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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.

CO-SPONSOR

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)

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SHORT PAPERS

POSTERS

POSTERS

PRIORITIZATION OF PROCESSES FOR SOFTWARE PROCESS IMPROVEMENT IN SMALL SOFTWARE ENTERPRISES

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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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