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Richard Messnarz
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Proceedings

The papers in this book comprise the industrial proceedings of the EuroSPI 2006 conference. They reflect the authors' opinions and, in the interests of timely dissemination, are published as presented and without change.

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EuroSPI

EuroSPI is a partnership of large Scandinavian research companies and experience networks (SINTEF, DELTA,STTF), the ASQF as a large German quality association, the American Society for Quality, and ISCN as the co-ordinating partner.

EuroSPI conferences present and discuss practical results from improvement projects in industry, focussing on the benefits gained and the criteria for success. Leading European industry are contributing to and participating in this event. This year's event is the 13th of a series of conferences to which countries across Europe and from the rest of the world contributed their lessons learned and shared their knowledge to reach the next higher level of software management professionalism.

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Welcome Address by the EuroSPI General Chair

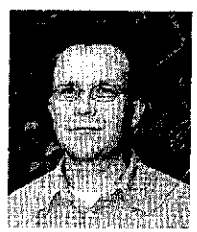
Dr Richard Messnarz

EuroSPI is an initiative with 3 major goals (www.eurospi.net):

1. An annual EuroSPI conference supported by Software Process Improvement Networks from different EU countries.
2. Establishing an Internet based knowledge library, newsletters, and a set of proceedings and recommended books.
3. Establishing an effective team of national representatives (in future from each EU country) growing step by step into more countries of Europe.

EuroSPI established an experience library (library.eurospi.net) which will be continuously extended over the next years and will be made available to all attendees. EuroSPI also established an umbrella initiative EQN (European Quality Network) which is funded by the EU Leonardo da Vinci Programme and establishes an European certification unit for T & Services professions. I therefore expect that EuroSPI partners will closely collaborate to form a group of national institutions in Europe representing a set of certified professions related with innovation and management.
Finally, keep in mind what companies stated about EuroSPI :" ... the biggest value of EuroSPI lies in its function as a European knowledge and experience exchange mechanism for SPI and innovation".

Welcome to Joensuu by Prof. Markku Tukiainen



Markku Tukiainen

Local Chair

As the Local Chair of EuroSPI'2006, it is a great pleasure to welcome you to Joensuu and to the University of Joensuu. Joensuu is the lively capital of the North Karelia Region in Finland. The city was established in 1848 by the Czar Nikolai I of Russia and it has flourished in the estuary of a notable waterway. It is a vital city with a growing and relatively young population. Of the total population of 58,000 almost 20,000 are pupils and students. The University of Joensuu was established in 1969. It includes eight faculties and nine non-faculty institutes. The University offers undergraduate and graduate degree in eight different fields: education, humanities, natural sciences, social sciences, economics, forestry, theology and psychology. The University has over 8200 students. Every year approximately 1500 new students are admitted. The staff comprises about 1200 people, of whom 160 work on the Savonlinna campus. Almost 600 international students annually study at the University of Joensuu. Computer Science belongs to the Faculty of Sciences and this year, with reorganization of university's structure, Statics joined to the Department of Computer Science. Computer science is one of the university's largest disciplines. Our top fields in research and education are software engineering, media computing, educational technology and cognition of computing. The Department of Computer Science and Statistics operates in the modern facilities of Joensuu Science Park and works in co-operation with local educational institutions, international universities and corporations.

Contents

Qualification of safety-critical systems in TVO nuclear power plants

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Abstract

Teollisuuden Voima Oy (TVO) operates two nuclear power plant units in Finland and has started to build a third one. The current nuclear power units have continuous need to maintain and update existing instrumentation and control systems (I&C).

Each new device shall be classified and qualified according to its safety requirements. Using modern technology means in practice that more and more components have programmable features. The reliability of such components has proven to be difficult to demonstrate due to the nature of flaws in software. Standards and rules given by authorities set the acceptance criteria for the components used in the safety systems of nuclear power plants.

As a result of this trend, there is a clear need for an integrated and effective method to qualify software intensive I&C systems in nuclear power plant units. Integration has three major areas: 1) definition and harmonization of requirements for software intensive systems at different safety classes, 2) integration of several approaches like SPICE (Software Process Improvement and Capability dEtermination) and FMECA (Failure Mode, Effects and Criticality Analysis method) to improve confidence in qualification and 3) integration of the system acquisition and qualification processes to improve total effectiveness of the acquisition, delivery and deployment processes.

The integrated qualification method is called TVO SWEP (SoftWare Evaluation Procedure). It consists of detailed qualification process and related methods for safety category B and C (IEC 61226) and Finnish safety class 3 qualifications. TVO will use the TVO SWEP method to evaluate suppliers and the conformance of their products/systems against requirements. It has been used in several cases, and it seems to save a lot of qualification resources compared to traditional methods.

Keywords

Safety-Critical systems, Instrumentation and Control, qualification, SPICE, FMECA

A Lightweight Model for the Assessment of Software Processes

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Abstract

Improvement in software development processes gives companies guaranteed high levels of maturity in their processes and increases their competitiveness in international terms. There are improvement, assessment and capability models which enjoy world-wide recognition but which must be adapted to the particular characteristics of the specific countries where those models are applied. These models can not easily be applied in the majority of organizations in many Latin American countries due to the large investment in money, time and resources that the models require. There is also the factor of the complexity of the recommendations they give, and the fact that the return on the investment is a long term prospect. This paper's main goal is to present MECPDS, a lightweight model for the assessment of the capability of software development processes and maturity of the organization. This model is based on the ISO/IEC 12207 e ISO/IEC 15504 standards and it is applicable to very small software enterprises. The model fulfils its function in a simple, economical way, using only a small amount of resources and in a short period of time.

Keywords

Software process improvement, Software process assessment, Measurement Framework, Process capability, Process fulfillment, ISO/IEC15504:2004, Small and medium enterprises, SMEs.

1 Introduction

The software industry is a highly important economic activity in every country in the world. It provides a significant window of opportunity for developing countries, as is the case of the majority of Latin American nations. It must be said, however, that the software industry in the above mentioned countries is in its infancy and as such still immature [3]. This of course leads to an inability to compete, which in turn hinders growth.

So in Colombia, for example, the software development companies are not yet ready to compete in the international market. The computer sector faces a number of problems, such as the country's technological dependence. Alongside this, we can observe a lack of awareness of the importance that the development process has on the overall quality of the product. This is related to the fact that the software is manufactured like a craft and what is produced by the majority of companies is therefore of low quality. In addition, the time taken in development is not acceptable, costs are uncompetitive and activities in the operation and maintenance of the software are complicated. Final customers and users are therefore manifestly dissatisfied.

It is our conviction, therefore, that some strategies must be worked out to deal with all these problems. Such strategies will aim to set these countries on the same path as those nations which are already highly developed in terms of their IT industry. This will be done by setting up programmes for software process improvement. In every improvement process it is particularly important to be able to dispose of a suitable process assessment model. Such a model should identify the aspects which the organization really needs to improve. For that reason an improvement program depends in vast part on the acceptance of those aspects that the company must improve.

Increasing the quality of software products by improving processes is a measure which organizations should take when responding to two areas of special concern. The first of these has to do with their image, if they are going to be able to export software, and hence enter the global marketplace and maintain their position in it. These companies have could potentially be very competitive in trade of this kind, taking into account their low labour costs. The other area meriting special consideration is a patent need that these companies have, which is to be able to make their administrative project units efficient and affective.

One of the main characteristics of the Latin American software industry is that it is made up of very small software enterprises (VSEs). The term "VSEs" refers to small software enterprises having between 1 and 9 employees. As we all know, this type of company shows serious problems in the maturity of its development processes. In many cases there is no software development process known to the company. This leads to chaotic models of operation and these in turn affect the whole organization [5] and also, naturally, the software product. Although many of these organizations do set an organizational goal of ensuring the quality of products by taking on board the models of quality established in the SEI or ISO [3], it has to be said that these processes are really structured in such a way as to be applied in large companies, preferably. They cannot easily be applied in small organizations given the fact that an improvement project involves a large investment in terms of money, time and resources. There is also the great complexity of the recommendations, as well as the fact that the return on the investment undertaken has to be seen from a long-term perspective [7, 9, 13].

A project has been set up in Colombia with the aim to lessen the negative effects of the aspects we have just outlined. Its name is "Sistema Integral para el Mejoramiento de los Procesos de Desarrollo de Software SIMEP_SW" (An Integrated System for the Improvement of Software Development Processes). This project seeks to provide organizations in the IT sector with the tools needed to help them to improve their software development processes. The goal is to increase the quality of the products developed, at the same time making it easier for the organizations to take up a competitive position in national and international markets.

As a result of this project an improvement system which integrates elements from improvement, capability, process and assessment models has been developed. These models are internationally recognized but they are tailored in such a way as to fit in with the specific characteristics of Colombia. Another feature is that this system can be copied by industries of a similar type at a national or international level. What is sought is for improvement projects to follow a national model that is consistent with the country's particular idiosyncrasies and which is therefore adapted to the specific socio-economic context. [8].

The main result of the SIMEP_SW Project is Agile SPI (Software Process Agile Improvement) [8], whose basic premise is that the models used should be lightweight and based on international standards. The architecture for Agile SPI is displayed in Figure 1

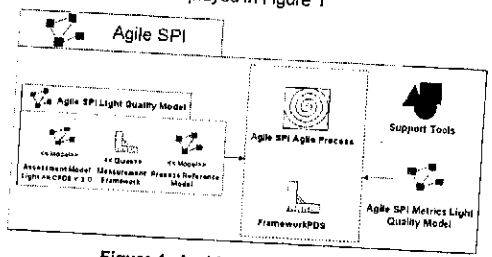

Figure 1: Architecture of Agile SPI.

The components of the system's architecture are as follows: (i) Agile SPI Agile Process: An agile process which guides the process improvement programme; (ii) Agile SPI Light Quality Model: A lightweight capability and assessment model of productive process; (iii) Framework PDS: conceptual and technical, to support processes and (iv) Agile SPI Metrics Light Quality Model: A lightweight model of measurements for the productive process.

In this article we introduce the definition of a lightweight model for the assessment of software development processes known as MECPDS, which is based on the ISO/IEC 15504:2004 [2] and ISO/IEC 12207:2004 [1] standards. This model provides a lightweight framework for the assessment of capability and the fulfilling of the process, along with a process reference model.

The paper proceeds as follows. In section 2 we give an overview of related work. Section 3 presents the model itself. In section 4 presents the utilization of MECPDS in an improvement programme. Finally, the conclusions and future work are outlined.

2 Related Work

Some Latin American countries have become concerned in recent years about quality of software development processes in their own industry, seeing it as a fundamental element in increasing product quality. Proof of this is seen in the "MoProSoft" model from Mexico and the "MR mps" from Brazil, amongst others that could be mentioned.

In the case of Mexico, the MoProSoft model has been developed - "Modelo de Procesos para la Industria de Software" [10] (Model of Processes for the Software Industry). This model is based on ISO 9001:2000, ISO/IEC 15504-2:1998 y CMM. MoProSoft aims to provide the software industry in Mexico with a model based on the best international practices. This model is at the same time easy to understand, simple to apply and economical to adopt. It seeks to assist organizations in standardizing their practices, in the assessment of their effectiveness and in the integration of ongoing improvement.

MoProSoft defines three process categories: High direction, Management and Operation. For each one of the processes it specifies three parts: a general definition of the system, practices and a guide for adjustments.

The basis tenet of its improvement strategy is that the organization should establish its own strategy for the setting up of the processes defined by the model. The processes should evolve in line with the suggestions for improvement. The objectives of the organization's strategic plan will be reached with increasingly ambitious goals being set all the time. In this way the company can reach maturity progressively, by this ongoing and continual improvement in its processes.

In Brazil, the mps Br project [14] has been developed. Its basis lie in ISO/IEC 12207:2002, CMMI e ISO/IEC 15504:2003. The mps Br project came up with two models: a Reference Model for the software improvement process– MR mps along with a Business Model for the software improvement process– MN mps. MN mps defines the elements and interactions involved in the certification of the organization by implementing MR mps in two ways: a personalized one for an organization or a group of organizations together (thus managing to make it more affordable for small and medium-sized enterprises). MR mps is made up of maturity levels, along with an assessment model. The maturity level is organized in two dimensions: capability and process. The process maturity is classified into seven levels: Optimized, Managed Quantitatively, Defined, Almost Completely Defined, Partially Defined, Managed and Partially Managed. Process areas are attributed to each maturity level based on the levels of CMMI. This is so as to ensure a gradual and fully appropriate implementation in Brazilian SMEs (Small and Medium Enterprises). The level of implementation of the practices associated with a process area is evaluated by means of indicators.

Other works related to the tailoring of the assessment process are RAPID (Rapid Assessment for Process Improvement for Software Developed) [12] based on ISO/IEC 15504:1998 and MARES (Método de Avaliaçao de Processo de Software) [4] based on ISO/IEC 15504:2003.

In previous models no improvement strategy guided by an improvement process has ever been set out explicitly. SIMEP_SW bases its improvement strategy on providing the organization with an agile process which will set the basis for a programme addressed at the improvement of the processes. Thus it is absolutely vital to have a lightweight assessment available, since if we are to be able to promote improvement in software processes, there is something important for us to do beforehand. This is to establish an assessment framework which will let us know the strong and weak points of the assessed processes.

MECPDS is based on ISO/IEC 15504:2004. It defines the measurement framework for assessment in the capability dimension of the process as well as in the fulfilling dimension of the process. In the capability dimension, there are only three levels of maturity, making the model lighter, so that it can be applied to VSEs. With the fulfillment dimension the VSEs can have a better knowledge of the carrying out of its processes, which is the first step towards software process improvement.

3 The MECPDS Lightweight Assessment Model

MECPDS is made up of a measurement framework, together with a process reference model, both of which should be applied during the assessment of an organization's software processes (see figure 2).

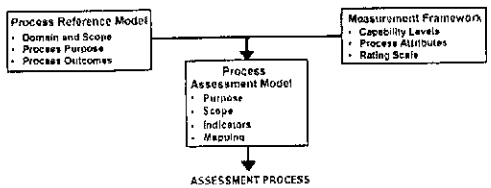

Figure 2: Structure of MECPDS

The purposes of MECPDS are:

- To set out the elements needed to evaluate the maturity and the fulfillment of an organization's processes in relation to a process reference model.
- To contribute a lightweight assessment model, this can be easily and economically applied to VSEs (with a small investment in money and time).
- To foster assessment on the part of the software VSEs in Colombia, so that they might find out their strong and weak points. That would be their basic guide when seeking to improve software process development in the organization.

- To form part of the Agile SPI Light Quality Model component in Agile SPI.

The scope MECPDS is made up of software life-cycle processes defined in the international standard ISO/IEC 12207:2004. However, MECPDS can use any reference process model, where each of its processes is described in terms of its purposes and its results. An element which also allows us to make the assessment more lightweight is the possibility of choosing the relevant applicable processes that are to be assessed in the organization.

To make the assessment model lighter, and bearing in mind the type of organizations in which it is to be applied, the assessment model is based on the international ISO/IEC 15504:2004 standard but only considering up to the level three of the capability model. Furthermore in section 3.2 a set of processes which are typically used by the Colombian VSEs is proposed.

The first step towards the improvement in VSEs is to define, manage and implement the processes, and these aspects are assessed by means of process attributes of the first and second capability levels (performed and managed) of the 15504 standard.

In addition, to make the assessment model lighter, three levels have been set out with three process attributes (from the nine attributes given by the standard). This means that a company which wants to assess the state of its processes is able to make the assessment significantly more lightweight in form.

MECPDS should form part of a software improvement programme set up by the organization, which takes their business and improvement goals as the starting point. From the set of processes described in the process reference model selected, the processes that are relevant and appropriate for assessment should be chosen. First of all, an assessment of the fulfillment process dimension has to be carried out in order to determine the degree of compliance with which a process is performed in relation to the selected process reference model. Then, once the process is explicitly defined to facilitate its carrying out, the capability process dimension is assessed.

MECPDS is based on a set of indicators which direct the purposes and results of all the processes within the process assessment model. These demonstrate what the attributes of the process have achieved in the realm of the capability level of the assessment model. These indicators are as follows:

- For the process capability dimension: the management practices that are associated with obtaining the results of the attributes of the process.
- For the process fulfillment dimension: the base practices associated with obtaining the results of the processes defined in the process reference model.

The degree of implementation of the practices is also evaluated by means of the indicators. These should be recognized by the organization for each practice involved, and may be of any of the following three sorts:

- Direct: these are the products which are the result of an activity.
- Indirect: in general, these are documents which indicate that an activity has been carried out.
- Comments: these are opinions given by those people who are involved in the process that is being evaluated.

3.1 Measurement Framework

The MECPDS measurement framework is based ISO/IEC 15504:2004 and embraces both the process capability dimension and the process fulfillment dimension.

The process capability dimension is defined by a hierarchical scale of three levels, which represent an increase in the capabilities of the software development processes: (i) Level 0: Incomplete Process, (ii) Level 1: Performed process, (iii) Level 2: Managed process. Reaching a level is shown on this dimension by the fulfilling of the process attributes. The process attributes are those elements which allow us to find out the capacities and abilities of a process. The process attributes are made up of

management practices.

A management practice is a process management activity which shows the capacity to carry out a process. A management practice supports the implementation or management of a process and can be applied to whatever process. Management practices allow individualized measurement. Thus we can determine the scope reached by the attribute to which it pertains, along with the specification of the particular level that the process under study is in. Each one of these attributes on its own allows us to measure a specific aspect of the capabilities and abilities in a process.

Both of the components described above (the management practices and process attributes), should have a specific scale of measurement. Thus for management practices and process attributes values are seen on a discrete scale made up of the following elements: (i) F: Fully achieved, (ii) L: Largely achieved, (iii) P: Partially achieved, (iv) N: Not achieved.

Each level demands a degree of fulfillment and/or a greater number of process attributes to reach it. In tables 1, 2 and 3 process attributes are specified, along with the management practices associated with it.

Id. Attribute	Description attribute: Process performance		Scale
PA 1.1	The process performance attribute is a measure of the extent to which the process purpose is achieved.		N, P, L, F
Level	Id. Practice	Description of the management practice	N, P, L, F
1. Performed	MP 1.1.1	The process achieves its defined outcomes	

Table 1: Process performance attribute

Id. Attribute	Description attribute: Performance management		Scale
PA 2.1	The performance management attribute is a measure of the extent to which the performance of the process is managed.		N, P, L, F
Level	Id. Practice	Description of the management practice	N, P, L, F
2. Managed	MP 2.1.1	Objectives for the performance of the process are identified.	
	MP 2.1.2	Performance of the process is planned and monitored.	
	MP 2.1.3	Performance of the process is adjusted to meet plans.	
	MP 2.1.4	Responsibilities and authorities for performing the process are defined, assigned and communicated.	
	MP 2.1.5	Resources and information necessary for performing the process are identified, made available, allocated and used;	
	MP 2.1.6	Interfaces between the involved parties are managed to ensure both effective communication and also clear assignment of responsibility.	

Table 2: Performance management attribute

Id. Attribute	Description attribute: Work product management		Scale
			N, P, L, F
Level	Id. Practice	Description of the management practice	N, P, L, F
2. Managed	MP 2.2.1	Requirements for the work products of the process are defined.	
	MP 2.2.2	Requirements for documentation and control of the work products are defined.	
	MP 2.2.3	Work products are appropriately identified, documented, and controlled.	
	MP 2.2.4	Work products are reviewed in accordance with planned arrangements and adjusted as necessary to meet requirements.	

Table 3: Work product management attribute

The value of a process attribute is obtained by finding the average of the percentage values of the management practices. It should be noted that each management practice has the same weight in a process attribute.

Table 4 defines the level of capability associated with a process, which allows the measuring of the degree of quality in a software product it has created. There is a relationship between the levels of capability and the degree to which the attributes of the process being evaluated have been fulfilled.

Capability Level	Attributes of the process	Rating
Level 1. Performed	Process performance	L or F
Level 2. Managed	Process performance	F
	Performance management	L or F
	Work product management	L or F

Table 4: Fulfillment of Capability Levels

A capability level is defined for each one of the processes evaluated and defined by the process reference model. It is important, however, to give an overview of the state of the maturity of the organization. To evaluate the "overall level of maturity" of the organization, the assessment results of the processes associated and defined by the process reference model of MECPDS (see Table 5) are taken into account.

Level of General Maturity of the Organization	Criterion to reach the level
Level 1. Performed	If all the processes applicable to the organization in the attribute of process PA 1.1, have a degree fulfillment L or F then the level is reached about the organization, else the level is not reached about the organization.
Level 2. Managed	If all the processes applicable to the organization in the attribute of process PA 1.1, PA 2.1 and PA 2.2, have a degree fulfillment L or F then the level is reached about the organization, else the level is not reached about the organization.

Table 5: Determination of the maturity level of the organization

The process fulfillment dimension is characterized by its focus on the characteristics and purposes of a specific process that has been established and defined by a process reference model. The processes are made up of base practices, which are software engineering activities which directly guide the purpose of a particular, contributing to the generation of its outputs.

The goal of this dimension is that VSEs can assess their processes in order to identify their strong and weak points. This dimension, therefore, provides the basis for the improvement of the VSEs processes, since it requires the definition and determination about how their processes are carried out. At least, these small organizations must achieve the fulfillment level L in their processes in order to guarantee a minimum knowledge of the processes to assess.

On this dimension, reaching a process is demonstrated by the fulfilling of the base practices associated with the process which is being assessed. The base practices can be individually measured and it allows VSEs to find out the value of fulfillment to which the process under study has been achieved.

In order to assign an implementation value to the base practices and to the processes, a specific scale is needed for that measurement. These values are on a discrete scale made up of the following elements F, L, P or N. The process fulfillment value is obtained by finding the average of the percentage values of the base practices, expressed in the values defined beforehand. It should be noted that each base practice has the same weight in a given process.

A fulfillment value is defined for each one of the processes which are evaluated and defined by the reference process model. It is important, however, to give an overview of the state of fulfillment of the organization's processes. First of all, the value of the fulfillment of each one of the process categories should be obtained (primary, supporting and organizational) defined in the process reference model. This value is obtained by finding the average of the percentage values of the corresponding processes, with this average expressed in terms of F, L, P or N. Once more it should be observed that each process is of equal weight.

To work out the "overall state of process fulfillment" in the organization, the fulfillment value of each one of the process categories should be taken into account. The value of the overall state of the process fulfillment in the organization is obtained by finding the average of the percentage values of its process categories, expressed in terms of F, L, P o N. Each process category should have the same weight.

3.2 The MECPDS Process Reference Model

MECPDS can use any process reference model, where each of its processes is described in terms of its purposes and its results (or a set of goals), for instance ISO/IEC 12207 or CMMI. Nevertheless, in order to give directions to the VSEs on which processes to establish when they initiate an improvement programme, a set of processes which are typically used by the Colombian VSEs is proposed. These processes are based on the ISO/IEC 12207 standard. The processes proposed in the table 6 have been obtained from different research works, as it is described in the following lines.

PRIMARY Software Life Cycle Processes	PRI 3	Development	PRI 3.1	Requirements elicitation
			PRI 3.2	System Requirements Analysis
			PRI 3.3	System Architectural Design
			PRI 3.4	Software Requirements Analysis
			PRI 3.5	Software Design
			PRI 3.6	Software Construction
			PRI 3.8	Software Testing
SUPPORTING Software Life Cycle Processes	SUP 1	Documentation		
	SUP 2	Configuration Management		
	SUP 3	Quality Assurance		
	SUP 11	Change request management		
ORGANIZATIONAL Software Life Cycle Processes	ORG 1	Management	ORG 1.3	Projects Management
			ORG 1.6	Measurement
	ORG 3	Improvement	ORG 3.1	Process Establishment

Table 6: Reference Processes for MECPDS

- A systematic review of the literature about the SPI efforts carried out in small and medium software enterprises –SMSEs- presented in [11]. Its research question is ¿What approaches concerning SPI have been focused on SMSEs and also present a real case study? The objective is to know what has been carried out and achieved about software process improvement in this type of companies. According to this systematic review the frequency of the improvement efforts aim to improve processes like project management, documentation, change requirement management, processes establishment, configuration management and requirements elicitation.

- The technical report about the state of the practice of software development processes in the Colombian southwestern region, presented in [8]. In the report an overview of software development practices, typically used to construct software products in several representative companies of the region, is shown. This study involved twenty software companies of three cities different from the region. These companies were visited by two people of SIMEP_SW project to carry out an interview and a survey. The 70% of the visited companies have less than 10 employees, 20% have between 11 and 20 employees and 10% have between 21 and 50 employees. In accordance with this technical report the practices focus mainly on the engineering processes (requirements, analysis and design, construction and testing), project management and quality assurance.

- The measurement process has been proposed because is a key responsibility in the software process management and improvement. Measurements are the basis for detecting deviations from acceptable performance of process, furthermore they are also the basis for identifying opportunities for process improvement [8].

4 Utilization of MECPDS in an improvement programme

Currently MECPDS is being applied in an improvement programme carried out by Unisoft Colombia Ltda., a small software organization from Cauca (Colombia) with 5 years experience in the regional market. The company has four employees, two people are dedicated to the administrative area of the organization and other two are dedicated to the software product development, operation and maintenance. Unisoft has two main products: "Academic", which is a software for academic management and a software product for payroll management.

The SPI programme began in December of last year with the support of the SPI Group part of the IDIS Research Group. The improvement programme is guided by Agile SPI Process, a tailoring for small software organizations of the IDEAL model. The installation phase has been already carried out. Currently, the improvement programme is being applied on the diagnosing phase in which assessment activities to estimate the general state of processes in the company are being performed. The process assessment method used is Light SPI Quality Model which uses MECPDS. For the first iteration, the processes related to requirements management such as requirements elicitation, system and software requirements analysis, change request management, have been chosen. Also the quality assurance which is related to supporting process has been chosen. A web tool [8] developed by the SPI Group is being used to support the assessment activity. (See figure 3)

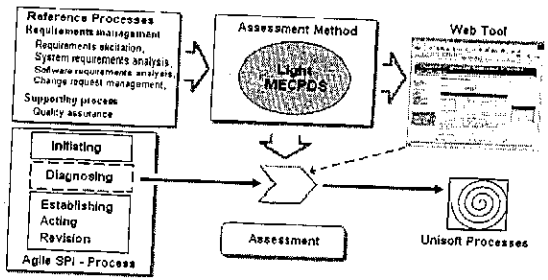

Figure 3: Unisoft SPI programme and Light MECPDS

Although at this moment the assessment process is running, from the first application of Light MECPDS in the enterprises all participating considered that the assessment experience was satisfactory. Furthermore, people of the company who are participating in the assessment agreed that:

- The questions of the interview and survey (from assessment instrument) allow them to visualize easier the changes they are adopting, to keep in mind the activities they should do but they do not actually do, and identify their problems and weaknesses.

- The assessment contributed to a better understanding of their software processes. The person in charge of the improvement in the company can have a general vision of the states of the processes and this information is useful to manage the software process improvement programme.

- The assessment process consumed little time and few resources because the assessment instruments have few questions.

Our experiences acquired in this first study case, indicate the suitable applicability Light MECPDS in VSEs. The model's principal strength is its simplicity, especially because use only three levels of standard ISO/IEC 15504 for assessment of the capability dimension. This allows to focus the improvement effort of very small software companies in establishing and managing its processes. Furthermore is easy to use and useful for rapid assessment, allows a fast feedback to improvement programme.

5 Conclusions

In this paper a lightweight model for the assessment of software process quality has been presented. Its basic components are: the measurement framework and the process reference model. The measurement framework gives a guide for working out the capability and level of fulfillment of a process. In the process capability dimension it defines how to assess the general capability level, the specific levels, process attributes and management practices. In the process fulfillment dimension it establishes how to assess the overall state of fulfillment, categories, processes and base practices.

One important contribution of this work is the definition of the process fulfillment dimension which has to be assessed before the capability process dimension. It provides VSEs with the necessary reference to identify and define their processes, which is an essential requirement for software process improvement programmes to be successful.

Furthermore, in this paper the set of processes which are typically used by the Colombian VSEs have been presented. This set of processes has been obtained from a systematic review of the literature on the SPI efforts carried out in small and medium software enterprises and a study of the state of the practice of software development processes in the Colombian southwestern region. The proposal considers also the measurement process as a key activity in the software process management and improvement, in order to measure process capability and to lead the improvement of the organiza-

tional processes maturity.

A tool prototype called SPQA_web has been produced for the MECPDS lightweight assessment model. It supports the MECPDS information gathering instrument and, since it is a Web tool, it contributes characteristics which make its application easier and help to fulfill certain objectives which open the way towards creating a culture of quality in small software organizations.

Currently, the proposed model is being applied in the Unisoft Company and we intend to apply it to other organizations in order to evaluate, fine-tune and validate the MECPDS model and support tool.

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