R. Conradi, and A. Fuggetta. Assessing Process-centered Software Engineering Environments. ACM Transactions on Software Engineering and Methodology, 6:3, 1997, pp. 283–328.
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- L. Osterweil. Software Processes are Software Too. Proc. of 9th International Conference on Software Engineering. Washington DC (USA). IEEE Comp. Soc. Press, 1987.

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