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secretariat@icsoft.org

BRIEF CONTENTS

INVITED SPEAKERS.....	IV
SPECIAL SESSION CHAIRS	V
ORGANIZING AND STEERING COMMITTEES	VI
PROGRAM COMMITTEE	VII
AUXILIARY REVIEWERS	X
SELECTED PAPERS BOOK	XII
CO-SPONSOR.....	XII
FOREWORD.....	XIII
CONTENTS.....	XV

INVITED SPEAKERS

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SELECTED PAPERS BOOK

A number of selected papers presented at ICSOFT 2007 will be published by Springer, in a book entitled Software and Data Technologies II. This selection will be done by the conference chair and program co-chairs, among the papers actually presented at the conference, based on a rigorous review by the ICSOFT 2007 program committee members.

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FOREWORD

This volume contains the proceedings of the second *International Conference on Software and Data Technologies (ICSOFT 2007)*, organized by the Institute for Systems and Technologies of Information, Control and Communication (*INSTICC*) in cooperation with the Interdisciplinary Institute for Collaboration and Research on Enterprise Systems and Technology (*IICREST*), and co-sponsored by the Workflow Management Coalition (*WfMC*).

The purpose of this conference is to bring together researchers, engineers and practitioners interested in information technology and software development. The conference tracks are “*Software Engineering*”, “*Information Systems and Data Management*”, “*Programming Languages*”, “*Distributed and Parallel Systems*” and “*Knowledge Engineering*”.

Software and data technologies are essential for developing any computer information system, encompassing a large number of research topics and applications: from programming issues to the more abstract theoretical aspects of software engineering; from databases and data-warehouses to management information systems and knowledge-base systems; Distributed systems, ubiquity, data quality and other related topics are included in the scope of ICSOFT.

ICSOFT 2007 received 292 paper submissions from more than 56 countries in all continents. To evaluate each submission, a double blind paper evaluation method was used: each paper was reviewed by at least two internationally known experts from ICSOFT Program Committee. Only 41 papers were selected to be published and presented as full papers, i.e. completed work (8 pages in proceedings / 30' oral presentations), 74 additional papers, describing work-in-progress, were accepted as short paper for 20' oral presentation, leading to a total of 115 oral paper presentations. There were also 76 papers selected for poster presentation. The full-paper acceptance ratio was thus 14%, and the total oral paper acceptance ratio was 39%.

In its program ICSOFT includes panels to discuss aspects of software development, with the participation of distinguished world-class researchers; furthermore, the program is enriched by several keynote lectures delivered by renowned experts in their areas of knowledge. These high points in the conference program definitely contribute to reinforce the overall quality of the ICSOFT conference, which aims at becoming one of the most prestigious yearly events in its area. This year, ICSOFT was held back-to-back with ENASE (Evaluation of Novel Approaches to Software Engineering) working conference, in a joint effort to offer the research community the best possible environment for discussing and debating innovative aspects of Software Engineering. This was quite a rewarding experience, thanks to ENASE program chairs Leszek Maciaszek and Cesar Gonzalez-Perez and all other ENASE participants.

The program for this conference required the dedicated effort of many people. Firstly, we must thank the authors, whose research and development efforts are recorded here. Secondly, we thank the members of the program committee and the additional reviewers for their diligence and expert reviewing. I would like to personally thank the Program Chairs, namely Boris Shishkov and Markus Helfert, for their important collaboration. The local organizers and the secretariat have worked hard to provide smooth logistics and a friendly environment, so we must thank them all and

especially Ms. Monica Saramago for their patience and diligence in answering many emails and solving all the problems. Last but not least, we thank the invited speakers for their invaluable contribution and for taking the time to synthesize and prepare their talks.

A successful conference involves more than paper presentations; it is also a meeting place, where ideas about new research projects and other ventures are discussed and debated. Therefore, a social event including a conference diner was organized for the evening of July 24 (Tuesday) in order to promote this kind of social networking.

We wish you all an exciting conference and an unforgettable stay in the cosmopolitan city of Barcelona. We hope to meet you again next year for the 3rd ICSOFT, to be held in the historic city of Porto (Portugal), details of which will be shortly made available at <http://www.icsoft.org>.

Joaquim Filipe

INSTICC/Polytechnic Institute of Setúbal, Portugal

(Conference Chair)

CONTENTS

INVITED SPEAKERS

KEYNOTE LECTURES

ENTERPRISE ONTOLOGY AND THE IDENTIFICATION OF BUSINESS COMPONENTS <i>Jan Dietz</i>	IS-5
DOCUMENT-DRIVEN SOFTWARE DESIGN - A Novel Approach that Should Not Be Novel <i>David Lorge Parnas</i>	IS-7
PRINCIPLES FOR REQUIREMENTS PROCESSES AT THE DAWN OF THE 21 ST CENTURY <i>Sean Hansen, Nicholas Berente and Kalle Lyytinen</i>	IS-9
CREATIVITY, AUTOMATION AND TECHNOLOGY <i>Stephen Mellor</i>	IS-27
SERVICE SCIENCE FOR MARKET SERVICES <i>Bart Nieuwenhuis</i>	IS-29
PRACTICAL SOA <i>Tony Shan</i>	IS-31
OPEN SOURCE SOFTWARE ADOPTION IN BEAUMONT HOSPITAL - Anatomy of Success and Failure <i>Brian Fitzgerald</i>	IS-33

SOFTWARE ENGINEERING

FULL PAPERS

ROLE-BASED CLUSTERING OF SOFTWARE MODULES - An Industrial Size Experiment <i>Philippe Dugerdil and Sebastien Jossi</i>	5
DETECTING PATTERNS IN OBJECT-ORIENTED SOURCE CODE – A CASE STUDY <i>Andreas Wierda, Eric Dortmans and Lon Somers</i>	13
SPECIFICATION AND PROOF OF LIVENESS PROPERTIES IN B EVENT SYSTEMS <i>Ofa Mosbahi and Jacques Jaray</i>	25
AUTO-COLLEAGUE - A Collaborative Learning Environment for UML <i>Maria Virvou and Kalliopi Tourtoglou</i>	35
USING MBIUI LIFE-CYCLE FRAMEWORK FOR AN AFFECTIVE BI-MODAL USER INTERFACE <i>Katerina Kabassi, Maria Virvou and Efthymios Alepis</i>	40
AN ONTOLOGICAL SW ARCHITECTURE FOR THE DEVELOPMENT OF COOPERATIVE WEB PORTALS <i>Giacomo Bucci, Valeriano Sandrucci, Enrico Vicario and Saverio Mecca</i>	48

HOW “DEVELOPER STORIES” IMPROVES ARCHITECTURE - Facilitating Knowledge Sharing and Embodiment, and Making Architectural Changes Visible <i>Rolf Njor Jensen, Niels Platz and Gitte Tjørneboj</i>	56
AN AGILE MODEL DRIVEN ARCHITECTURE-BASED CONTRIBUTION TO WEB ENGINEERING <i>Alejandro Gómez Cuesta, Juan Carlos Granja and Roy O'Connor</i>	65
AN INTEGRATED TOOL FOR SUPPORTING ONTOLOGY DRIVEN REQUIREMENTS ELICITATION <i>Motobiro Kitamura, Ryo Hasegawa, Haruhiko Kaiya and Motoshi Saeeki</i>	73
VCODEX: A DATA COMPRESSION PLATFORM <i>Kiem-Phong Vo</i>	81
DIFFERENCING AND MERGING OF SOFTWARE DIAGRAMS - State of the Art and Challenges <i>Sabrina Förtsch and Bernhard Westfechtel</i>	90
MODERN CONCEPTS FOR HIGH-PERFORMANCE SCIENTIFIC COMPUTING - Library Centric Application Design <i>René Heinzl, Philipp Schwaha and Siegfried Selberherr</i>	100
SHORT PAPERS	
REFORMULATING COMPONENT IDENTIFICATION AS DOCUMENT ANALYSIS PROBLEM - Towards Automated Component Procurement <i>Hans-Gerhard Gross, Marco Lormans and Jun Zhou</i>	111
LINKING SOFTWARE QUALITY TO SOFTWARE ENGINEERING ACTIVITIES, RESULTS FROM A CASE-STUDY <i>Jos J. M. Trienekens, Rob J. Kusters and Dennis C. Brussel</i>	117
ON GENERATING TILE SYSTEM FOR A SOFTWARE ARCHITECTURE CASE OF A COLLABORATIVE APPLICATION SESSION <i>C. Bouanaka, A. Choutri and F. Belala</i>	123
ADDRESSING SECURITY REQUIREMENTS THROUGH MULTI-FORMALISM MODELLING AND MODEL TRANSFORMATION <i>Miriam Zia, Ernesto Posse and Hans Vangheluwe</i>	129
EVOLUTION STYLES IN PRACTICE - Refactoring Revisited as Evolution Style <i>Olivier Le Goer, Mourad Oussalah, Dalila Tamzalit and Djamel Serai</i>	138
INTEGRATING SOFTWARE ARCHITECTURE CONCEPTS INTO THE MDA PLATFORM <i>Ali Adel, Khammaci Tabar, Smeda Adel and Bennonar Djamel</i>	144
AUTOMATIC TEST MANAGEMENT OF SAFETY-CRITICAL SYSTEMS: THE COMMON CORE - Behavioural Emulation of Hard-soft Components <i>Antonio Grillo, Giovanni Cantone, Christian Di Biagio and Guido Pennella</i>	150
INCLUDING IMPROVEMENT OF THE EXECUTION TIME IN A SOFTWARE ARCHITECTURE OF LIBRARIES WITH SELF-OPTIMISATION <i>Luis-Pedro Garcia, Javier Cuenca and Domingo Giménez</i>	156
A STABILITY AND EFFICIENCY ORIENTED RESCHEDULING APPROACH FOR SOFTWARE PROJECT MANAGEMENT <i>Yunjia Ge and Lijun Bai</i>	162

A STATISTICAL NEURAL NETWORK FRAMEWORK FOR RISK MANAGEMENT PROCESS - From the Proposal to its Preliminary Validation for Efficiency <i>Salvatore Alessandro Sarvià, Giovanni Cantone and Victor R. Basili</i>	168
A CASE STUDY ON THE APPLICABILITY OF SOFTWARE RELIABILITY MODELS TO A TELECOMMUNICATION SOFTWARE <i>Hassan Artail, Fuad Mrad and Mohamad Mortada</i>	178
INTEGRATING A DISTRIBUTED INSPECTION TOOL WITHIN AN ARTEFACT MANAGEMENT SYSTEM <i>Andrea De Lucia, Fausto Fasano, Genoveffa Tortora and Giuseppe Scanniello</i>	184
COMPONENT BASED METHODOLOGY FOR QOS-AWARE NETWORK DESIGN <i>Cédric Teysié, David Espès and Zoubir Mammeri</i>	190
ASSL SPECIFICATION OF RELIABILITY SELF-ASSESSMENT IN THE AS-TRM <i>Emil Vassev, Olga Ormandjieva and Joey Paquet</i>	198
A FORMAL APPROACH TO DEPLOY HETEROGENEOUS SOFTWARE COMPONENTS IN A PLC <i>Mohamed Khalgui and Emanuele Carpanzano</i>	207
A COMPARISON OF STRUCTURED ANALYSIS AND OBJECT ORIENTED ANALYSIS - An Experimental Study <i>Davide Falessi, Giovanni Cantone and Claudio Grande</i>	213
SECURE REFACTORING - Improving the Security Level of Existing Code <i>Katsuhisa Maruyama</i>	222
MACRO IMPACT ANALYSIS USING MACRO SLICING <i>László Vidács, Árpád Beszédes and Rudolf Ferenc</i>	230
A METHOD TO MODEL GUIDELINES FOR DEVELOPING RAILWAY SAFETY-CRITICAL SYSTEMS WITH UML <i>D. D. Okalas Ossami, J.-M. Mota, L. Thiry, J.-M. Perronne, J.-L. Boulanger and G. Mariano</i>	236
SOFTWARE DEFECT PREDICTION: HEURISTICS FOR WEIGHTED NAÏVE BAYES <i>Burak Turhan and Ayşe Bener</i>	244
TEST FRAMEWORKS FOR ELUSIVE BUG TESTING <i>W. E. Howden and Cliff Rhyne</i>	250
SOFTWARE PROCESS CONVERSION RULES IN IMPPROS - Quality Models Conversion for a Software Process Implementation Environment <i>Sandro Ronaldo Bezerra Oliveira, Alexandre Marcos Lins de Vasconcelos and Tiago Soares Gonçalves</i>	258
A PRODUCT LINE OF SOFTWARE REUSE COST MODELS <i>Mustafa Korkmaz and Ali Mili</i>	264
SIMULATION METHODOLOGIES FOR SCIENTIFIC COMPUTING - Modern Application Design <i>Philipp Schwaba, Markus Schwaba, René Heinzl, Enzo Ungersboeck and Siegfried Selberherr</i>	270
NEW DESIGN TECHNIQUES FOR ENHANCING FAULT TOLERANT COTS SOFTWARE WRAPPERS <i>Luping Chen and John May</i>	277
RESOURCE SUBSTITUTION FOR THE REALIZATION OF MOBILE INFORMATION SYSTEMS <i>Hagen Höpfner and Christian Bunse</i>	283

GOAL-ORIENTED AUTOMATIC TEST CASE GENERATORS FOR MC/DC COMPLIANCY <i>Emine G. Aydal, Jim Woodcock and Ana Cavalcanti</i>	290
A MODEL-DRIVEN ENGINEERING APPROACH TO REQUIREMENTS ENGINEERING - How These Disciplines May Benefit Each Other <i>Begoña Moros, Cristina Vicente-Chicote and Ambrosio Toval</i>	296
A FORMAL APPROACH FOR THE DEVELOPMENT OF AUTOMATED SYSTEMS <i>Ofa Mosbabi, Leila Jemni and Jacques Jaray</i>	304
SCMM-TOOL - Tool for Computer Automation of the Information Security Management Systems <i>Luis Enrique Sánchez, Daniel Villafranca, Eduardo Fernández-Medina and Mario Piattini</i>	311
A SOFTWARE TOOL FOR REQUIREMENTS SPECIFICATION - On using the STORM Environment to Create SRS Documents <i>Sergiu Dascalu, Eric Fritzinger, Kendra Cooper and Narayan Debnath</i>	319
 POSTERS	
IMPLEMENTING A VALUE-BASED APPROACH TO SOFTWARE PROCESS AND PRODUCT ASSESSMENT <i>Pasi Ojala</i>	329
CLOSING THE BUSINESS-APPLICATION GAP IN SOA - Challenges and Solution Directions <i>Boris Shishkov, Jan L. G. Dietz and Marten van Sinderen</i>	333
PRIORITIZATION OF PROCESSES FOR SOFTWARE PROCESS IMPROVEMENT IN SMALL SOFTWARE ENTERPRISES <i>Francisco J. Pino, Félix Garcia and Mario Piattini</i>	337
SCHEME FOR COMPARING RESULTS OF DIVERSE SOFTWARE VERSIONS <i>Viktor Mashkov and Jaroslav Pokorny</i>	341
TOWARDS A UNIFIED SECURITY/SAFETY FRAMEWORK - A Design Approach to Embedded System Applications <i>Miroslav Sveda and Radimir Vrba</i>	345
THE MISSING LAYER - Deficiencies in Current Rich Client Architectures, and their Remedies <i>Brendan Lawlor and Jeanne Stynes</i>	351
RE-USING EXPERIENCE IN INFORMATION SYSTEMS DEVELOPMENT <i>Paulo Tomé, Ernesto Costa and Luís Amaral</i>	357
TOWARDS A NEW CODE-BASED SOFTWARE DEVELOPMENT CONCEPT ENABLING CODE PATTERNS <i>Klaus Meffert and Ilka Philippow</i>	363
A COMPUTERIZED TUTOR FOR ARCHITECTING SOFTWARE - Supporting the Creative Aspects of Software Development <i>José L. Fernández-Sánchez and Javier Carracedo Pais</i>	367
REQUIREMENTS DEFINITIONS OF REAL-TIME SYSTEM USING THE BEHAVIORAL PATTERNS ANALYSIS (BPA) APPROACH - The Elevator Control System <i>Assem El-Ansary</i>	371
DETECTING ASPECTUAL BEHAVIOR IN UML INTERACTION DIAGRAMS <i>Amir Abdollahi Foumani and Constantinos Constantinides</i>	378

AN IMPROVEMENT TO THE MIXED MDA-SOFTWARE FACTORY APPROACH: A REAL CASE <i>Gustavo Muñoz Gómez and Juan Carlos Granja</i>	387
A CASE STUDY OF DISTRIBUTED AND EVOLVING APPLICATIONS USING SEPARATION OF CONCERNS <i>Hamid Mcheick, Hafedh Mili and Rakan Mcheick</i>	393
SOFTWARE ENGINEERING LESSONS LEARNED FROM DEVELOPING AND MAINTAINING WEBSITES <i>Tammy Kam Hung Chan and Zhen Hua Liu</i>	401
UNDERSTANDING PRODUCT LINES THROUGH DESIGN PATTERNS <i>Daniel Cabrero, Javier Garzás and Mario Piattini</i>	405
HARDWARE PROJECT MANAGEMENT - What we Can Learn from the Software Development Process for Hardware Design? <i>Rolf Drechsler and Andreas Breiter</i>	409
AN EXPERIMENTAL EVALUATION OF SOFTWARE PERFORMANCE MODELING AND ANALYSIS TECHNIQUES <i>Julie A. Street and Robert G. Pettit IV</i>	417
TOWARDS A KNOWLEDGE BASE TO IMPROVE REUSABILITY OF DESIGN PATTERN <i>Cédric Bonhours, Hervé Leblanc and Christian Percebois</i>	421
MODEL-DRIVEN DEVELOPMENT OF GRAPHICAL TOOLS - Fujaba Meets GMF <i>Thomas Buchmann, Alexander Dotor and Bernhard Westfechtel</i>	425
A STUDY ON SOFTWARE PROJECT COACHING MODEL USING TSP IN SAMSUNG <i>Taehee Gwak and Yoonjung Jang</i>	431
V3STUDIO: A COMPONENT-BASED ARCHITECTURE DESCRIPTION META-MODEL - Extensions to Model Component Behaviour Variability <i>Cristina Vicente-Chicote, Diego Alonso and Franck Chauvel</i>	437
E-LEARNING FOR HEALTH ISSUES BASED ON RULE-BASED REASONING AND MULTI-CRITERIA DECISION MAKING <i>Katerina Kabassi, Maria Virvon and George Tsibrintzis</i>	441
COSA: AN ARCHITECTURAL DESCRIPTION META-MODEL <i>Sylvain Maillard, Adel Smeda and Mourad Oussalah</i>	445
A METHODOLOGY TO FINALIZE THE REQUIREMENTS FOR A PROJECT WITH MULTIPLE STAKE- HOLDERS - Presenting Software Engineering Workshop as a Solution <i>Ashtosh Parashar and Selvakumaran Mannappan</i>	449
AUTHOR INDEX	453

POSTERS

PRIORITIZATION OF PROCESSES FOR SOFTWARE PROCESS IMPROVEMENT IN SMALL SOFTWARE ENTERPRISES

Francisco J. Pino

*IDIS Research Group, Electronic and Telecommunications Engineering Faculty
University of Cauca, Street 5 # 4 – 70 Popayán, Colombia
fjpino@unicauca.edu.co*

Félix Garcia, Mario Piattini

*ALARCOS Research Group
Information Systems and Technologies Department, UCLM–Soluziona Research and Development Institute
University of Castilla–La Mancha, Paseo de la Universidad, 4 – 13071 Ciudad Real, Spain
Felix.Garcia, Mario.Piattini@uclm.es*

Keywords: Prioritization of processes, Software process improvement, SPI, Software process management, Small software enterprises, VSEs, SMEs, Reference process model.

Abstract: In this article a set of processes which are considered to be of high-priority when initiating the implementation of a Software Process Improvement –SPI– project in Very Small Software Enterprises –VSEs–, is presented. The objective is to present the VSEs with a strategy to deal with the first processes that must be considered when they undertake an SPI project. The processes proposed in this article are fundamentally based on the analysis and contrast of several pieces of research carried out by the COMPETISOFT project. The fundamental principle of the proposal is that process improvement must be connected with the other software process management responsibilities.

1 INTRODUCTION

From the beginning of the 21st century onwards, the Software Engineering community (industry and researchers) has expressed a special interest in Software Process Improvement –SPI– for Small Software Enterprises –VSEs–. Interest in SPI in VSEs is growing due to the fact that these companies are an extremely important cog in the gears of the economy of many nations in the world. The software industry in most countries has an industrial backcloth, made up mainly of small software organizations which favour the growth of national economies. In order to fortify this kind of organizations, efficient strategies, practices and/or guides to tailor software process improvement to their size and type of business are needed.

Currently, the COMPETISOFT project is being developed. This project deals with the creation of the software reference process, assessment and improvement models adapted to the characteristics of the software industry in Latin America. One of the strategies of the COMPETISOFT Project is to

carry out theoretical and/or practical studies in the area of SPI for VSEs, which provide information in order to attain more elements of judgement and to thus facilitate the adoption and implantation of international or regional standards related to SPI in VSEs. In this article a set of processes which are considered to be of high-priority when initiating the implementation of a project SPI in VSEs, is presented. The objective is to present the VSEs with a strategy to deal with the first processes that must be considered when they undertake an SPI project.

The paper proceeds as follows. In Section 2 related works are presented. The high-priority processes are shown in Section 3 and 4, and finally, our conclusions and future work are outlined.

2 RELATED WORKS

There are various related works that present a set of processes which VSEs could use to derive significant benefit from process improvement. These include:

- MoProSoft (Oktaba, 2005) proposes 6 processes (based on ISO 12207, CMM).
- MPS.BR (Weber et al., 2005) proposes 23 processes (based on ISO 12207 and CMMI).
- RAPID (Cater-Steel et al., 2005) proposes 8 processes (based on ISO 15504:1998).
- PROCESSUS (Horvat et al., 2000) proposes 6 processes (based on CMM and ISO 9001).
- ADEPT (McCaffery et al., 2006) proposes 12 processes (based on CMMI).

The main contribution that this work pretends to make in the area of SPI in VSEs is to propose and prioritize several reference processes based both on the VSEs' special characteristics and on the existing literature dealing with SPI. Prioritization of processes allows VSEs to be guided in the question of which practices should be carried out first at the beginning of an SPI project, regardless of the process reference model used. It is important to emphasize that this work wishes to explain to VSEs which processes to tackle at the beginning of an SPI project. The description of the processes as well as their results, conclusions, practices, inputs, etc., are available in process reference model material such as MoProSoft, MR-MPD de MPS.BR, RAPID, PROCESSUS, ADEPT, ISO/IEC 12207, CMMI.

3 SELECTION OF PROCESSES

The processes proposed in this article are fundamentally based on the analysis and contrast of three research works carried out by the COMPETISOFT project:

- **An exploration of the background of software process practices in the south-western Colombian software industry** (Hurtado et al., 2006). From this research work we can see that companies are more interested in the implementation of disciplines related to the Engineering Process Group (requirement elicitation, analysis and design, software construction, testing and software installation). The companies are less interested in disciplines related to the Management Process Group (planning, tracking and control) and to the Support Process Group (quality assurance, configuration management and requirement management).
- **A systematic review of software process improvement in small software enterprises** (Pino et al., 2006). From this research work we can see that companies are more interested

in improving: (i) the processes of project management related to the management process group; and (ii) the documentation processes, change request management and configuration management related to the support process group. Companies do not appear to show much interest in carrying out improvements to the engineering process group, with the exception of the requirement elicitation process.

- **An analysis of the contribution of international standards to the management and improvement of software process** (Pino et al., 2007). As this work is related to the area of software process improvement, it is important to express a special interest in the processes which are strongly connected to the responsibility of improving processes: (i) organizational alignment and measurement related to the management process group, and (ii) process establishment, process assessment and process improvement related to the Process improvement process group. It is essential to bear in mind that process improvement is immersed in process management.

The processes that are proposed as high-priority in the implementation of a software process improvement programme in small software enterprises are described in Table 1. With the aim of expressing these processes in terms of an internationally recognized reference model, the nomenclature of processes and groups of process defined in the ISO/IEC 15504-5:2006 standard, is followed. This standard has been chosen because its process group has a greater degree of detail.

Table 1: Processes proposed to begin SPI in VSEs.

ENG — Engineering Process Group	ENG 1. Requirements elicitation	
	ENG 2. System requirements analysis	
	ENG 3. System architectural design	
	ENG 4. Software requirements analysis	
	ENG 5. Software design	
	ENG 6. Software construction	
	ENG 7. Software integration	
	ENG 8. Software testing	
	ENG 11. Software installation	
	ENG 12. Software maintenance	
	SUP — Support Process Group	SUP 1. Quality assurance
		SUP 7. Documentation
SUP 8. Configuration management		
SUP 10. Change request management		
MAN — Management Process Group	MAN 1. Organizational alignment	
	MAN 3. Project management	
	MAN 6. Measurement	
PIM — Process Improvement Process Group	PIM 1. Process establishment	
	PIM 2. Process assessment	
	PIM 3. Process improvement	

The processes displayed in the previous table are organized into process groups, which have been selected according to the results of the research shown previously. For the selection of these processes the following issues have been considered:

- The engineering process group with the aim of improving and complementing the technical disciplines (analysis and design, software construction, etc) which are those most frequently carried out by VSEs. The intention is to consolidate this area in order to guarantee the responsibilities to be carried out by following the best practices proposed by a reference model. It is necessary to place great emphasis on requirement elicitation because it is a discipline that tends to be implemented and improved.
- The processes of project management, documentation, change request management, process establishment, configuration management and quality assurance. These processes have been the subject of many improvement attempts by SPI efforts carried out in VSEs. These processes also contribute to the support of control process responsibility within software process management.
- The processes of organizational alignment, measurement, process establishment, process assessment and process improvement, because these practices are closely related to the responsibilities of defining, measuring and improving processes within software process management.

4 PRIORITIZATION OF PROCESSES

According to (Derniame et al., 1999) the emphasis on processes and on process management provides the main justification for many standardization initiatives, such as CMMI, SCAMPI, ISO/IEC 15504, ISO/IEC 12207 (in addition to the efforts of measuring process capability) and therefore for other proposals based on the philosophy of these standards. Process improvement, following the conception of measuring its capability, is based on statistical processes control. Statistical processes control is based on the management process and its four key responsibilities: improve the process, define the process, measure the process and control the process. It is also important to emphasize that process improvement is immersed as a responsibility

within software process management (Florac et al., 1997).

On the other hand, VSEs are generally created as the result of having carried out a successful project. In fact, in these organizations the process is carried out in an innate way. The process is born with the organization although it is neither defined nor visible. These organizations start their operation by carrying out technical processes, which is an inherent responsibility of the project management. According to the information presented in (Hurtado et al., 2006) and (Pino et al., 2007) there is a high risk that VSEs will never cease to carry out technical processes, and evidence of this is: (i) their interest in implementing these processes and (ii) the improvements introduced into these kind of companies are concentrated on project management. Project management is responsible for ensuring that a software product is developed according to a plan and that that plan is feasible.

Therefore it is fundamental that, through software process improvement, the enterprises can carry their processes from process execution and project management up to the establishment of the four software process management responsibilities. We propose that process groups should be prioritized by setting up the process groups in the following order:

- The process improvement process group.
- The management process group.
- The support process group.
- The process engineering group.

Once the SPI programme has been established in the VSE, the first step is to follow an iterative and incremental improvement process (for instance, PmCOMPETISOFT (Vidal et al., 2006)). The improvement process guides the creation (or improvement) of processes within the VSE, with the objective of creating a basic infrastructure for software process management at the first iteration. This infrastructure is based on the following processes: process improvement, process establishment, process assessment, organizational alignment, project management, and measurement. With the improvement or creation of these processes and their later execution within the VSE, responsibilities such as defining, measuring, and improving the process are supported.

The following step is to use a second improvement project iteration to set up the processes related to the support process group. Besides being those that the majority of VSEs look to improve, these processes also help to support and deal with

the responsibility of controlling the process. Process control tries to make results predictable, which means keeping the process within its normal inherent limits of operation.

Finally, practices relating to the engineering process group must be established through more improvement project iterations. It is also possible to include other processes determined by the organization's business objectives.

5 CONCLUSIONS AND FUTURE WORKS

This article has proposed and prioritized a group of processes with which to guide VSEs as they begin an SPI project. The process selection and prioritization which has been carried out was based on the fact that process improvement is not an isolated activity, but is closely related to process management.

The fundamental principle of our proposal is that process improvement must be connected to the other process management responsibilities. Having taken this into consideration, an SPI in VSEs project must first establish a basic infrastructure related to the responsibilities of the process management. This is the reason why the first processes to be established must be those in the improvement and management group, with the objective of creating the ring of Improve-Define-Execute-Measure necessary for process management. The second step is to include the control process through the support process group. Finally, engineering process improvement must be carried out. It is important to emphasise that the establishment of this infrastructure in itself implies process improvement within the VSE.

Our future work is to apply this proposal in order to refine and validate it. This application will be made to different process improvement projects that will be carried out in the Latin American companies involved in the COMPETISOFT project.

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AUTHOR INDEX

Adel, A.	144	Fasano, F.	184
Adel, S.	144	Ferenc, R.	230
Alepis, E.	40	Fernández-Medina, E.	311
Alonso, D.	437	Fernández-Sánchez, J.	367
Amaral, L.	357	Förtsch, S.	90
Artail, H.	178	Foumani, A.	378
Aydal, E.	290	Fritzinger, E.	319
Bai, L.	162	García, F.	337
Basili, V.	168	García, L.	156
Belala, F.	123	Garzás, J.	405
Bener, A.	244	Ge, Y.	162
Beszédes, Á.	230	Giménez, D.	156
Biagio, C.	150	Goaer, O.	138
Bouanaka, C.	123	Gómez, G.	387
Bouhours, C.	421	Gonçalves, T.	258
Boulanger, J.	236	Grande, C.	213
Breiter, A.	409	Granja, J.	65, 387
Brussel, D.	117	Grillo, A.	150
Bucci, G.	48	Gross, H.	111
Buchmann, T.	425	Gwak, T.	431
Bunse, C.	283	Hasegawa, R.	73
Cabrero, D.	405	Heinzl, R.	100, 270
Cantone, G.	150, 168, 213	Höpfner, H.	283
Carpanzano, E.	207	Howden, W.	250
Cavalcanti, A.	290	Jang, Y.	431
Chan, T.	401	Jaray, J.	25, 304
Chauvel, F.	437	Jemni, L.	304
Chen, L.	277	Jensen, R.	56
Choutri, A.	123	Jossi, S.	5
Constantinides, C.	378	Kabassi, K.	40, 441
Cooper, K.	319	Kaiya, H.	73
Costa, E.	357	Khalgui, M.	207
Cuenca, J.	156	Kitamura, M.	73
Cuesta, A.	65	Korkmaz, M.	264
Dascalu, S.	319	Kusters, R.	117
Debnath, N.	319	Lawlor, B.	351
Dietz, J.	333	Leblanc, H.	421
Djamal, B.	144	Liu, Z.	401
Dortmans, E.	13	Lormans, M.	111
Dotor, A.	425	Lucia, A.	184
Drechsler, R.	409	Maillard, S.	445
Dugerdil, P.	5	Mammeri, Z.	190
El-Ansary, A.	371	Mannappan, S.	449
Espès, D.	190	Mariano, G.	236
Falessi, D.	213	Maruyama, K.	222

AUTHOR INDEX (CONT.)

Mashkov, V.	341	Smeda, A.	445
May, J.	277	Somers, L.	13
Mcheick, H.	393	Street, J.	417
Mcheik, R.	393	Stynes, J.	351
Mecca, S.	48	Sveda, M.	345
Meffert, K.	363	Tahar, K.	144
Mili, A.	264	Tamzalit, D.	138
Mili, H.	393	Teyszié, C.	190
Moros, B.	296	Thiry, L.	236
Mortada, M.	178	Tjørnehøj, G.	56
Mosbahi, O.	25, 304	Tomé, P.	357
Mota, J.	236	Tortora, G.	184
Mrad, F.	178	Tourtoglou, K.	35
O'Connor, R.	65	Toval, A.	296
Ojala, P.	329	Trienekens, J.	117
Oliveira, S.	258	Tsihrintzis, G.	441
Ormandjieva, O.	198	Turhan, B.	244
Ossami, D.	236	Ungersboeck, E.	270
Oussalah, M.	138, 445	Vangheluwe, H.	129
Pais, J.	367	Vasconcelos, A.	258
Paquet, J.	198	Vassev, E.	198
Parashar, A.	449	Vicario, E.	48
Pennella, G.	150	Vicente-Chicote, C.	296, 437
Percebois, C.	421	Vidács, L.	230
Perronne, J.	236	Villafranca, D.	311
Pettit IV, R.	417	Virvou, M.	35, 35, 441
Philippow, I.	363	Vo, K.	81
Piattini, M.	311, 337, 405	Vrba, R.	345
Pino, F.	337	Westfechtel, B.	90, 425
Platz, N.	56	Wierda, A.	13
Pokorny, J.	341	Woodcock, J.	290
Posse, E.	129	Zhou, J.	111
Rhyne, C.	250	Zia, M.	129
Saeki, M.	73		
Sánchez, L.	311		
Sandrucci, V.	48		
Sarcià, S.	168		
Scanniello, G.	184		
Schwaha, M.	270		
Schwaha, P.	100, 270		
Selberherr, S.	100, 270		
Serai, D.	138		
Shishkov, B.	333		
Sinderen, M.	333		

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