

**Otto-von-Guericke Universität Magdeburg**



**Design and prototypical implementation of an ISO/IEC 15504 compliant PCD/ PI  
Assessment Support Tool**

# **Diplomarbeit**

by  
Isabelle Côté

Fakultät für Informatik  
Institut für Verteilte Systeme  
Arbeitsgruppe Softwaretechnik

in cooperation with the

Ecole de Technologie Supérieure (ETS)  
Montréal, Quebec

Topic by: Prof. A. Abran, Prof. Dr. Reiner R. Dumke  
Tutor: Prof. A. April in Montréal, Prof. Dr. R. Dumke in Germany

## **ACKNOWLEDGEMENT**

I would like to thank Prof. Dumke and Prof. Abran for giving me the opportunity to write my thesis as cooperation between the OvG and The ETS in Montréal, Canada.

A special thank you goes to Prof. April for his continuous support and advice throughout the whole period of my stay in Montréal, as well as to Prof. Dumke who provided advice for the finishing touch of my thesis. I would also like to thank Mathias Lothar for his assistance considering style and format and Asma Sellami for providing me with information and help while I was at the ETS.

This thesis would not have been possible without the support and encouragement of my parents and my dear friends Ulrike Temm, Michala Weisensee and Isabelle Roy.

## TABLE OF CONTENTS

FIGURES .....	iv
TABLES .....	5
ABBREVIATIONS .....	6
1 INTRODUCTION .....	7
1.1 Motivation .....	7
1.2 Objective .....	8
1.3 Structure .....	9
1.4 Research Questions .....	9
1.5 Research Methodology .....	10
2 THE ISO/IEC 15504 STANDARD AND THE PROCESS ASSESSMENT MODEL...	12
2.1 The basic characteristics of the ISO/IEC 15504 standard.....	12
2.1.1 Rating guidance provided by the ISO/IEC 15504 standard .....	14
2.1.2 Capability Levels based on the ISO/IEC 15504 Standard .....	15
2.1.3 Assessment types considered by the ISO 15504 Standard.....	16
2.2 Minimum Requirements requested by the ISO 15504 Standard.....	16
2.2.1 Assessment Activities listed by the ISO 15504 Standard .....	16
2.2.2 Minimum input and output required by the ISO 15504 Standard.....	18
2.2.3 Key requirements considered by the ISO 15504 Standard .....	19
2.3 The Process Assessment Model (PAM).....	19
3 THE SOFTWARE MAINTENANCE MATURITY MODEL (SM <sup>mm</sup> ) AS THE PROCESS REFERENCE MODEL (PRM) .....	21
4 AVAILABLE ASSESSMENT TOOLS.....	26
4.1 Overview of assessment tools .....	26
4.2 Results .....	30
5 SM <sup>MM</sup> ASSESSMENT TOOL (AST) DESIGN .....	31
5.1 Concept and Specification of the AST (Assessment Support Tool) .....	31
5.2 Proposals for the implementation of the AST .....	34
5.2.1 AST Look & Input .....	34
5.2.2 AST Data storage .....	37
5.2.3 Assessment Tool Output .....	38
5.3 Questionnaire .....	39
5.4 Prototyping .....	42
6 EVALUATION AND BENCHMARK OF THE SM <sup>MM</sup> ASSESSMENT SUPPORT TOOL (AST).....	48
7 SUMMARY & FUTURE WORK .....	50
8 REFERENCES .....	51
APPENDIX A .....	52
A 1 Documentation .....	52
APPENDIX B .....	59
B 1 Presentation held on 15.06.2004.....	59
APPENDIX C .....	66
C 1 Numbering of the Domains, KPAs and Roadmaps .....	66
C 2 Questionnaire.....	69
APPENDIX D .....	98
D 1 Project Management.....	98
Reviews .....	98
APPENDIX E.....	108
E 1 Tools used .....	108
SELBSTÄNDIGKEITSERKLÄRUNG.....	109

## FIGURES

Figure 1 Relations between the different components (adapted from [ISO/IEC04] .....	13
Figure 2 Overview of the complete process assessment (adapted from [ISO/IEC04]).....	20
Figure 4 SM <sup>mm</sup> Maturity Levels .....	22
Figure 5 Use Case diagram for the assessment tool.....	31
Figure 5 activity diagram of the assessment .....	32
Figure 7 Class diagram of the assessment support tool .....	33
Figure 7 Example of a language selection dialogue.....	34
Figure 8 example for a general input data form .....	34
Figure 9 Representation of storing question/ practice information.....	37
Figure 11 Exemplary overview of the capability of the different domains.....	38
Figure 12 NPLF color legend .....	39
Figure 14 Exemplary NPLF graph .....	39
Figure 16 Essential aspects of the iterative prototyping approach.....	42
Figure 17 Screenshot of language selection dialogue .....	44
Figure 18 Screenshot Assessor data input.....	44
Figure 20 Screenshot of the selection tree .....	46
Figure 22 Altered representation of the NPLF-Rating.....	46
Figure 24 Screenshot of output representing KPA vs. Capability Level .....	47
Figure 26 Altered representation of Domains vs. Capability Levels .....	47

## TABLES

Table i Overview of the thesis approach .....	10
Table ii Corresponding values of the NPLF-Rating (adapted from [ISO/IEC04] ) .....	15
Table iv Capability Levels with corresponding PAs.....	15
Table v Minimum activities to be performed for an assessment.....	17
Table vi Overview of domains part 1 .....	24
Table viii Overview of domains part 2.....	25
Table x Summary of the assessment tools .....	29
Table xi Strength and weaknesses of the assessment tools .....	30
Table xii Reference information considering the input.....	45
Table xiv Outcomes of the AST testing .....	48

## ABBREVIATIONS

AST	Assessment Support Tool
CMMI	Capability Maturity Model Integrated
CMMI IPPD SS	Capability Maturity Model Integrated, Integrated Product and Process Development, and Supplier Sourcing
CMMI SE SW	Capability Maturity Model Integrated Systems Engineering, Software Engineering
ETS	Ecole de Technologie Supérieure
GUI	Graphical User Interface
IME	Interim Maturity Evaluation
IT	Information Technology
KPA	Key Process Area
MF	Measurement Framework
MIS	Management Information Systems
MS	Microsoft
OvG	Otto – von – Guericke
PA	Process Attribute
PAM	Process Assessment Model
PCD	Process Capability Determination
PCI	Process Capability Indicator
PCMM	People Capability Maturity Model
PI	Process Improvement
PRM	Process Reference Model
SE	Software Engineering
SM <sup>mm</sup>	Software Maintenance Maturity Model
SPI	Software Process Improvement
SPICE	Software Process Improvement and Capability dEtermination
SW	Software
UML	Unified Modeling Language
Win	Windows

# 1 INTRODUCTION

## 1.1 Motivation

Software has entered our lives in many different ways e.g. the internet, driving supports in cars, tools helping with our tax declaration etc. The development of new tools and equipment has not stopped, yet. In fact, it is still increasing and taking over more and more functions of our everyday life. This also implies increasing the effort required for maintenance purposes.

Therefore Process Improvement (PI) and Process Capability Determination (PCD) have gained increasing importance over the years.

Most of the past effort, though, was spent in developing improvement models and best practices that address the software development process.

However, the domain of maintenance and its function was largely overlooked [April03] even though it is considered to be an important factor contributing to the total cost of a system life-cycle [Hanna93]. Still, the maintenance domain does not get the researchers attention it is entitled to.

In spite of some extensive discussions about the maintenance issue, not much information about software maintenance practices and its affects on the user are available up to now [April04a]. This also results in the existence of only a few capability maturity models considering the maintenance function [April04].

Those that do exist are regarded as limited in their coverage of the software maintenance domain complexity [April03].

Nevertheless, the interest in the maintenance domain starts to awaken.

However, the models needed for the development process differ from those needed for the maintenance process. Therefore new models have to be built addressing the specific needs of the maintenance domain. A task that is not easy to fulfill because maintenance addresses very complex issues and because the SW engineering as a whole is not a completely mature discipline, yet [April04a].

An initiative to change the lack of best practices and models in this domain of maintenance is undertaken through the Software Maintenance Maturity Model (SM<sup>mmm</sup>) developed by Alain April, Alain Abran and Reiner Dumke<sup>1</sup> [April04]. The SM<sup>mmm</sup> provides a capability maturity model that addresses the specific aspects and needs of the software maintenance function.

This model is also to be used as a Reference Process Model (RPM) which complies with the international standard ISO/IEC15504.

The objective is to provide a complete model for the SW maintenance function that enables companies and assessors to carry out assessments in the software maintenance domain which will be fully compliant to the ISO/IEC15504 standard. To support such assessment activities it is helpful to apply appropriate tools similar to those already available e.g. for SW – development assessments.

---

<sup>1</sup> A. April & A. Abran, ETS, Montréal, Canada  
R. Dumke: OvG University of Magdeburg

Such a support tool would be useful in many ways:

- To provide the environment that is based on a standard against which the assessment is carried out,
- To record the data,
- To store the data for later use or as evidence should questions concerning the results arise
- the results can be used to perform comparisons among the different companies
- the results show where weaknesses still exist so that improvement actions can be undertaken in those specific cases
- the results can be used to show customers that the company cares about process improvement and process capability and that it is willing to improve continually their practices to decrease costs & time and to increase quality & customer satisfaction

## 1.2 Objective

The influence of software is almost everywhere. The pace in which the environment and/or technology change is increasing [April04a]. The response time to enquiries for problem solutions or adaptations of software should accelerate, as well.

In order to be able to do so it is necessary to improve the processes. Through carrying out an assessment this task can be tackled.

An assessment that is compliant to the ISO/IEC 15504 offers the possibility to state the process capability and areas for process improvement.

However, the assessments that are carried out today usually focus on the development with the maintenance only getting small attention in the overall inspection. By developing models that are designed to especially focus on the maintenance domain it is also desirable to carry out assessments that are based on them so that the focus can be set on maintenance.

The objective of this diploma thesis is to design and to prototypically implement an assessment tool based on the recently released final version of the ISO/IEC 15504 with the SM<sup>mm</sup> as a Process Reference Model (PRM) requested by the ISO/IEC 15504.

Therefore it is necessary to look at the requirements for an assessment tool requested by the ISO/IEC 15504 and the PRM, as well as to analyze assessment tools that already exist for other software engineering domains.

Furthermore, the result of this thesis should aim at the implementation of a fully applicable assessment support tool for the maintenance domain and act as a basis for enhancements to this tool in the future.

### **1.3 Structure**

This thesis deals with the design and prototypical implementation of an ISO/IEC 15504 compliant Process Capability Determination/ Process Improvement (PCD/ PI) Assessment Support Tool.

Therefore the rest of chapter one will address the research questions and the methodology that will be applied for the thesis.

In the second chapter the fundamentals of the ISO/IEC 15504 standard as well as the main aspects of the Process Reference Model SM<sup>mm</sup> which will form the basis for further research will be introduced. Furthermore, the minimum requirements requested by the standard and the model will be synthesised for the specification and design phase later in this thesis.

The third chapter will introduce the Process Reference Model which will be used throughout the research.

Chapter four will provide an overview of assessment tools already available. It will also present the strength and weaknesses that were observed during the analysis of the tools as well as aspects that are to be considered while designing the assessment support tool.

Chapter five will consist of the specification and design of the tool. This includes the requirements, Use Case diagrams, behaviour of the program and the data model.

In chapter six the evaluation/ benchmark of the program as well as the test reports and the documentation will be given.

With chapter seven the thesis will end by summarizing the research and results. It will also point out possible extensions for future research.

### **1.4 Research Questions**

Throughout this thesis the following questions will be investigated and answered:

- (1) What has to be included in the tool to be compliant to the ISO/IEC 15504?
- (2) What has to be included in the tool when the Software Maintenance Maturity Model (SM<sup>mm</sup>) is used as the reference model?
- (3) What tools do exist and what do they offer?
- (4) How should the tool look like taking into consideration the features that are offered in similar tools and the requirements requested by the ISO/IEC 15504 and the SM<sup>mm</sup>?

## 1.5 Research Methodology

This research will be carried out as the diploma thesis for obtaining a Diplom-degree in computer science at the Otto von Guericke University Magdeburg (OvG). It is a cooperation between the Ecole de Technologie Superieur à Montréal (ETS) and the OvG. The aim of this thesis is to design a tool that is compliant to the ISO/IEC 15504 Standard and can be applied to assessments for process improvement (PI) and process capability determination (PCD) in the maintenance domain. Therefore the research in this thesis is divided into four stages as shown in the table below. The timeframe for this work is 18 weeks. The coding of the tool will be handed over to a third party supporting this work.

The methodology will follow a modified pattern of Basili's methodology grid [Bourque91].

**Table i Overview of the thesis approach**

### Stage 1: Definition of research

Motivation	Objective	Proposal	Research User
Support SM <sup>mm</sup> assessment activities.	Identify the criteria that are necessary for an ISO/IEC15504 compliant assessment.	Develop a tool that is based on the ISO/IEC15504 with the SM <sup>mm</sup> as Process Reference Model to support the assessment.	<ul style="list-style-type: none"> <li>- Assessors carrying out assessments</li> <li>- Managers of the unit being assessed</li> <li>- Researchers in process improvement</li> </ul>

### Stage 2: Planning

Activities	Inputs	Outputs
<ul style="list-style-type: none"> <li>- Literature review</li> <li>- Investigate existing assessment tools</li> <li>- Establish project plan</li> </ul>	<ul style="list-style-type: none"> <li>- List of inputs to be considered for this project</li> </ul>	<ul style="list-style-type: none"> <li>- Intermediary and final product description</li> </ul>

### Stage 3: Execution

Preparation	Execution	Analysis
Specification of SM <sup>mm</sup> assessment support tool	<ul style="list-style-type: none"> <li>• Conduct inventory of data elements required (data model)</li> <li>• Develop Use Cases</li> <li>• Outline process flow</li> <li>• Outline outputs</li> </ul>	<ul style="list-style-type: none"> <li>- Comparative Analysis of existing tools</li> <li>- Synthesis of ISO/IEC15504 conformance requirements</li> <li>- SM<sup>mm</sup> architecture synthesis</li> </ul>
Design of SM <sup>mm</sup> assessment support tool.	<ul style="list-style-type: none"> <li>• Allocate functionality to a design.</li> </ul>	<ul style="list-style-type: none"> <li>- Modularity, coupling, cohesion</li> <li>- Decomposition</li> </ul>
Code of SM <sup>mm</sup> assessment support tool.	<ul style="list-style-type: none"> <li>• Identify a technology</li> <li>• Code the designs</li> <li>• Unit test each component</li> </ul>	<ul style="list-style-type: none"> <li>- Translate design into the program</li> <li>- Conduct Unit testing</li> </ul>
Test of SM <sup>mm</sup> assessment support tool.	<ul style="list-style-type: none"> <li>• Build test data</li> <li>• Conduct testing</li> </ul>	<ul style="list-style-type: none"> <li>- Conduct system testing and acceptance testing</li> </ul>
Document Test of SM <sup>mm</sup> assessment support tool.	<ul style="list-style-type: none"> <li>• Create technical and user documentation</li> </ul>	<ul style="list-style-type: none"> <li>- Review documentation with project sponsor</li> </ul>

### Stage 4: Interpretation

Interpretation Context	Extrapolation of results	Future Work
<ul style="list-style-type: none"> <li>• Understanding of ISO15504 Assessment tools</li> </ul>	<ul style="list-style-type: none"> <li>• ISO/IEC15504 assessment toolset is necessary and still new to the industry of software engineering</li> </ul>	<ul style="list-style-type: none"> <li>• Use of tool within an assessment</li> <li>• Publication on the use of the tool to help assessment</li> <li>• List of functions to be developed next</li> </ul>

During the analysis phase it turned out that the requested process attributes (PA) are not yet explicitly featured in the Software Maintenance Maturity Model (SM<sup>mm</sup>). Therefore this thesis will concentrate on the Process Capability Determination (PCD) aspect for the assessment support tool.

The Process Improvement (PI) aspect, as well as the Risk Evaluation will be considered as being out of scope for this thesis. It makes it more difficult for the assessor to carry out an assessment because the PA provides a basis that makes it easier to proof and propagate the results of the assessment. However, it is still possible to perform the PCD without explicitly referring to the PA.

## 2 THE ISO/IEC 15504 STANDARD AND THE PROCESS ASSESSMENT MODEL

The following chapter introduces the fundamentals which are needed for further work of the thesis. This includes an overview of the ISO/IEC 15504 international standard, the assessment rating system, capability levels and its key requirements followed by the overview of the PRM (Process Reference Model). Finally the Process Assessment Model will be described.

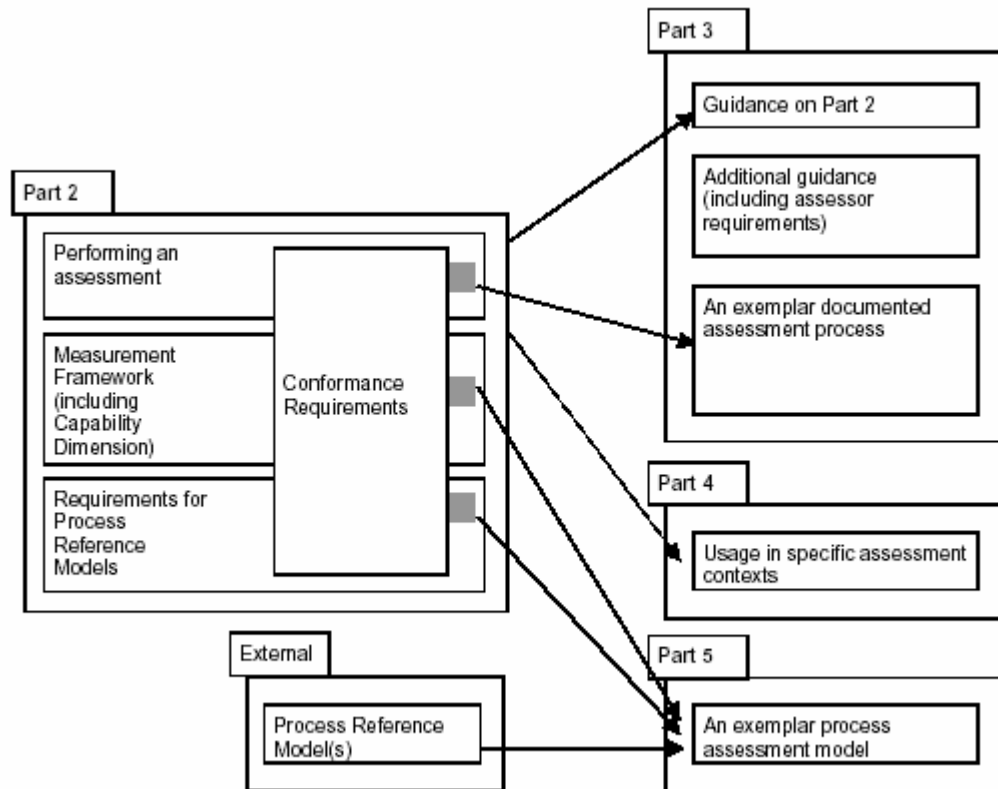
### 2.1 The basic characteristics of the ISO/IEC 15504 standard

This section presents a short synopsis of the standard. For more information please refer to the source documents [ISO/IEC04]. The ISO/IEC 15504 standard consists of a total of five components:

- ISO/IEC 15504-1: Vocabulary and Concepts: This standard introduces the vocabulary needed to understand the specialized topics addressed in this series of standards. It also provides the definition for the process improvement and the capability determination and presents a two-dimensional model that deals with the process improvement as the first dimension and the capability determination as the second dimension. The basic assessment activities (namely: planning, data collection, data validation, process attribute rating and reporting) for carrying out an assessment are defined. Emphasis is put on the assessment indicators: repeatability, reliability and consistency. It is necessary to record the evidence for the indicators just named - this is accomplished through documentation. This can be done through manual instruments such as questionnaires or automated through an appropriate tool.
- ISO/IEC 15504-2: Performing an Assessment: This standard introduces the minimum requirements that have to be applied while carrying out an assessment so that the rating is kept consistent and repeatable. It also addresses the issue of the external PRM and the Measurement Framework with its six process capability levels and associated process attributes. The emphasis of this standard is placed on the input, which defines the purpose, scope, responsibilities, and output. The output provides a set of process attribute ratings. This may also include capability levels for the process and the results, which have to be objective, impartial, consistent, repeatable and representative of the assessed processes.
- ISO/IEC 15504-3: Guidance on Performing an Assessment: This standard gives more information about the two dimensional model and the process dimension which consists of the external PRM. The definition is generic, which means that it addresses the question of *what* has to be achieved but not *how* it can be achieved. The capability dimension represented by the Measurement Framework provides 9 process attribute indicators for achieving process attributes. A mapping that is necessary to determine the capability level is also defined. Furthermore the requirements for a tool, such as that the data needs to be: collected, recorded, stored, collated, processed, analysed, retrieved and presented are shown, as well as the need for computer based support because of the volume and/ or the complexity of the data accumulating during an assessment activity.
- ISO/IEC 15504-4: Guiding on Using Assessment Results: It is a standard that indicates how the results of the PI (Process Improvement) and the PCD (Process Capability Determination) have to be interpreted and how it is possible to identify process oriented risks.
- ISO/IEC 15504-5: An Exemplar Process Assessment Model: In this last component of the standard an assessment model is introduced that is compliant with the requirements introduced in part 2 of ISO/IEC 15504 Standard. It can therefore be used while carrying

out an assessment or as an example while developing a PAM (Process Assessment Model).

The different parts of the standard should not be considered to be completely independent of each other. In fact, they have great dependencies among them. The following figure shows the relations between the different parts within this standard.



**Figure 1 Relations between the different components (adapted from [ISO/IEC04])**

The components that will be of main interest for this research are:

- part 2 considering the minimum requirements for activities, input and output including the need for the PRM
- part 3 considering of the supplementary comments on the requirements in part 2
- part 4 considering the Risk Evaluation
- part 5 considering its relation to the PAM
- the rating system and
- the capability levels

### 2.1.1 Rating guidance provided by the ISO/IEC 15504 standard

The rating is a vital part of the assessment. It determines the fields of potential Process Improvement, the Capability Levels and also supplies the indicator for the Risk evaluation. In this standard the rating is performed using the NPLF – Rating. Whereupon NPLF stands for:

- N – not achieved
- P – partially achieved
- L – largely achieved
- F – fully achieved

The scale on which the process attributes are measured follows the ordinal scale. The process attributes are therefore measured according to their extent of achievement against the defined attributes.

This results in the following rating scale of the assessed process against the defined attribute:

- N - No evidence or little evidence of an approach  
No evidence or little evidence of achievement
- P - Some evidence of an approach  
Some evidence of achievement  
Probable existence of unpredictability
- L - Evidence of systematic approach  
Significant achievement  
Existence of some weaknesses
- F - Evidence of complete and systematic approach  
Full achievement  
No significant evidence of weakness

These values are then extended to a percentage scale according to the equation:

$$\frac{\sum A_i}{A}$$

with A = number of practices in the roadmap  
and A<sub>i</sub> = individual practice in the roadmap

Note, that no weighting of the different processes is performed. They should be considered as equally weighted.

The resulting values are assigned to the rating as shown in Table ii

**Table ii Corresponding values of the NPLF-Rating (adapted from [ISO/IEC04] )**

Rating	Achievement in %
<b>N</b>	0 – 15
<b>P</b>	> 15 – 50
<b>L</b>	> 50 – 85
<b>F</b>	> 85 – 100

This rating system is used as the rating scale in the Measurement Framework.

### 2.1.2 Capability Levels based on the ISO/IEC 15504 Standard

There are a total of 6 capability levels. They range from level 0 to level 5. The rating to determine the capability levels is performed using the NPLF-rating mentioned above. The meaning of the different levels is:

- Level 0** *incomplete process.* This means that little or no evidence of a systematic approach is present
- Level 1** *performed process.* This means that it fulfills the process attribute (PA) for this level
- Level 2** *managed process.* This means that it fulfills the PA of Level 1 as well as the PAs of this level have to be accomplished
- Level 3** *established process.* This means that it fulfills the PAs of Level 1 & Level 2 completely as well as the one demanded for this level
- Level 4** *predictable process.* This means that it fulfills all the PAs required by the lower levels as well as the ones requested for this level
- Level 5** *optimizing process.* This means that all the PAs of Level 1 to 4 are met as well as the ones required for this level

The corresponding Process Attributes (PA) for the different levels consist of:

**Table iii Capability Levels with corresponding PAs**

Level	Process Attribute(s)
<b>0</b>	No attributes
<b>1</b>	Process performance attribute
<b>2</b>	Performance management attribute Work product management attribute
<b>3</b>	Process definition attribute Process deployment attribute
<b>4</b>	Process measurement attribute Process control attribute
<b>5</b>	Process innovation attribute Process optimization attribute

As already mentioned in the meaning of the capability levels, it is only possible to obtain a certain level if and only if the PAs of all lower levels are fully achieved.

### **2.1.3 Assessment types considered by the ISO 15504 Standard**

Two types of assessments can be carried out. These are self-assessment and independent assessment. They are defined as follows:

- a) Self-assessment: this kind of assessment is carried out by the organization considering its own processes. The assessors are internal employees of the organization. Throughout the thesis this type will be referred to as Quick Assessment.
- b) Independent assessment: here the assessment is carried out by assessors that are external to the organization. Therefore the assessment is considered as an independent process capability determination.

## **2.2 Minimum Requirements requested by the ISO 15504 Standard**

This section is a synthesis of the minimum requirements that are requested by [ISO/IEC04] for an assessment tool to be compliant with the standard. It outlines the minimum activities and information required during either a process improvement (PI) or a process capability determination (PCD) assessment. It is followed by the requirements imposed on a tool that is used to support an assessment.

### **2.2.1 Assessment Activities listed by the ISO 15504 Standard**

The minimum activities comprise the following five steps requested by the standard:

- (1) Planning
- (2) Data Collection
- (3) Data Validation
- (4) Process Attribute Rating and
- (5) Reporting

Each step comprises additional information that has to be met. These are defined as:

**Table iv Minimum activities to be performed for an assessment**

	Step (1)	Step (2)	Step (3)	Step (4) <sup>2</sup>	Step (5)
<b>1<sup>3</sup></b>	The inputs required in part 2 of the standard	The explicit identification of the strategy and techniques that are applied for: selection, collection analysis of data and justification of the ratings (it should be possible to demonstrate these techniques and strategies on demand)	The confirmation that the evidence gathered is objective	The recording of the set of process attributes	The reporting of the assessment results according to the minimum outputs requested by part 2 of this standard
<b>2</b>	The activities listed above	The establishment of correspondence between the assessment scope and the PAM	The warrantee that the objective evidence is covering the complete purpose and scope of the assessment	The support of the judgement through the defined set of assessment indicators and the PAM to ensure the repeatability	
<b>3</b>	The resources and schedule for these activities	The assessment of each process within the scope according to the objective evidence	To guarantee the consistency of the data	The recording of the decision making process	
<b>4</b>	The identity and responsibility of the people involved in the assessment	The collection of objective evidence for each attribute assessed have to meet the purpose and the scope		The attribute rating and the objective evidence have to be maintained traceable	
<b>5</b>	The criteria according to which the requirements are verified against	The recording and maintaining of the objective evidence collected as basis for the verification of the ratings		The recording of the correlation between assessment indicators and objective evidence	
<b>6</b>	The description of the assessment output				

<sup>2</sup> Every single process attribute has to be considered

<sup>3</sup> The numbering is done to facilitate the reference to the different points within the steps. It does not indicate a specific order.

There are two points that are of special interest in this research in the table above:

The third point in step (2) because it refers to the PRM which establishes the correspondence between the processes and the elements of the PAM.

The fifth point of step (2) because it indicates that the processes with their attributes have to be recorded in a distinct way so that the collected data can be easily identified during the rating as requested by step (3).

### **2.2.2 Minimum input and output required by the ISO 15504 Standard**

The previous chapter introduced the activities that need to be performed in carrying out an assessment. Step (1) requested the minimum input and step (5) the minimum output. This section provides the information that is needed for those steps. First the requirements for the input will be presented, followed by the outputs and key requirements.

**Input:** The following ten points with their constituents, in the case that they have some, describe the initial input that is necessary to be compliant with the standard.

1. the sponsor and their relationship to the organization being assessed
2. purpose of the assessment
3. scope of the assessment consisting of
  - 3.1. the processes to be assessed
  - 3.2. definition of the highest capability level for every single process declared in 3.1
  - 3.3. the unit that uses these processes
  - 3.4. the context of the assessment consisting of a minimum of
    - 3.4.1. size of the unit
    - 3.4.2. the units application domain of the products or services
    - 3.4.3. key characteristics considering the information size, quality etc.
4. the approach to the assessment
5. the constraints of the assessment
  - 5.1. key resources availability
  - 5.2. maximum length of the assessment
  - 5.3. exclusion of particular processes or units
  - 5.4. amount and character that needs to be considered for the objective evidence
  - 5.5. restriction to the use of the assessment outputs and the ownership
  - 5.6. restrictions due to confidentiality agreements
6. identity of both PAM as well as PRM
7. the identity of the lead assessor
8. the criteria on the basis of which the assessor is chosen (competences)
9. identity and roles of
  - 9.1. assessees
  - 9.2. assessment team
  - 9.3. assessment support stuff
10. data, supporting the assessment that has been collected additionally during the assessment and the recording of the changes to the assessment input, should any be performed.

**Output:** The minimum output that has to be produced in order to be compliant to the standard consists of the following elements:

1. the assessment date
2. the input of the assessment
3. the identification of the collected objective evidence
4. the identification of the assessment processes documented
5. the identification of additional collected data and the changes to the assessment input, if any
6. the identification of the risks

Please note that point number 6 is not demanded by the standard but is an additionally requested output.

### **2.2.3 Key requirements considered by the ISO 15504 Standard**

The previous chapter introduces the different aspects of activities, input and output that have to be considered for an assessment. In this chapter the key requirements for the assessment support tool (AST) are identified.

a) **Minimum activities:**

The tool should include step (2) Data Collection, step (3) Data Validation, step (4) Process Attribute Rating and step (5) Reporting

b) **Minimum input:**

The input should consist of all the requested inputs given in the INPUT paragraph with the following restrictions:

- point (8): it is only indicated if the assessor is certified or not. No further collection of information about the competences is collected.

c) **Minimum output:**

The whole set of outputs mentioned in the OUTPUT paragraph has to be included as output for the tool.

## **2.3 The Process Assessment Model (PAM)**

The ISO/IEC 15504 is based on the already mentioned two dimensional model. These two dimensions are characterized as follows [ISO/IEC04]:

- the process dimension represented by the Process Reference Model defining the domain, scope, purpose, and outcomes, and
- the capability dimension represented by the measurement framework defining the capability levels, process attributes and rating scale.

The PAM now represents those two views of the dimensions. Their relationship can be described by a diagram with the X-axis representing the process dimension and the Y-axis representing the capability dimension. The Process Assessment Model provides the basis for the evidence collection and process capability rating. Therefore it must take into account the following aspects:

- scope,
- indicators,
- mapping, and
- translation

The four factors above guarantee that the PAM is compliant to the ISO/IEC15504 standard if the following conditions are met:

The scope:

- ◇ relation between PAM and PRM in not less than one process in the assessment
- ◇ coverage of all or a continuous subset of a process regarding its capability levels with the restriction, that the capability levels have to be in sequence. Skipping of one level is not permitted
- ◇ the coverage of the scope is ensured through
  - the Process Reference Model chosen,
  - the processes chosen out of the PRM, and
  - the capability levels chosen from the Measurement Framework

The indicators:

- ◇ must address the purpose and the outcomes defined in the PRM
- ◇ must demonstrate the achievement of the capability levels defined in the MF

The mapping:

- ◇ correlation to the processes chosen from the PRM corresponding to the purposes and outcomes defined
- ◇ correlation to the process attributes chosen from the MF

The translation:

- ◇ representation of the results in a formal and verifiable form for each process based on a set of process attributes

Figure 2 presents the different factors that contribute to a complete process assessment compliant to ISO/IEC 15504.

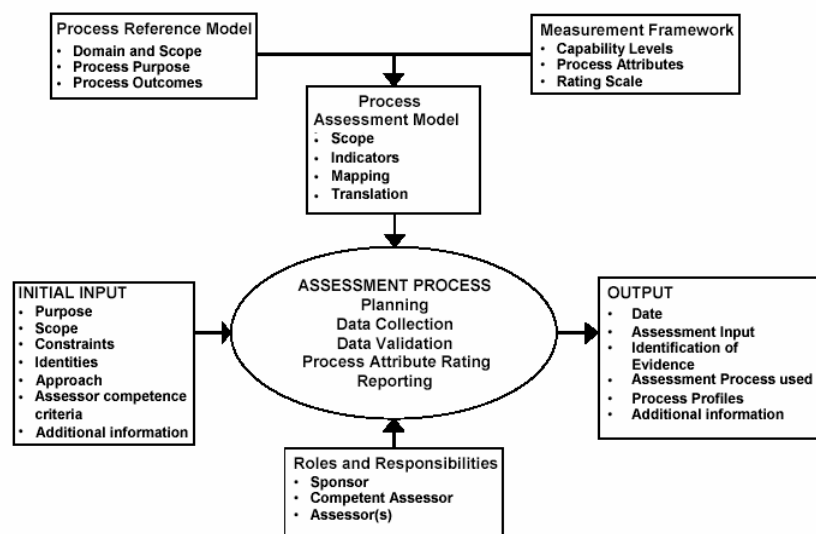


Figure 2 Overview of the complete process assessment (adapted from [ISO/IEC04])

So far the following issues of assessment have been addressed:

- the Measurement Framework
- the Process Assessment Model
- the initial inputs
- the output
- the assessment process

The issues remaining unaddressed are:

- the roles and responsibilities
  - They will not be explicitly addressed in this paper. Only the identity and the roles of the people involved during the assessment will be recorded. Matters of how the responsibilities or roles have to be distributed etc. will not be considered.
- the Process Reference Model (PRM)
  - This issue will be addressed in the following chapter

### **3 THE SOFTWARE MAINTENANCE MATURITY MODEL ( $SM^{mmm}$ ) AS THE PROCESS REFERENCE MODEL (PRM)**

This chapter describes the model to be implemented in the PCD/PI Assessment support tool. The information was mainly provided by Prof. April who works on this topic for his PhD-degree. Improvement models are required to be compliant to the ISO/IEC15504 standard. For this research the newly developed maturity model for software maintenance ( $SM^{mmm}$ ) will be used as a case study for its implementation and prototyping.

The  $SM^{mmm}$  is presented in Table v and Table vi in more detail. This model includes 4 Process Domains, 18 KPAs, 74 Roadmaps and 443 Practices. While some KPAs are unique to maintenance, some others were derived from the CMMi<sup>®</sup> and other models and modified slightly to map more closely to daily maintenance characteristics.

#### **The $SM^{mmm}$ Foundation**

The  $SM^{mmm}$  is based on the Software Engineering Institute (SEI) Capability Maturity Model Integration for Software Engineering (CMMi<sup>®</sup>), version 1.1 [Sei02] and *Camélia* [Camelia94]. The  $SM^{mmm}$  must be viewed as a complement to the CMMi<sup>®</sup>, especially for the processes that are common to developers and maintainers, for example:

- a) process definition;
- b) development;
- c) testing;
- d) configuration management; and
- e) QA practices

These are also used by the software development organization.

The architecture of the  $SM^{mmm}$  differs slightly from that of the CMMi<sup>®</sup> version 1.1. The most significant differences are:

1. A Roadmap category to further define the Key Process Areas,
2. Detailed references to related publications

3. Examples on how to implement the practice.

The  $SM^{mmm}$  incorporates additional practices on the following topics:

1. Event and Service Request Management;
2. Maintenance Planning activities specific to maintainers (versions, SLA, impact analysis);
3. Service Level Agreement;
4. Software Transition;
5. Operational Support;
6. Problem Resolution Process with a Help Desk;
7. Software Rejuvenation, Conversion and Retirement.

### The $SM^{mmm}$ Architecture

The CMMi<sup>®</sup> has recently adopted the continuous representation that has been successfully used in the past by other models such as: Bootstrap [Bootstrap91], *Camélia* [Camelia94] and ISO/IEC 15504 (Spice) [ISO/IEC04]. This  $SM^{mmm}$  model also uses a continuous representation, as it helps to:

- a) conform to Spice recommendations;
- b) obtain a more granular rating for each Roadmap and KPA; and
- c) identify a specific practice across maturity levels and identify its path from level zero (absent) to higher levels of maturity.

The  $SM^{mmm}$  is also based on the concept of a Roadmap. A Roadmap is a set of related practices that focuses on an organizational area or need, or a specific element within the software maintenance process. Each Roadmap represents a significant capability for a software maintenance organization. Within a given Roadmap, the level of a practice is based on its respective degree of maturity. The most fundamental practices are located at a lower level, whereas the most advanced ones are located at a higher level. An organization will mature through the Roadmap. Lower-level practices must be implemented and sustained for higher-level practices to achieve maximum effectiveness. Each of the 6 maturity levels can be characterized, in the  $SM^{mmm}$  model, as follows:

<i>Level</i>	<i>Level Name</i>	<i>Risk</i>	<i>Interpretation</i>
<b>0</b>	<i>Incomplete</i>	<i>Highest</i>	<i>No sense of process</i>
<b>1</b>	<i>Performed</i>	<i>Very High</i>	<i>ad hoc maintenance process</i>
<b>2</b>	<i>Managed</i>	<i>High</i>	<i>basic request-based process</i>
<b>3</b>	<i>Established</i>	<i>Medium</i>	<i>state-of-the-art maintenance process</i>
<b>4</b>	<i>Predictable</i>	<i>Low</i>	<i>generally difficult to achieve now</i>
<b>5</b>	<i>Optimizing</i>	<i>Very Low</i>	<i>technologically challenging to attain</i>

**Figure 3  $SM^{mmm}$  Maturity Levels**

The maturity (capability) level definitions and the corresponding generic process attributes are described for each maturity level of the  $SM^{mmm}$  in [April04].

## **The Model's Purpose**

*SM<sup>mm</sup>* was designed as a customer-focused benchmark for either:

- Auditing the software maintenance capability of a software maintenance service supplier or outsourcer; or
- Internal software maintenance organizations.

The *SM<sup>mm</sup>* has been developed from a customer perspective, as experienced in a competitive, commercial environment. The ultimate objective of improvement programs, initiated as a result of a *SM<sup>mm</sup>* assessment, is increased customer (and shareholder) satisfaction, rather than rigid conformance to the standards referenced by this document.

A higher capability, in the *SM<sup>mm</sup>* context, means for customer organizations:

- a) Reaching the target service levels and delivery on customer priorities;
- b) Implementation of the best practices available to software maintainers;
- c) Obtaining transparent software maintenance services and incurring costs that are competitive;
- d) The shortest possible software maintenance service lead time.

### **For a maintenance organization, achieving a higher capability can result in:**

- a) Lower maintenance and support costs;
- b) Shorter cycle time and intervals;
- c) Increased ability to achieve service levels; and
- d) Increasing ability to meet quantifiable quality objectives at all stages of the maintenance process and services.

Appendix C 1 contains the numbered overview of the Domains with their corresponding KPAs and Roadmaps. The numbering of the different elements makes it easier to identify and reference them throughout their further use.

**Table v Overview of domains part 1**

<b>Process Domain</b>	<b>Key Process Area</b>	<b>Roadmap</b>
Software Maintenance Process Management	Maintenance Process Focus	Responsibility and Communications Information gathering Findings Action plan
	Maintenance Process/Service Definition	Documentation and Standardization of processes/services Process/Service adaptation Communication processes /services Repository of processes/services
	Maintenance Training	Requirements, plans, and resources Personal training Initial training of newcomers Projects training on transition User training
	Maintenance Process Performance	Definition of maintenance measures Identification of baselines Quantitative management Prediction models
	Maintenance Innovation and Deployment	Research of innovations Analysis of improvement proposals Piloting selected improvement proposals Deployment of improvements Benefit measurement of improvements
Software Maintenance Request (MR) Management	Event and Service Request Management	Communications and contact structure Management of events and service requests
	Maintenance Planning	Maintenance Planning (1 to 3 yrs) Project transition planning Disaster Recovery planning Capacity planning Versions and upgrade planning Impact analysis
	Monitoring and Control of Service Requests and Events	Follow up on planned and approved activities Review and analyze progress Urgent changes and corrective measures
	SLAs and Supplier Agreements	Account Management of users Establish SLAs and contracts Execute services in SLAs and contracts Report, explain and bill services

**Table vi Overview of domains part 2**

<b>Process Domain</b>	<b>Key Process Area</b>	<b>Roadmap</b>
Software Evolution Engineering	Software Transition	Developer and owner involvement and communications Transition process surveillance and management Training and knowledge transfer surveillance Transition preparation Participation in system and acceptance tests
	Operational Support	Production software monitoring Support outside normal hours Business rules and functionality support Ad hoc requests/reports/services
	Software Evolution and Correction	Detailed design Construction (programming) Testing (unit, integration, regression) Documentation
	Software Verification and Validation	Reviews Acceptance tests Move to production
Support to Software Evolution Engineering	Software Configuration Management	Change Management Baseline configuration Reservation, follow-up, and control
	Process and Product Quality Assurance	Objective evaluation Identify and document non-conformances Communicate non-conformances Follow up on corrections/adjustments
	Measurement and Analysis of Maintenance	Define measurement program Collect and analyze measurement data Repository of maintenance measures Communicate measurement analysis
	Causal Analysis and Problem Resolution	Investigate defects and defaults Identify causes Analyze causes Propose solutions
	Software Rejuvenation, Migration, and Retirement	Re-documentation of software Restructuring of software Reverse engineering of software Reengineering of software Software migration Software retirement

## 4 AVAILABLE ASSESSMENT TOOLS

Supporting assessments through tools is not a new challenge. In the past and present several approaches were made to help the assessor carrying out assessments and being compliant with the requirements needed.

This chapter investigates seven tools : the Seal of Quality SPICE Assessment Tool, the SPICE 1-2-1, the CMM-Quest, the CMMI – Browser, the MISIME (CMMi-SE-SW), the Trillium and the Quaudit, respectively to see how they work and what kind of support for the assessment they offer. The outcome will then be taken into consideration in designing the assessment tool.

### 4.1 Overview of assessment tools

The tools mentioned above are divided into three categories

- a) SPICE consisting of Seal of Quality SPICE Assessment Tool and SPICE 1-2-1
- b) CMM/ CMMI and suggested by the SPI Partners consisting of CMM-Quest, CMMI – Browser and MISIME (CMMi-SE-SW)
- c) Others consisting of Trillium and Qaudit

#### a) SPICE

##### SEAL of Quality SPICE Assessment Tool

The book *SPICE: The Theory and Practice of Software Process Improvement and Capability Determination* gives an overview of the whole topic related to ISO/IEC TR15504, beginning with an introduction to SE standards ending with the future of the SPICE Trials. It also introduces a tool that is attached to the book on a separate CD-Rom. The tool was designed for Win 3.1/ Win 95 which makes it rather unusable to be applied now.

The tool has two applications, one for the assessment (SEAL) and the other one for visualizing the resulting data (Strathclyde Process Visualization Tools).

The visualization is made through histograms and pie charts. It is possible to choose to view only specific point of interest like individual processes, individual process attributes or different capability levels.

##### SPICE 1-2-1

The program SPICE 1-2-1 V.3 is based on the ISO/IEC standard 15504-5. A Demo-Version<sup>4</sup> can be downloaded from: <http://www.spice121.com/english/download.htm>. It addresses the SW-processes with its corresponding attributes. The rating follows the NPLF-Scale. This tool is available in different versions (standard, extended, professional in-house and professional consultant).

The Spice 1-2-1 has a very user friendly graphical interface. The tool itself is divided into different steps. The first step “Prepare” allows preparing an upcoming assessment. Therefore 40 different processes to be evaluated are provided. For each process a definition and best practices are given (both not available in the demo version). Furthermore it is possible to write down personal notes and evidence into two separate fields. This information will then be available when the assessment takes place. At the right bottom of this window it is possible to customize some settings for the next steps e.g. choose between direct rating and suggest button, the latter will give advice how to adjust the percentage when different practices are met or not met.

---

<sup>4</sup> A copy of this Demo-Version will also be included in a CD-Rom attached to this thesis

The second step “Fill in” is the actual assessment. The personal notes (if any entered) and the rating window appear on the right hand site in a record card manner. The left hand site displays the different processes with the process attributes.

The third step “charts” represents the results of the assessment. Different visualizations are available like processes vs. attributes, processes vs. capability level or an overview of all process areas considering all process categories. In some cases it is possible to change the type of the chart used e.g. pie-chart or horizontal bars. The result is color coded. The darker the color, the more was achieved, with dark blue indicating fully achieved. White indicates that it was not achieved at all.

Two ways of saving the file are offered, namely “save file as” or “save to anonymous file” (both not possible in the demo version). For security reasons it is possible to protect the files with a password when saving them.

A special service is offered: it is possible to send a file in html-format or a SPICE-file to the HM&S<sup>5</sup> company and obtain a web report in return.

## **b) CMM/ CMMI**

### CMM-Quest

This tool resembles the SPICE 1-2-1 tool considering the appearance and the handling. The difference here is that the standard used is not ISO/IEC 15504 but the CMMI SW/SE/IPPD/SS Version 1.1.

A demo version can be downloaded from: <http://www.cmm-quest.com/download.htm>.

However, it is not possible to send in a file and obtain a report in return with this program as it is with the SPICE 1-2-1.

### CMMI – Browser

This tool consists of a MS-Access database. For this overview the CMMI – Browser v1.0e was considered.

It can be downloaded from <http://www.spipartners.nl/english/tools/index.html>.

The process areas, practices and goals that are included in the CMMI are in this database, as well. It is yet not a full assessment tool but it could be developed into it in the future. At this moment it allows to view the text of the CMMI standard by clicking on the process areas, practices or goals. The CMMI-Browser does not support any kind of self-assessment questionnaires nor graphical representation nor rating etc. in this version.

It is possible to use several filters to narrow down the field of interest e.g. choose the upper margin of the capability level or choose a specific process area only.

It can be used as a reference guide while doing an assessment. Adding interview questions is planned for later versions of this tool.

It is a quick possibility to browse through the complete CMMI standard.

### MISIME (CMMi-SE-SW)

This tool is based on Excel spreadsheets. First a questionnaire is filled out. The results are then transferred into the different categories in the spreadsheets. The results are shown in radar charts. A PowerPoint presentation is included to explain what is going to be done in the interview.

Separate questionnaires and Excel spreadsheets are available for CMMI-SE-SW, PCMM and CMMI IPPD SS

---

<sup>5</sup> HM&S is working in the fields of consultancy and support in software engineering. For further information please refer to <http://www.hms.org/>

### **c) Others:**

#### Trillium

The program called “Software Product Development Capability Assessment Model” was created with Lotus and was then converted to an Excel spreadsheet so that it could be used in this paper.

There are 9 Process Capability Areas considered, each of which is subdivided into practices grouped by maturity level. The maturity levels considered are 2 to 4. The analysis is performed after each maturity level within the capability areas as well as after each capability area. The results are displayed in stacked bar graphs where each maturity level is represented through a distinct color at the end of each capability area. At the end an overall stacked bar graph is presented. The calculation is based on aggregation of the different best practices. A “1” denotes “yes, fulfilled and a “0” denotes no, not fulfilled. It is also possible to denote a partially fulfillment by applying fourths e.g. “0.25”, “0.5”etc.

The assigned values are calculated against actual values to calculate the percentage of the achievement in the different practices.

#### Qaaudit

The program called “Quality Assurance Audit Handler” was build using MS-Excel. This tool allows to enter general information that is needed or the audit, e.g. auditor, auditee, date, key dates etc.

It uses separate spreadsheets to address the different parts of the audit. Additional hints are given throughout the different input patterns.

The rating is performed by applying the following: “A” for Absence, “P” for Presence, “X” for out of scope, “O” for not serious deficiencies, “L” for low number of deficiencies and “S” for serious deficiencies. At the end, the scores are being shown in an overview and a “traffic light” graph is applied to show the success of the different parts of the audit. Also, 6 charts are provided that give a detailed view on the different aspects treated in the audit.

## Summary of assessment tools

The representation of the results adapts to some extend the style used in [Mendes96].

Table vii Summary of the assessment tools

Tool	Type	Version	Platform	Adaptability	Documentation/ Help	Standard	Goal
<b>SEAL</b>	Stand alone	VersionA VersionB	Win 3.1 Win95	yes	Good documentation (complete book)	ISO/IEC TR 15504	Process improvement support Process capability determination
<b>SPICE 1-2-1</b>	Stand alone	3	Newer Windows versions (including Win XP)	yes	Medium Documentation, some help on using the program	ISO/IEC 15504	Process improvement Process capability determination
<b>CMM – Quest</b>	Stand alone	1.1	Newer Windows versions (including Win XP)	yes	Medium Documentation, some help on using the program	CMM	Capability determination
<b>CMMi – Browser</b>	MS-Access database	1.0e	Compatible with newer Windows versions	yes	Good documentation of CMMi No help on using the database	CMMi	-
<b>MISIME (CMMi-SE-SW)</b>	Questionnaire and Excel spreadsheet	1.1	Compatible with newer Windows versions	yes	Short documentation No real help on using the program	CMMi	Capability determination
<b>Trillium</b>	Excel spreadsheet	2.4	Compatible with newer Windows versions	yes	Short documentation	CMM	Product development capability determination
<b>Qaaudit</b>	Excel spreadsheet	1.0a	Compatible with newer Windows versions	yes	Some little help on using the tool		Quality assurance

## 4.2 Results

During the analysis of the several tools, some strength and weaknesses were being observed. They are presented in the following table.

**Table viii Strength and weaknesses of the assessment tools**

<b>Tool</b>	<b>Strength</b>	<b>Weakness</b>
<b>SEAL of Quality</b>	- good documentation provided by the book	- not usable with newer Windows versions - uses old version of the standard
<b>SPICE 1-2-1</b>	- user friendly GUI - preparation of the assessment - online report - password protection of files - additional information on definition and base practices - possibility of entering notes - language selection (English/German)	- GUI seems sometimes rather frisky - no description how the calculations are performed - no description why they use 0%, 33%, 66% and 100% as default values - too many graphical representations
<b>CMM – Quest</b>	- user friendly GUI - preparation of the assessment - password protection of files - additional information on definition and base practices - possibility of entering notes	- GUI seems sometimes rather frisky - no description how the calculations are performed - no description why they use 0%, 33%, 66% and 100% as default values - too many graphical representations
<b>CMMi – Browser</b>	- good reference guide for an assessment	- not an assessment tool, yet
<b>MISIME (CMMi-SE-SW)</b>	- useful for self assessments - idea to include a PowerPoint presentation to provide the possibility to propagate the need of an assessment beforehand	- pedestrian method: first fill out questionnaire and than copy the results in the tool - rather complex representation style (many spreadsheets) - only usable as self assessment tool
<b>Trillium</b>	- representation of results after each area assessed - description of the calculation	- almost no documentation - restricted assessment profile (already very specific questions) - labeling of the graphs
<b>Qaaudit</b>	- concise segmentation of the different aspects - idea of the traffic light graphs	- not much documentation - graphical representation of the output - restricted assessment profile (already very specific questions)

As result from the summary and the strengths and weaknesses of the seven tools investigated, the following aspects will be considered during the design of the assessment support tool for the Maintenance Domain:

- ❖ user friendly graphical interface
- ❖ not too fancy GUI - rather keep it simple and clear
- ❖ description of the calculation
- ❖ possibility to prepare assessments
- ❖ possibility to enter notes etc.
- ❖ documentation
- ❖ help considering the handling of the program
- ❖ password protection of files, if desired
- ❖ not too many different graphs representing the outputs
- ❖ concise labeling of the graphs
- ❖ multi-language support

## 5 SM<sup>MM</sup> ASSESSMENT TOOL (AST) DESIGN

### 5.1 Concept and Specification of the AST (Assessment Support Tool)

For the specification the Unified Modeling Language (UML) will be used. The diagrams are being modeled using the program Enterprise Architect<sup>6</sup> v4.00. At first a Use Case diagram will show the actors, their roles and possible actions in an assessment. It is followed by an activity diagram which will show the general functionality of the application flow. These first diagrams give a rough overview of the concept and will be gradually refined as needed as the conceptual design proceeds.

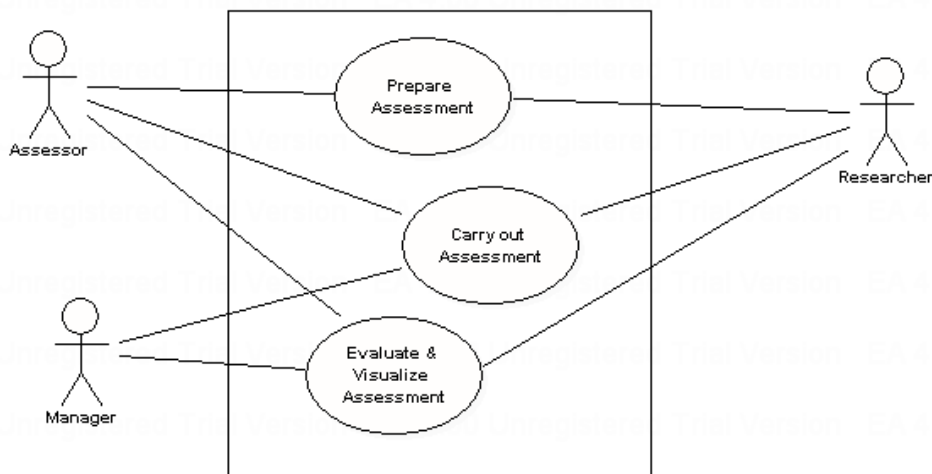


Figure 4 Use Case diagram for the assessment tool

Figure 6 will conduct the data model. It is represented as a class diagram, which is the equivalent in UML notation to an E-R- diagram [Silberschatz02].

Additional information:

- The assessment type can be either short or long
- The assessment languages planned are English, German and French

---

<sup>6</sup> Copyright by Sparx System.

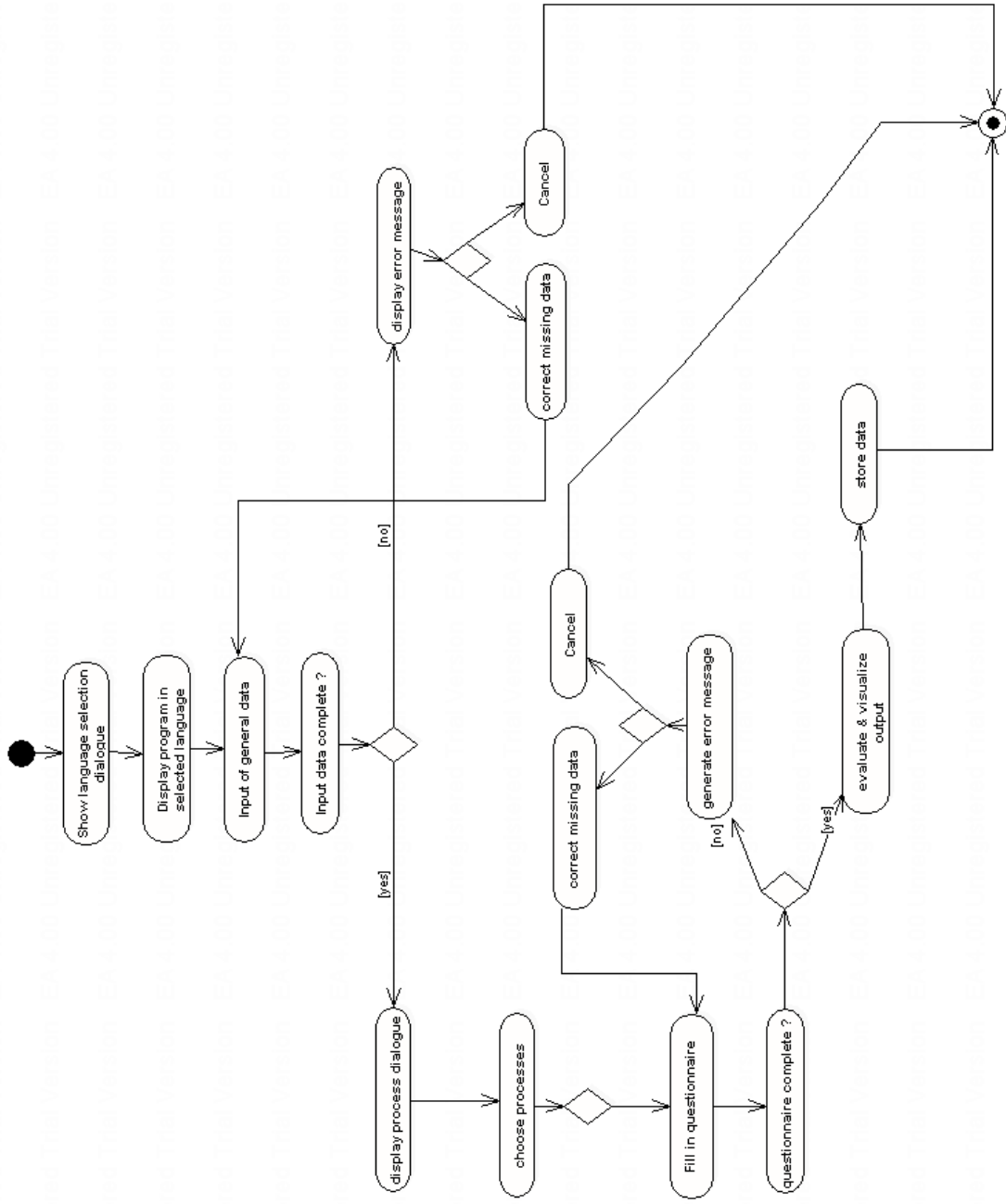


Figure 5 activity diagram of the assessment

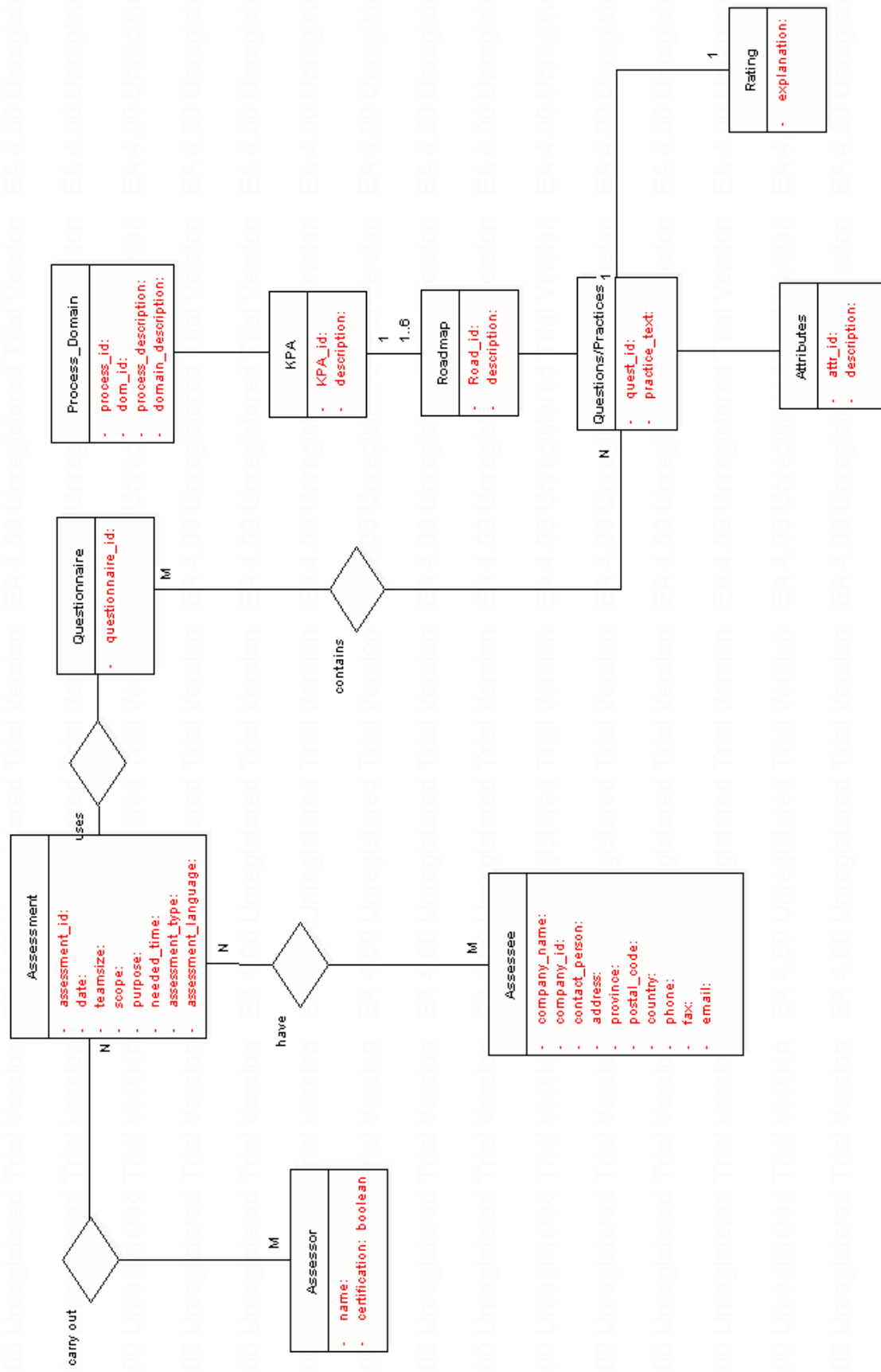


Figure 6 Class diagram of the assessment support tool

## 5.2 Proposals for the implementation of the AST

The following section will show examples through description and/ or pictures of how different aspects of the tool could be realized. This includes aspects of the look, the input and the output as well as aspects considering internal realization of components.

### 5.2.1 AST Look & Input

The first dialogue that appears in the program is the language selection dialogue. This dialogue should look similar to the figure below. The help button is not necessary in this case. The list of offered languages with the two buttons “OK” and “Cancel” will be enough for our purpose. As, for now, only the French version will be available, so that the other languages should be listed but not selectable (inactive)

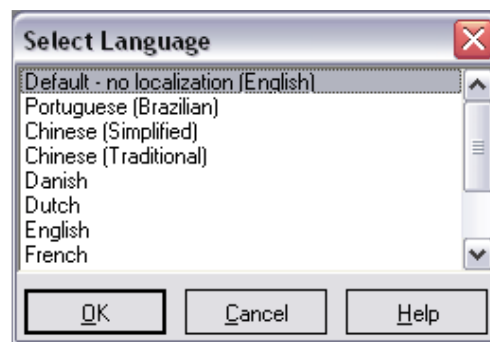


Figure 7 Example of a language selection dialogue<sup>7</sup>

The second step will be to collect the information of the company wishing to carry out the assessment. The required data can be collected through the form displayed below.

General Input Data of Assessee	
Company name	<input type="text"/>
Department	<input type="text"/>
Address	<input type="text"/>
Postal Code	<input type="text"/>
Province	<input type="text"/>
Country	<input type="text"/>
Phone	<input type="text"/>
Fax	<input type="text"/>
Contact Person	<input type="text"/>
email	<input type="text"/>

Figure 8 example for a general input data form

<sup>7</sup> Figure taken from <http://ems-hitech.com/mymanager/docs.phtml?docID=477>

The company should also have an identification number (company\_id in the class diagram). The suggestion here is to use the number of its position in the database. This will provide a consecutive numbering of the companies entered in the data set.

The other information that need to be collected as part of the general input data are:

- the assessment type
- the date
- the length of the assessment
- the sponsor
- the department/ group being assessed
- the identity of the assessor and if he is certified or not
- the highest capability level that should be assessed
- the selection of the processes to be assessed
- and, of course all the other input required by the ISO/IEC 15504 standard and the SM<sup>mm</sup>

The division of the input data will be done as shown below. It will mainly follow the class diagram only with slightly differences considering the scope.

#### Assessee

Company_name	Text
Company_id	Number
Contact_person	Text
Address	Text
Province	Text
Postal code	Number
Country	Text
Phone	Number
Fax	Number
Email	Text

#### Assessment Input

Date	Number
Team being assessed and their domain	Text
Teamsize	Number
Purpose	Text
Assessment type (quick, full)	Checkbox
Assessment_id	Number
Assessment_language	Number
Sponsor	Text
Relationship of Sponsor towards company	Text
Assessment_length	Number

#### Assessor

Name	Text
Certification	Boolean

#### Scope (Process dialogue)

Highest capability level to assess	Choice (numbers)
Processes	Selection possibility (text + checkbox)

The selection of the different processes in the scope should be done using a check box option. Only the processes checked will be included in the assessment. It should also be possible to view an explanatory text when the different items (domains, KPA...) are selected and to add notes to the different elements in the scope.

Therefore the screen should be divided in 2 columns. The left half of the screen will contain a listing of the different domains with the corresponding KPAs and question/practices. The right half is once more divided. This time it is split into two rows. The upper right half contains the explanations and additional information respectively. The lower right half contains the field where the additional notes can be written down by the assessor. The information needs to be stored in relation to the question/ practices it has been written down to. This information will be available during the assessment phase. Therefore it is necessary to attach the entered notes to the question/ practices it relates to.

As for the capability levels: the highest level to be assessed has to be chosen. Only questions lower or equal to the choice will be asked in the assessment. The way of choosing the level can be realized through an input field that allows the input from 0 to 5 or by selecting the level out of a list.

The dialogue for carrying the assessment should contain the questions up to the capability level chosen which have been selected in the preceding step. The notes that have been entered in the process selection dialogue have to be presented when the corresponding question/practice is being accessed.

The possibility to enter comments, evidence and any other information that shows and supports the judgment of the rating has to be stored and kept. This should be done in the same way as the notes by providing a field that allows entering the information. Once more this data has to be attached to the question/practice it relates to. In other words, should any questions or doubt arise considering a specific rating it is possible to go to the practice in question and get the assessment information that was entered for this question.

It is indispensable that all the question/practices selected are answered. Otherwise a message will appear telling the user to where he has to return to finish the questioning in order to complete the assessment.

The explanatory text that will be displayed whenever a Domain, KPA or practice is selected will mainly follow the design used in the book being in preparation by Professor April. The descriptions and additional information will also be extracted out of this book.

This design consists of these three entities:

First entity: the domain. Here the purpose of the domain as well as an overview of the different KPAs will be given. A short introduction to each of the Key Process Areas will be included.

Second entity: the KPA. At first a short description of the purpose of the particular KPA will be given. This is then followed by explanations about a) the intention, b) the objective(s), c) the relations to other KPAs and d) the expected outcome.

Furthermore it is possible that some introductory notes considering the KPA in general and/ or specific capability levels are given.

Third and last entity is the practice. This entity provides additional information about the single practices. Note, that not all of the practices contain additional information, yet.

## 5.2.2 AST Data storage

The storage of information is shown in Figure 9. The rows in the first column indicate the question/ practice number. The rows of the following columns contain the different language versions of the question/ practice. Each language has its own column.

The numbering is done using a four digit numbering system with the following information:

- Domain\_id
- KPA\_id
- Level
- Question/practice\_id

The representation in rows and columns can also be used to contain the description of the different Domains and KPAs. Whereby this time the first column indicates the number of the domain or practice and the adjacent columns contain the different languages.

	A	B	C	D
1	Question/ Practice	French	English	German
		Est-ce que la déclaration suivante décrit votre situation de travail: L'unité organisationnelle de maintenance du logiciel ne fait pas d'activité d'améliorations structurées des processus menant à des améliorations de processus persistantes et contrôlées	Does the following statement describe your current work situation: The SW-maintenance unit you work in does not perform any structured activity that aims at a persistent and controlled process improvement	Beschreibt die folgende Aussage Ihre gegenwärtige Situation: Die SW-maintenancegruppe in der Sie arbeiten führt keinerlei strukturierte Aktivitäten durch, die auf dauerhafte und kontrollierte Prozessverbesserungen ausgelegt sind
2	1.1.0.1		Does the following statement describe your current situation: The SW-maintenance unit you work in performs informal process improvement	
3	1.1.1.1		activities	

Figure 9 Representation of storing question/ practice information

### 5.2.3 Assessment Tool Output

The proposed output depicts the results of an assessment. This depiction has to be presented and formatted in an appropriate manner. As pointed out in chapter 4.2 the graphical representation will be simple but still conformant to the standard.

Different views will be provided. These views are, for example:

- capability levels of the different domains
- NPFL - rating of the different domains with their KPAs
- Risk overview
- Process attributes vs. assessed attributes

As mentioned earlier this thesis will concentrate on the capability determination task and will leave the process improvement and risk evaluation for future research domains.

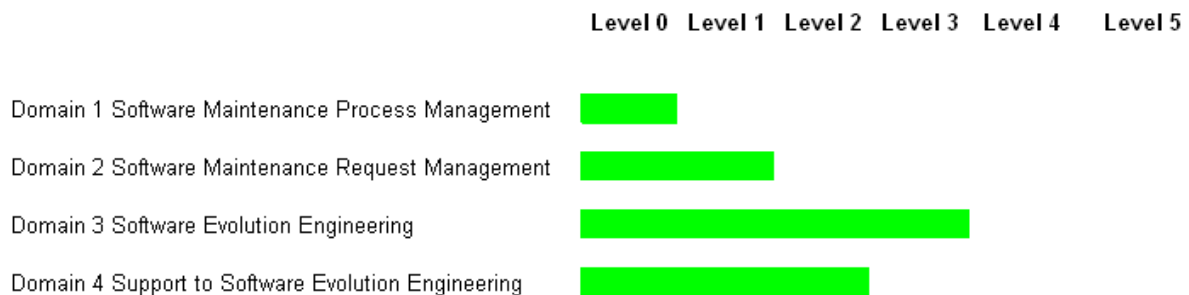
#### Capability determination

##### Domain vs. Capability Level graph

This graph should display up to which capability level the different domains reach. This provides an overview of the current state and indicates where future efforts and resources have to be supplied.

A bar graph was chosen because it provides a clear and understandable representation.

The following figure shows how the results of the SM<sup>mm</sup> process capability levels will be represented in the tool output:



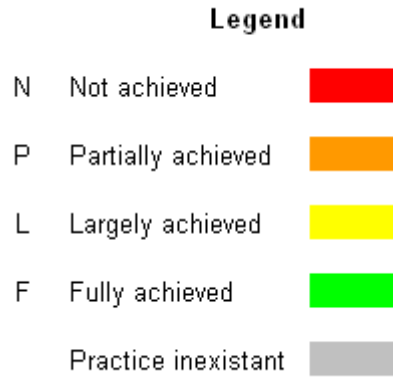
**Figure 10 Exemplary overview of the capability of the different domains<sup>8</sup>**

##### KPA vs. Capability level graph

The NPLF- rating will use a colour coded representation as shown in Figure 11. The colours were chosen according to the “traffic light graphs” of the Qaudit tool. This should provide a commonly used representation of the rating results. The grey does not mean that the question is not applicable. It should be considered as a not existent or not yet existent question/ practice.

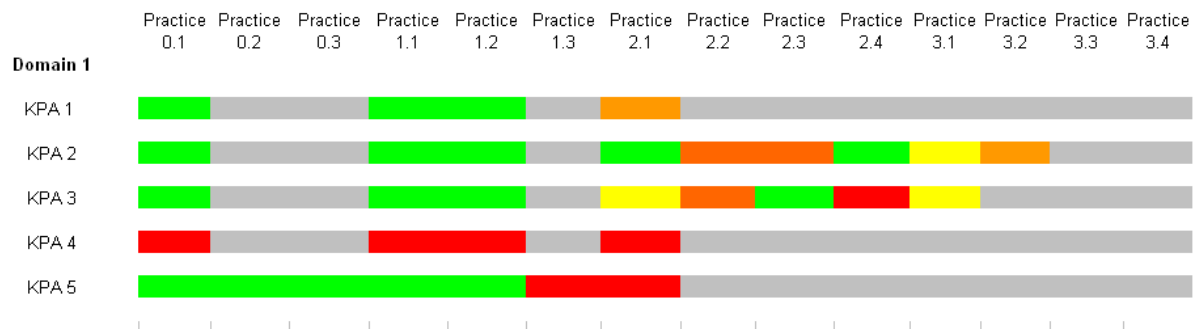
---

<sup>8</sup> Note that the representations of the results do only depict exemplary output graphs



**Figure 11 NPLF color legend**

The graph for the results of the NPLF-rating is exemplarily shown in Figure 12 for a domain with its KPAs and the corresponding question/ practices up to level 2.



**Figure 12 Exemplary NPLF graph**

### 5.3 Questionnaire

The complete Software Maintenance maturity model was recently sent to Ericsson to determine their interest in the SM<sup>mm</sup> assessment. They thought that the application of the whole model would be too complex for them. Instead they asked for a shorter version. Therefore a quick SM<sup>mm</sup> assessment was suggested. This quick assessment only comprises a representative set of the complete set described in the SM<sup>mm</sup>. This research will concentrate on this quick assessment support tool and will provide a tool that deals with this sub – set.

The following representative set of the domains, KPAs and Roadmaps was chosen for this purpose:

Here a remainder of the numbering of the different domains, KPAs etc. will be provided It is done using a numerical code consisting of 4 digits. The first digit indicates the domain, the second the KPA, the third the capability level, and the fourth the question number. The Roadmap is not taken into consideration in this representation. However, it is still referenced in the thesis to make it easier for future work to add the missing roadmaps.

Note, that the numbering of the Domains, their KPAs and roadmaps will not be changed. The original numbering given in Appendix C 1 will still be applied.

- Domain 1
  - KPA 1
    - Roadmap 2
  - KPA 2
    - Roadmap 1
  - KPA 3
    - Roadmap 1
  - KPA 4
    - Roadmap 1
  - KPA 5
    - Roadmap 1
- Domain 2
  - KPA 1
    - Roadmap 2
  - KPA 2
    - Roadmap 6
  - KPA 3
    - Roadmap 1
  - KPA 4
    - Roadmap 2
- Domain 3
  - KPA 1
    - Roadmap 4
  - KPA 2
    - Roadmap 1
  - KPA 4
    - Roadmap 2
- Domain 4
  - KPA 1
    - Roadmap 1
  - KPA 2
    - Roadmap 2
  - KPA 3
    - Roadmap 2

Note, that Level 0 and Level 1 are rated using a binary (yes/ no) rating scale. From Level 2 onwards the NPLF-rating scale will be applied.

Should the question to Level 0 be answered with “yes” it is not necessary to move on to the next level. The resulting level is Level 0.

Should the questions to Level 1 be answered with “yes” it is not necessary to move on to the next level. The resulting level is Level 0, as well.

Should one or more question(s) of Level 2 or higher levels be rated with “N” or “P” it is still interesting to move on in the rating and to ask the complete remaining questions. This is of interest because it provides a better overview of the capability. The reason for this is that level 0 and level 1 can be considered as the fundamental basis. If they are not fully achieved it is not desirable to check whether or not higher levels could have been reached. The company should solely concentrate on fulfilling level 0 and level 1 before moving the focus to higher levels.

The questionnaire for domain 1, KPA 1 up to Level 2 will be shown here in English. The remaining questionnaire will be provided in Appendix C 2 in French (the English translation is planned but not yet available) as well as the remaining questionnaire of the English version of domain 1, KPA 1. The information is adapted from [April04b].

Domain 1 Software Maintenance Process Management  
 KPA 1 Maintenance Process Focus  
 Roadmap 2 Information Gathering

Level	Number	Question	Rating
0	1	Does the following statement describe your current situation: The SW-maintenance organization(s) you work in does not perform any structured activity that aims at a persistent and controlled process improvement.	Yes No
1	1	Does the following statement describe your current situation: In your software maintenance organization the process improvements are done informally.	Yes No
	2	Does the following statement describe your current situation: Improvement activities are mainly individual initiatives and mostly done on technical issues.	Yes No
		How do the following statements describe your current situation:	
2	1	A company wide process improvement program has been established. The SW-maintenance managers have been informed and trained on the improvement program.	N P L F
	2	A software maintenance resource is assigned to co-ordinate process improvement activities.	N P L F
	3	A survey of software maintenance services and products is used to collect data that indicate possible process improvement activities.	N P L F
	4	Notices, comments and complaints received from customers and other involved organization(s) (e.g. developers, operations, help – desk, sub – contractors) are used to collect data that indicate possible process improvement activities.	N P L F
	5	Operational software benchmarks and comparisons are being used to collect data that indicate possible process improvement activities.	N P L F
	6	Data about SW failure is used to collect data that helps to find possible improvement activities in both maintenance processes as well as in the other organization(s)	N P L F
	7	The SW-maintenance group is subjected regularly to internal audits (e.g. internal auditors, ISO9001:2000, quality audits). The results are being used to address possible process improvement areas.	N P L F
	8	A partial or complete software maintenance process assessment has been done. One maintenance organization has been the subject of a process assessment. The results are being used to address possible improvement areas.	N P L F

## 5.4 Prototyping

The design will be followed by an iterative prototyping approach. The coding will be performed by a third party supporting this research. It is a master student of the École de Technologie Supérieure. The duration of this cooperation will be six weeks with a programming effort of 10 to 12 hours a week performed by this programmer.

The iterative prototyping approach was chosen because it offers the possibility to start of with a prototype and refine it stepwise throughout the development process until the final product is reached. The spiral depicted in the figure below shows the actions to be performed throughout the development cycle. The project will mainly follow this spiral, however, some of the steps that are beyond the scope of this work of six weeks will be skipped. The steps followed are highlighted in purple.

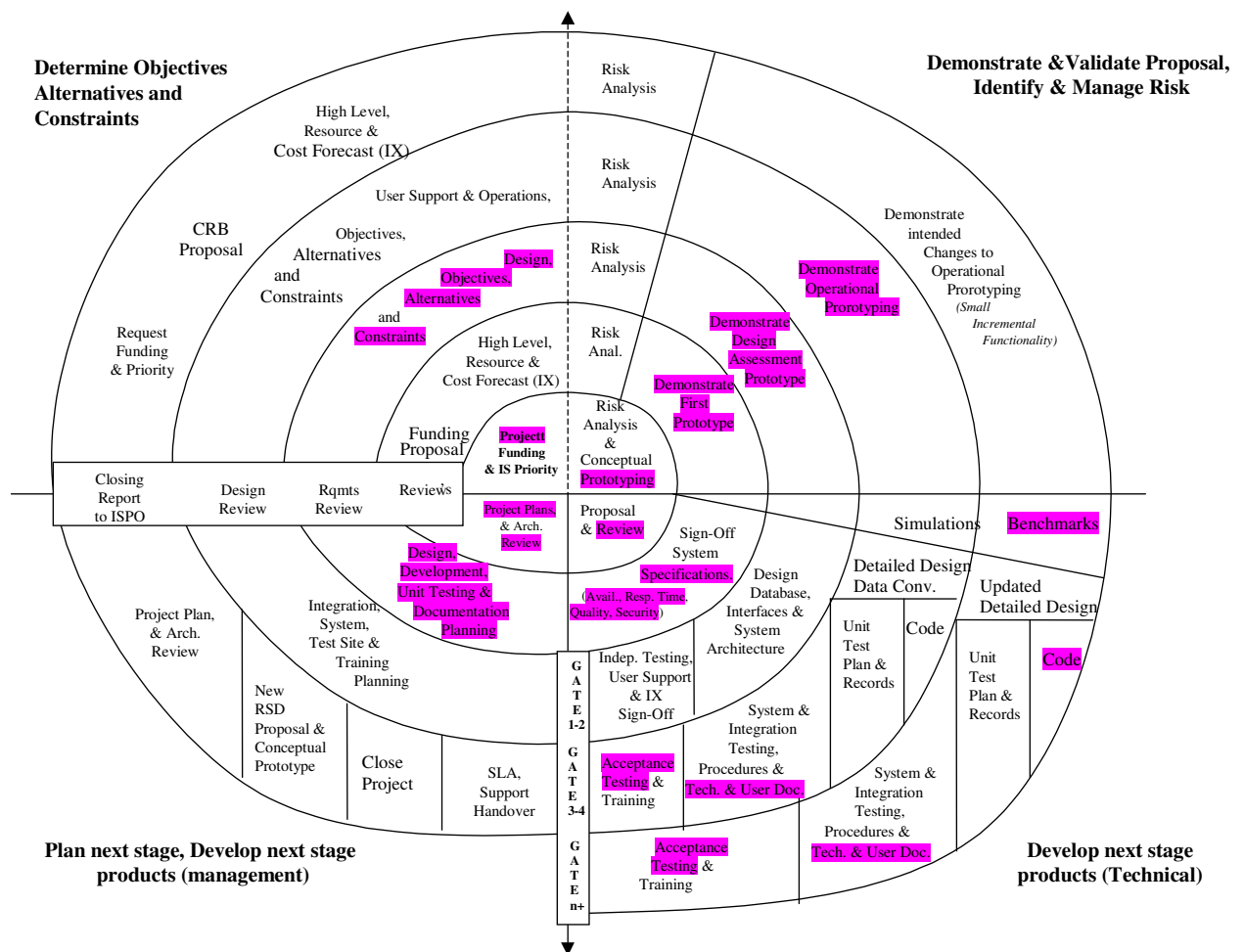


Figure 13 Essential aspects of the iterative prototyping approach

The spiral is divided into four sections. The direction in which it should be read is clockwise. Each of the four sections contains several steps that, when completed, advance the project towards the next maturity stage of the prototype. Every time a gate is reached the cycle for one prototype stage is finished and a new stage begins. This is repeated until the final product is achieved.

As already mentioned the coding part of the design will be done by a master student from the ETS. This research report will provide the concept, specification and design requirements that are needed to fulfil his task of coding.

Therefore at least once a week a meeting will be held to control the progress of the coding and to discuss arising questions, to provide additional information and to check the outputs against the specifications etc.

This chapter includes the information that was refined, altered etc. throughout the tool development process, as well as screenshots from the actual realisation of the tool.

Two meetings took place beforehand to provide the programmer with a short overview of the research and its goals.

The kick-off for the programming of the first prototype was 07. July 2004. In this meeting the technology for the project was defined to be Visual C++ using the MS-Visual C++ 6.0. It was also discussed how the looks and the behaviour of the resulting program should look like in general and the programmer was told to keep records about his programming action and to comment the source code. The cooperation will end on 11. August 2004.

The cooperation was settled as follows:

- at least a meeting once a week to confirm the progress of the programming
- each stage will be discussed during the meetings as well as arising questions from both sites
- each stage will be documented by a review containing supplements, rework to be done, missing elements etc.
- regular meetings are scheduled with Professor April to show him the status of the project

The Appendix Project Management contains the detailed overview of the different stages of programming by providing the reviews, additional information and changes performed during the cooperation. It also contains the documentation such as the user manual for the tool.

As mentioned in chapter 5.3 the SM<sup>mm</sup> is currently being translated and not yet available so that the first version of the tool will be provided in French.

Input: Table ix provides the information that was requested as reference information for the input data.

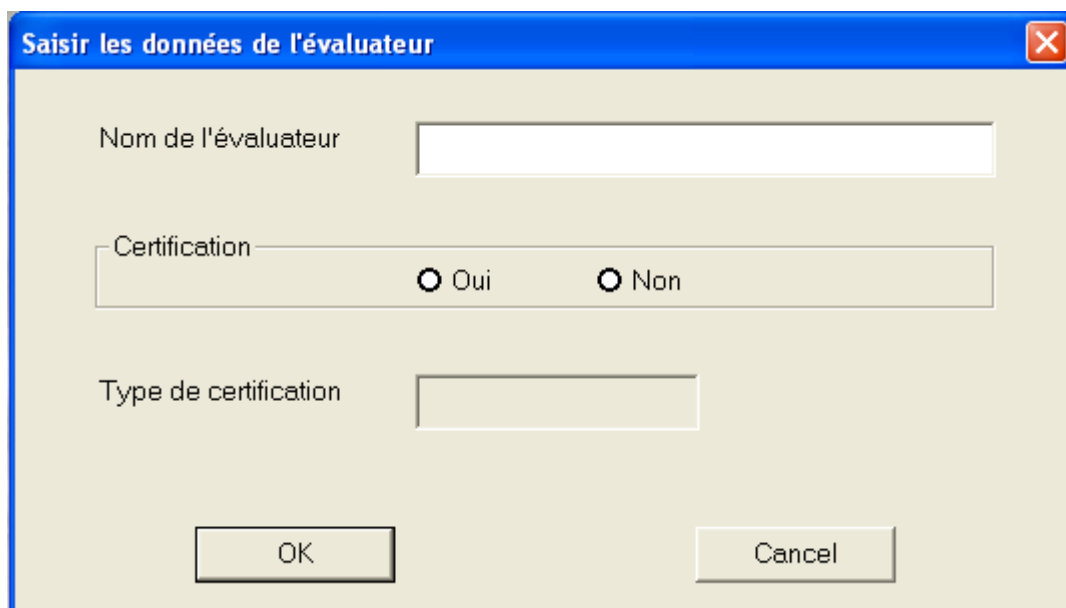
The following figures show screenshots of the actual look of the tool. The first figure depicts the language selection dialogue. As for now French is the default language.

The deactivation of the other languages is realized by jumping back to French when English or German is attempted to be selected.



**Figure 14 Screenshot of language selection dialogue**

Figure 15 shows the input dialogue solution for the assessor data. If “yes” in the certification field is checked the “certification type” is being activated to be able to write down the kind of certification the assessor possesses.



**Figure 15 Screenshot Assessor data input**

It was also pointed out that the description of the process selection dialogue resembles the representation used for the Windows Explorer. Therefore a tree structure has been chosen to represent this purpose. This can be seen in the practice selection (Figure 16 Screenshot of the selection tree) in the assessment preparation dialogue

**Table ix Reference information considering the input**

Assessee

Company_name	Text	My Company Inc
Company_id	Number	
Contact_person	Text	Hans Musterman
Address	Text	2345 New Boulevard Ouest
Province	Text	Quebec
Postal code	Number	H2V 3P7
Country	Text	Canada
Phone	Number	Country code city code phone number
Fax	Number	Country code city code fax number
Email	Text	H.Musterman@mycompany.com

Assessment Input

Date	Number	04.07 2004
Team being assessed and their domain	Text	Maintenance Team 1; Respond to change requests for the program
Teamsize	Number	5
Purpose	Text	Determine process improvement areas within this work environment
Assessment type (quick, full)	Checkbox	quick
Assessment_id	Number	
Assessment_language	Number	French
Sponsor	Text	Claude Vanier
Relationship of Sponsor towards company	Text	Senior Manager at My Company Inc.
Assessment_length	Number	(the time needed from selecting the practices to finish answering the practices e.g. 120min)

Assessor

Name	Text	Karl Gauthier
Certification	Boolean	Yes
Type of certification	Text	Lead TickIT auditor

Scope (Process dialogue)

Highest capability level to assess	Choice (numbers)
Processes	Selection possibility (text + checkbox)

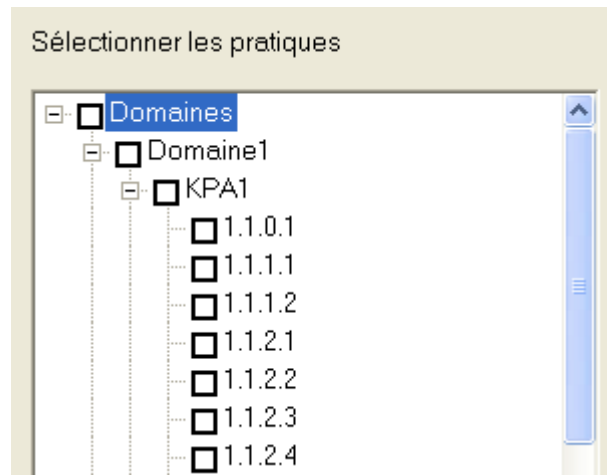


Figure 16 Screenshot of the selection tree

### Output

During a review the following problem occurred:

The representation of the NPLF – rating shown Figure 12 creates the impression that there are gaps within the KPAs even if it is not so. This impression is created by the varying numbers of practices in the different KPAs. This causes a disturbance to the viewer because the gap representation is used as an indicator for the risk of the processes in the risk evaluation graph. Therefore the representation was altered by eliminating the gaps. This was reached through the normalization of the practices and a representation by capability levels, as shown in Figure 17.

For the normalisation each level is considered to be of equal length. Each level is then divided into as many slices as the average of the practices contained in the KPA for this specific level. Let us illustrate this with the following example: KPA 4 has one practice for Level 0, while KPA 5 has three practices for it. This will result in one third of the total length for each of the practices in KPA 5, while the practice in KPA 4 gets the complete length. This normalization is demonstrated in Figure 17.

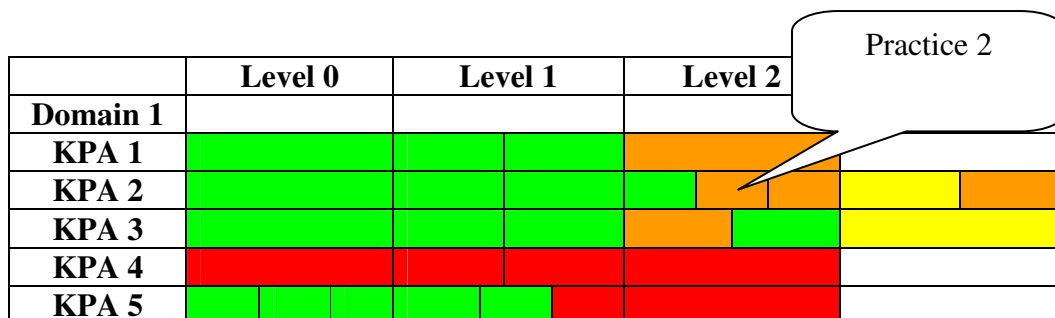


Figure 17 Altered representation of the NPLF-Rating

To keep the graph in manageable dimensions it is not possible to include the information about the identity of the practice in the graphical representation. That is why a context sensitive approach was chosen. This means that when the cursor is positioned over a certain slice a bubble will appear containing the name of the practice.

The colour code and the context sensitive approach will help to find and identify practices that do not completely fulfil the requirements.

Figure 18 shows how the output of KPAs vs. Capability Levels looks like in the assessment support tool. Due to the tight schedule the context sensitive help has not been implemented for this prototype.

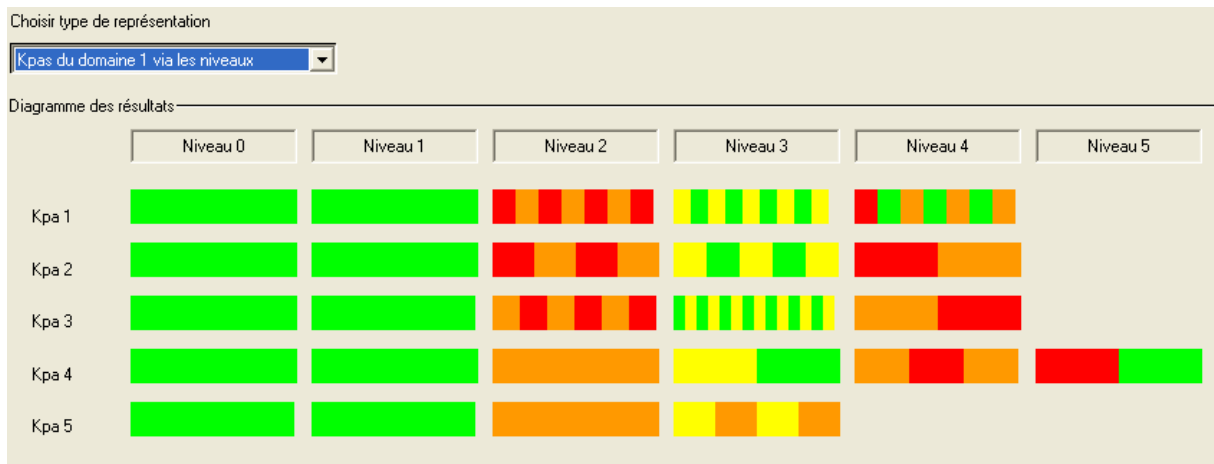


Figure 18 Screenshot of output representing KPA vs. Capability Level

The representation of the Domains vs. Capability Levels was also slightly altered. This representation takes into account only the practices that were rated with “fully achieved” in the assessment. In the case of Level 0 and Level 1 the practices answered with “no” will be considered as rated with “F”. They are then arranged starting from the left. The colour used is the colour for the fully achieved practices. In this case “green. The results can be seen in Figure 19.

It stands out, that some Capability Levels are only partially completed. These partially completions indicate where the current limits of the company’s capability lies. To be able to identify the KPAs and practices that have not been fully achieved, once more a context sensitive approach was chosen. Pointing at a partially completed level will cause a bubble to appear containing the information of the KPAs as well as the practices within the specific KPA that have been rated with “N, P” or “L”.

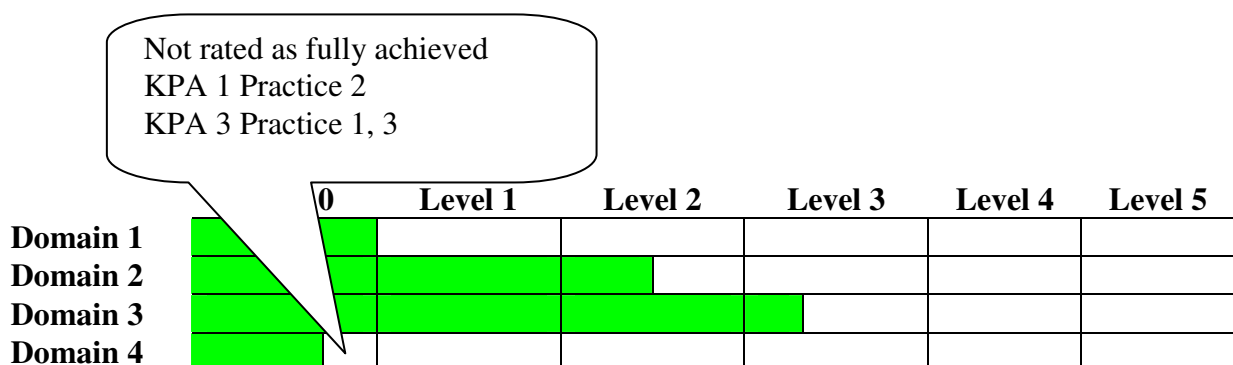


Figure 19 Altered representation of Domains vs. Capability Levels

## 6 EVALUATION AND BENCHMARK OF THE SM<sup>MM</sup> ASSESSMENT SUPPORT TOOL (AST)

This chapter will give an insight into the evaluation, the testing and the cooperation performed throughout the research work. It will start with the testing followed by an evaluation of the AST which was carried out by Prof. April who offered it because of his experience as an assessor in the industry for several years. Finally some words about the cooperation between the programmer and me will be provided.

### The testing

Usually two kinds of testing are performed to find out the quality. These two kinds are static and dynamic testing:

Static testing considers the testing of the source code solely. This method will be omitted in this thesis. The decision was based on the facts that a prototypic coding approach was chosen as well as the inexperience of the programmer with this kind of work and the short timeframe. It was predictable from the start that the source code would not meet up to high expectations considering style and structure.

Dynamic testing considers the functionality of the program. This method will be applied in this thesis. Therefore the program will be investigated taking the following questions as a basis:

- are the titles of the different dialogue boxes available and are they correct
- are all the entries present and shown in the appropriate windows
- are the buttons functional
- do the message boxes appear correctly (right time, right message)
- is the correct order of the assessment guaranteed
- are invalid data inputs possible
- is the data saving possible and performed correctly
- is the output depicted correctly
- is documentation about the coding process available (in the source code and as a manual)

The following table describes the outcomes of the investigation of the AST. Therefore it follows the order used in the tool adding details as needed.

**Table x Outcomes of the AST testing**

Requirement	Comment
<u>General input data dialogue</u>	
Programming language (Visual) C++	Fulfilled
Stand alone program	Fulfilled
Simple GUI	Fulfilled
Well-documented source code	Only little comments here and there available
Coding documentation	No
Language selection	Yes
Input dialogue	Yes
<u>Preparation of the assessment dialogue</u>	
- Maximum Capability level selection	Yes, but the selection is not transferred to the assessment dialogue
- selection of single practices	Not possible in this prototype

	Selection only by KPA
<u>Performing the assessment dialogue</u>	
-only the selected KPAs are presented	yes
-questions are displayed	Yes, but they have to be selected out of a provided list
- explanatory text is available	yes
- possibility to enter evidence for every single question	yes
<u>Output dialogue</u>	
- KPA vs. Capability levels	Yes, but the context sensitive help is not available in this prototype
- Domain vs. Capability levels	Yes, but the context sensitive help is not available in this prototype
- Process Improvement	Postponed to future work
- Risk	Postponed to future work
<u>Data Storage</u>	
- Save data	Yes, but not in a database. Instead, it is stored in a file. Due to short coding period
- password protection	Not available
- Load data	Postponed to future work
<u>Help</u>	
- help file	Currently not available in the AST Instead the user manual should be used.

### The evaluation

An evaluation is currently being performed using the demo version of this tool. Unfortunately the results will not be available for this thesis because some further work still has to be done before the outcome can be published.

### The cooperation

The team for fulfilling the task of creating a tool out of the design provided in this thesis consisted of two people: the programmer and me. The roles were divided as follows. The programmer would perform the coding and document his efforts and I would provide all the information, details and data that are needed for that task. We also agreed upon at least weekly meetings to see and discuss the progress and the further proceeding. Usually such a meeting took place as follows. The programmer handed in his current version of the program (sent via email). He then showed up to explain what he has done and we discussed what had to be done next or discussed difficulties and open questions he encountered during his coding effort. After that I reviewed the program taking into account the specifications and design of the tool. This resulted in a review file<sup>9</sup> including the answers to the questions (if any) asked during the discussion of the tool. This was then sent to the programmer immediately.

At some milestones meetings with Prof. April were held to keep him up to date with the progress and the schedule.

Unfortunately the cooperation was not always harmonious. Some of the main problems consisted of the programmer not wanting to make available his source code and complaining about the amount of work he had to perform. He also tried to meet with the professor more often to show him his progress although he should have come to me first. However, at the end solutions or compromises were found for most of the problems.

---

<sup>9</sup> The reviews can be found in Appendix D

## 7 SUMMARY & FUTURE WORK

The rising importance of software in our everyday life enhances also the maintenance effort. To be able to perform this growing task it is necessary to improve the processes applied in this domain. An approach that is already successfully applied in the Software Development Domain is to determine the Process Capability and localize potential Process Improvement Areas and evaluate the Risk at the same time. To be able to perform such an assessment it is necessary that a framework exists that is consistent, reliable and objective no matter which company in the maintenance domain carries it out. It is also desirable to get a tool support to automate the assessment and to facilitate the collection and storage of the accumulating data. The ISO/IEC 15504 standard provides such a basic, generic framework. That is why this thesis investigated the standard considering a tool support for the assessment process. Therefore the different parts of the standard as well as the requirements were analyzed in terms of specifications for an assessment support tool.

As the Standard addresses only generically the PCD and PI it is necessary to apply models that establish the Standard in a particular domain. This is an easy task for the domain of software development. For the software maintenance, however, this task is more difficult because this domain is only about to get the attention it deserves.

Professor April of the ETS dedicated his PhD-degree research to the establishment of a model for the improvement of software maintenance. It is called the Software Maintenance Maturity Model (SM<sup>mmm</sup>). The information provided by this model as well as the information derived from the ISO/IEC 15504 Standard built the basis for the environment of the assessment support tool AST.

The unified modeling language UML was used to design and specify the tool. The coding was performed by a master student supporting this research. My role shifted towards the position of a project manager supervising this master student by planning and scheduling the effort for the cooperation as well as reviewing the different programming stages. This resulted in a demo version of an assessment support tool based on the SM<sup>mmm</sup> and compliant to the ISO/IEC 15504 Standard.

Some aspects closely related to this thesis remain unaddressed because they were out of scope for this research. This provides a field for further research and includes:

- include the remaining KPAs and Roadmaps to be able to perform a full assessment
- add the Process Attributes which will support and confirm the NPLF-rating already in use, and which will also provide the information for the Process Improvement graph as well as the Risk Evaluation
- create a JAVA based tool to provide a platform independent version of AST
- perform assessments using AST
- publish the experiences with the tool

Throughout the first part of the research the findings were presented to several PhD-students of Prof. Abran. An interest in this field was shown and the outcome of this thesis will be provided to these people to analyze what and to which extent the tool can be integrated into their research. This will then result in extensions or additions to this basic version of the tool.

## 8 REFERENCES

- [April03] A. April , A. Abran, R. Dumke, "*Software Maintenance Capability Maturity Model (SM-CMM): Process Performance Measurement*", 13<sup>th</sup> International Workshop on Software Measurement – IWSM 2003, Montréal (Canada), Springer-Verlag, Sept. 23-25, 2003, pp. 311-326.
- [April04] A. April, A. Abran, R. Dumke, "*Assessment of Software Maintenance Capability: A model and its Architecture*", CSMR 2004, 8<sup>th</sup> European conference on Software Maintenance and Reengineering, Tampere (Finland), Mar. 24-26, 2004..
- [April04a] A. April , A. Abran, R. Dumke, "What do you need to know about Software Maintenance", MJ – Maintenance Journal, February 2004, p.10
- [April04b] April, A., Abran, A. , Dumke, R. *SM<sup>CMM</sup> Model to Evaluate and Improve the Quality of Software Maintenance Process: Overview of the model*, 4<sup>th</sup> Spice Conference on Process Assessment and Improvement, Lisbon, Portugal, 27-29 Avril 2004;
- [Bootstrap91] European Commission. Bootstrap. Esprit project #5441, European Commission: Brussels, Belgium, 1991; 26 pp.
- [Bourque91] Bourque, P. , Côté, Vianney; "An experiment in Software Sizing with Structured Analysis Metrics" J.Systems Software, 1991;15,159-172
- [Camelia94] Camélia. Modèle d'évolution des processus de développement, maintenance et d'exploitation de produits informatiques, Version 0.5. Projet France-Québec: Montréal, Canada, 1994; 115 pp.
- [Dumke00] Dumke, R. "Modernes Software Engineering" Vieweg Verlag, 2000
- [Dumke03] Lecture script "Softwarequalitätsmanagement (SWT2)"; Last checked 08.09.2004
- [ElEmam98] El Eman et al.: "*SPICE: The Theory and Practice of Software Process Improvement and Capability Determination*". IEEE Computer Society Press 1998
- [Hanna93] Hanna, M. "*Maintenance Burden Begging for a Remedy*", Datamation, April 1993, pp.53-63
- [ISO/IEC04] International Organization for Standardisation/ International Electrotechnical Commission (ISO/IEC): "*ISO 15504*", 2003/2004
- [Mendes96] Mendes, Olavo: "*Function Point Tool Market Survey*". Université du Québec à Montréal, Software Engineering Management Laboratory, 1996
- [Sei02] CMMI Product Development Team. "*Capability Maturity Model Integration for Software Engineering (CMMi)*", Version 1.1, CMU/SEI-2002-TR-028, ESC-TR-2002-028. Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA, 2002; 707 pp.
- [Silberschatz02] Silberschatz, A. , Korth, H.F. ,Sudarsan, S. "*Database System Concepts 4<sup>th</sup> Edition*" McGraw – Hill Companies, 2002

## APPENDIX A

### A 1 Documentation

#### User Manual

## User Manual

1. Introduction .....	52
2. Installation .....	52
2.1. System requirements .....	52
2.2. Installing the tool .....	52
3. Getting Started .....	53
3.1. Operating the tool .....	53
3.2. Starting the tool .....	53
4. Working with the Assessment Support Tool (AST) .....	53
4.1. The representation of the results .....	58
4.2. Saving the data .....	59
5. Help .....	59

### Introduction

This manual will provide you with the information considering the Graphical User Interface (GUI) and the usage of the tool.

### Installation

#### System requirements

The tool was tested using the following Operating systems

- ❖ Windows 2000
- ❖ Windows XP Professional

It is probably possible that it will work other versions as well. However, this can not be guaranteed as it was only tested using the Operating systems mentioned above.

#### Installing the tool

The tool is delivered in a zip-archive named AST.zip.

Please unzip/ unpack the archive in the same directory using an appropriate program (e.g. WinZip).

After unpacking the archive the following files have to be present in your directory:

- AST.exe
- Description.txt
- Evaluation.txt

## Getting Started

### Operating the tool

The tool is operated using mainly the mouse. The input data as well as comments and notes etc. will be handled through the keyboard.

### Starting the tool

To start the tool navigate to the directory you unpacked the archive to. There double-click on the file named *AST.exe*.

After that the welcome screen (Figure 20) will appear. Now press the “Créer”- Button to start a new assessment file.

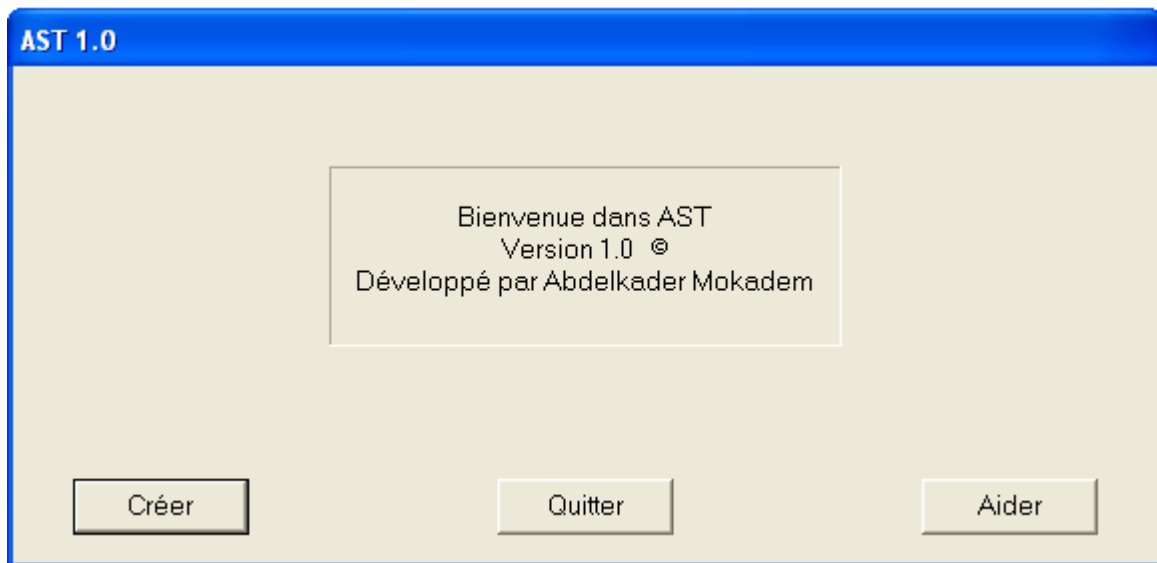


Figure 20

## Working with the Assessment Support Tool (AST)

After pressing the “créer”-button a dialogue will appear with the language selection (Figure 21). After your selection, hit the “OK”-button to move on to the next screen.

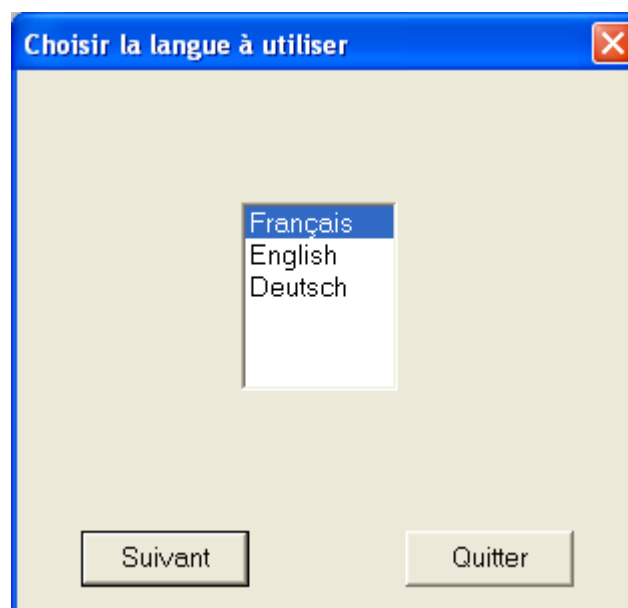


Figure 21

The next screen is the first of three input data dialogues. In this phase the required data needed for the assessment are being prompted. The order is a) company details, b) assessor details, and c) assessment details.

Figure 22 shows the third input data dialogue.

The dialog box is titled "Saisir les données de l'évaluation" and contains the following fields and controls:

- Parrain: Text input field
- Relation du parrain à l'entreprise: Text input field
- Département à évaluer: Text input field
- Taille: Text input field followed by the label "Personnes"
- Objectif: Text input field
- Type d'évaluation: Radio buttons for "Quick" and "Full"
- Date d'évaluation: Three text input fields for day, month, and year, with the format "(JJ.MM.AAAA)" to the right.
- Temps début de l'évaluation: Two text input fields for hours and minutes, with the format "(HH:MM)" to the right.
- Buttons: "Suivant" and "Précédent" at the bottom.

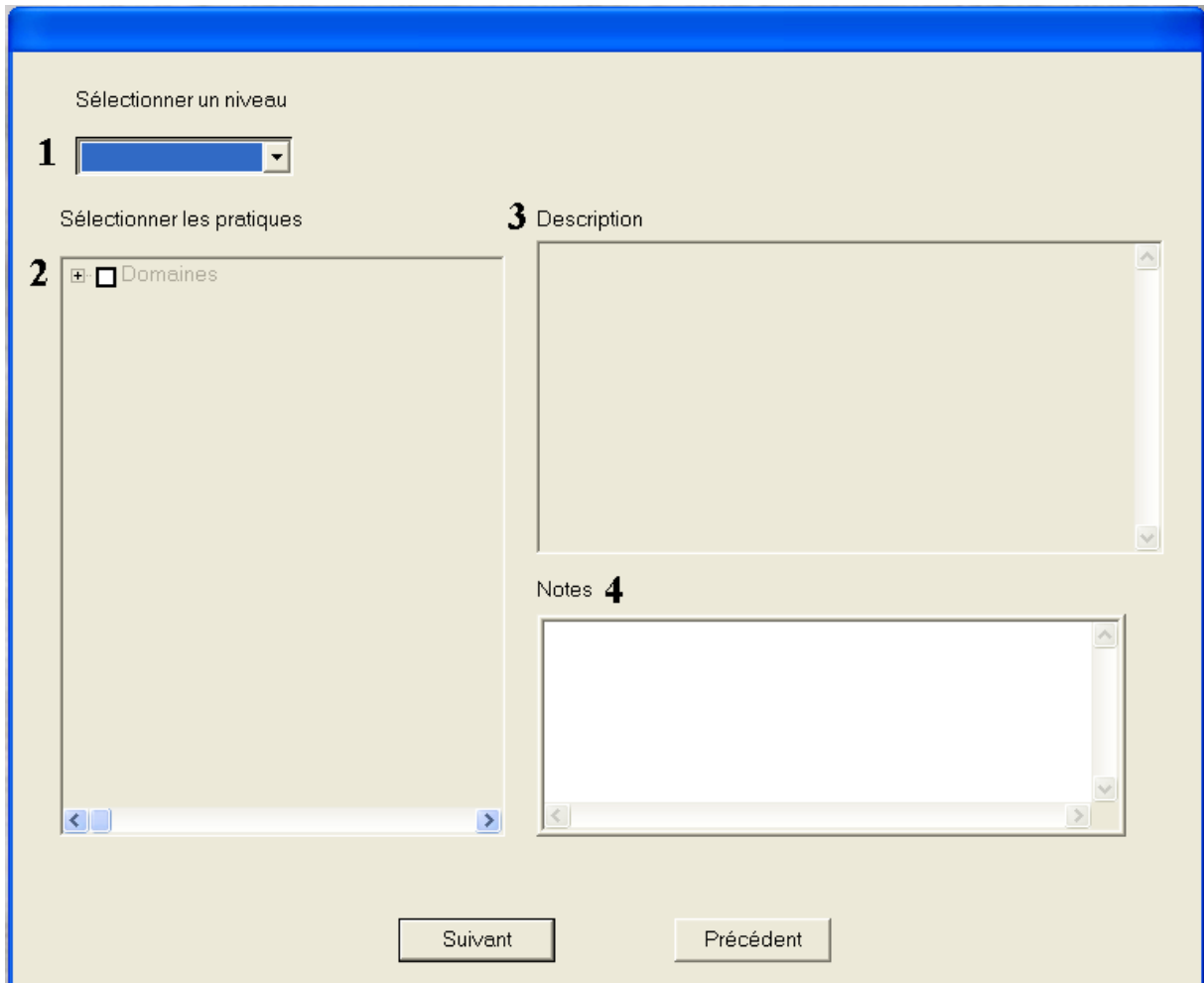
Figure 22

After completing this press the “suivant”- button. The assessment preparation dialogue will appear (Figure 23).

The first step that has to be made is to select a capability level (1). When it has been chosen the dialogue “sélectionner les pratiques” will be activated (2). By expanding the tree structure the subcategories will appear.

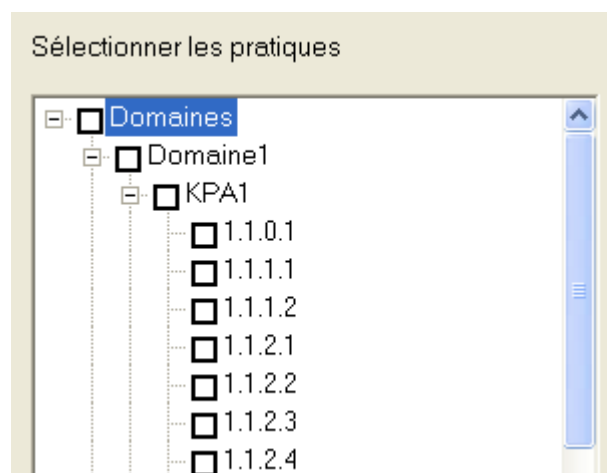
To see the description of any domain, KPA or practice please click on the desired item and the description will be shown in the description field (3)

It is also possible to write down notes for each practice. For this purpose fill in your note in the notes field (4).



**Figure 23**

The structure is build up as follows: There are four domains. Each of these domains is subdivided into several Key Process Areas (KPA). Each of the KPA contains several questions (Figure 24). In this version of the tool the selection of the assessment questions is done by selecting KPAs. To select one KPA simply click on the little square in front of the KPA and a checkmark will appear indicating that this KPA has been selected.



**Figure 24**

When the selection is completed, click on the “suivant”-button to move on to the performing the assessment dialogue.

This dialogue is show in Figure 25.

It is build up in a record card style (1). The different record cards represent the selected KPAs with the corresponding practices (2) within the domains.

To see the questions to and the descriptions of the practices, select the corresponding number from the pull down menu (3). The question will appear (in capital letters) followed by the description. The comment field (4) should be used to write down the objective evidence, additional information and remarks that have been collected throughout the assessment process.

When all the questions have been answered you will automatically being transferred to the record card containing the results named “Analyse”.

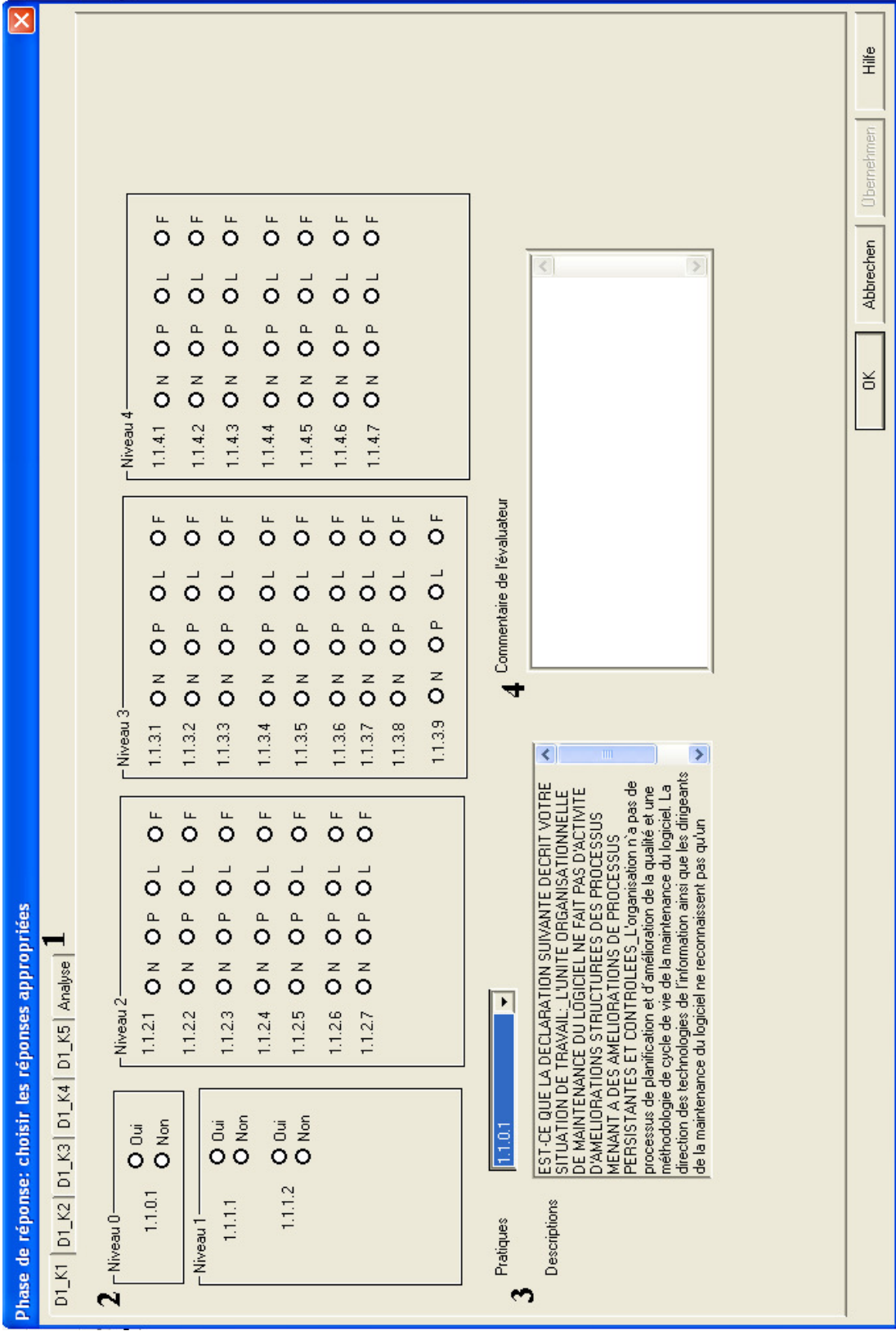


Figure 25

## The representation of the results

To finish the input phase of the assessment, push the button “Saisir la fin de l’évaluation” (1).

Figure 26 shows the last dialogue containing the output of the assessment.

The legend for the color code of the results can be seen at (2). Several different representations are available these can be selected through the pull down menu (3). The results of the assessment will be displayed in (4).

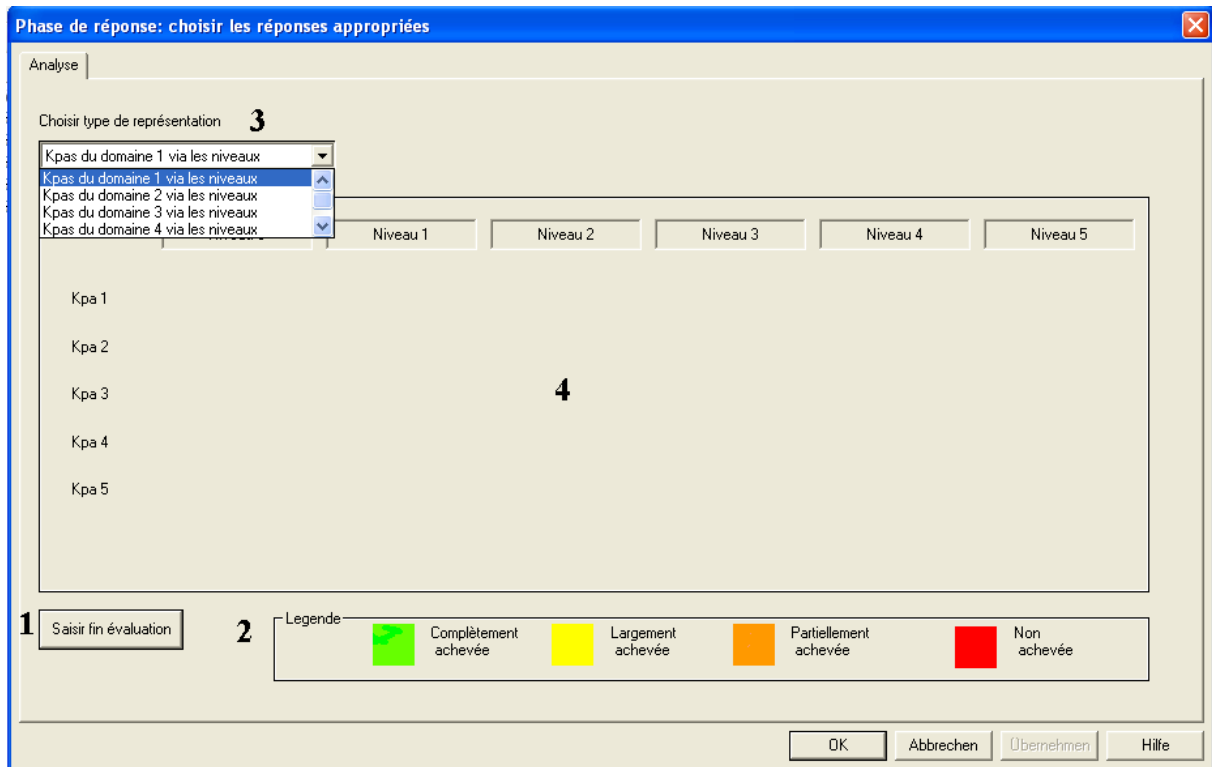


Figure 26

An exemplary output of the results is provided by Figure 27.

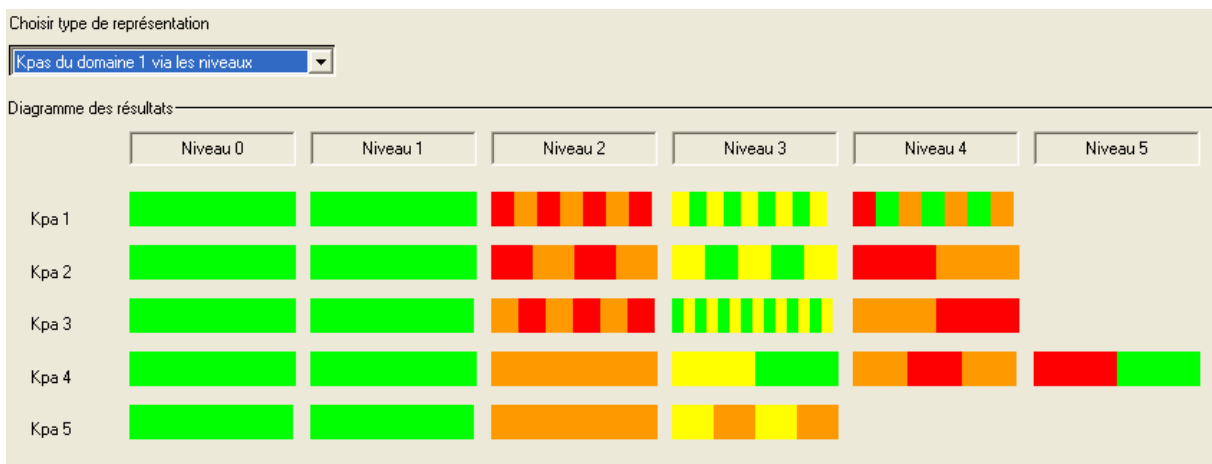


Figure 27

## Saving the data

To save your assessment data and exit the program press the “OK”- button (Figure 26). A dialogue box will open asking you to press “OK” to save and leave the program or to press “Cancel” and return to the tool. When you press the “OK”-button the following box will show up (Figure 28).



Figure 28

Your data has been successfully saved and you can find it under the name of “evaluation.txt” in the AST-directory.

Before performing another assessment please make sure that you go to the directory and rename the “evaluation.txt”. Otherwise your former data will be overwritten and is lost.

## Help

The user manual will be included in the help file of the tool.

## APPENDIX B

### B 1 Presentation held on 15.06.2004



## Design and Prototypical Implementation of an ISO/IEC 15504 PCD/ PI Assessment Support Tool

Isabelle Côté  
Otto von Guericke Universität Magdeburg, Germany  
in Cooperation with the  
École de Technologie Supérieure, Montréal, Canada

# Overview

- Introduction
- The ISO/IEC 15504 Standard
- The Process Reference Model
- Existing Assessment Tools
- Conclusions & Future Work

Isabelle Côté ISO/IEC 15504  
Assessment Support Tool

2

# Introduction

- Motivation
  - growing influence of software in everyday life
  - Rising need for process improvement & capability
  - Up to now main focus of research in SW-development
  - Maintenance domain overlooked
    - Lack of models & best practices

Isabelle Côté ISO/IEC 15504  
Assessment Support Tool

3

# Introduction

- Difference existing between models needed for development and maintenance
- New models needed
- Initiative to provide the missing models and best practices
  - SM<sup>mm</sup>

Isabelle Côté ISO/IEC 15504  
Assessment Support Tool

4

# Introduction

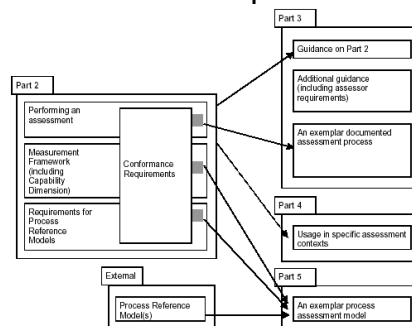
- Objective
  - Provide an assessment
  - Tool support
    - Based on:
      - ISO/IEC 15504
      - SM<sup>mm</sup>

## The ISO/IEC 15504 Standard

- Consists of 5 parts
  - Vocabulary & Concepts
  - Performing an assessment
  - Guidance on performing an assessment
  - Guiding on using assessment results
  - An exemplar process assessment model

## The ISO/IEC 15504 Standard

- Overview of relationships



# The ISO/IEC 15504 Standard

- Consists of 5 parts
  - Vocabulary & Concepts
  - Performing an assessment
  - Guidance on performing an assessment
  - Guiding on using assessment results
  - An exemplar process assessment model
  - Rating Guidance
  - Capability levels (later)

# The ISO/IEC 15504 Standard

- The rating guidance
  - NPLF- rating on ordinal scale
  - Transformation into percentage

Rating	Achievement in %
N	0 – 15
P	> 15 – 50
L	> 50 – 85
F	> 85 – 100

# The ISO/IEC 15504 Standard

- Minimum
  - Activities
    - Planning, Data Collection...
  - Input
    - Sponsors, purpose...
  - Output
    - Identification of objective evidence, identification of risk...

## The Process Reference Model

- Based on several models
  - SEI CMMi, Camélia
- Complement to the CMMi
  - For processes in common
- Customer focused benchmark
  - Assessment
  - Self-Assessment

## The Process Reference Model

- Capability Levels (with risk indicator)

Level	Level Name	Risk	Interpretation
0	Incomplete	Highest	No sense of process
1	Performed	Very High	ad hoc maintenance process
2	Managed	High	basic request-based process
3	Established	Medium	state-of-the-art maintenance process
4	Predictable	Low	generally difficult to achieve now
5	Optimizing	Very Low	technologically challenging to attain

## The Process Reference Model

- Consists of
  - 4 domains
  - 18 KPAs
  - 74 Roadmaps
  - 443 Practices
- For this research:
  - 16 KPAs
  - 16 Roadmaps

## Existing Assessment Tools

Tool	Type	Version	Platform	Adaptability	Documentation/ Help	Standard	Goal
SEAL	Stand alone	VersionA VersionB	Win 3.1 Win95	yes	Good documentation (complete book)	ISO/IEC TR 15504	Process improvement support Process capability determination
SPICE 1-2-1	Stand alone	3	Newer Windows versions (including Win XP)	yes	Medium Documentation, some help on using the program	ISO/IEC 15504	Process improvement Process capability determination
CMM – Quest	Stand alone	1.1	Newer Windows versions (including Win XP)	yes	Medium Documentation, some help on using the program	CMM	Capability determination
CMMi – Browser	MS-Access database	1.0e	Compatible with newer Windows versions	yes	Good documentation of CMMi No help on using the database	CMMi	-

Isabelle Côté ISO/IEC 15504  
Assessment Support Tool

14

## Existing Assessment Tools

Tool	Type	Version	Platform	Adaptability	Documentation/ Help	Standard	Goal
MISIME (CMMi-SE-SW)	Questionnaire and Excel spreadsheet	1.1	Compatible with newer Windows versions	yes	Short documentation No real help on using the program	CMMi	Capability determination
Trillium	Excel spreadsheet	2.4	Compatible with newer Windows versions	yes	Short documentation	CMM	Product development capability determination
Qaudit	Excel spreadsheet	1.0a	Compatible with newer Windows versions	yes	Some little help on using the tool		Quality assurance

Isabelle Côté ISO/IEC 15504  
Assessment Support Tool

15

## Existing Assessment Tools

- user friendly graphical interface
- not too fancy GUI rather keep it simple and clear
- description of the calculation
- possibility to prepare assessments
- possibility to enter notes etc
- documentation

Isabelle Côté ISO/IEC 15504  
Assessment Support Tool

16

## Existing Assessment Tools

- help considering the handling of the program
- password protection of files if desired
- not too many different graphs representing the outputs
- concise labeling of the graphs
- multi-language support

## Conclusion & Future Work

- Importance of SW increases
- Necessary to perform PI & PCD
- Maintenance possesses a great share
  - Develop models specializing in this domain
  - No tools available
  - SM<sup>mm</sup> and ISO/IEC 15504 as basis available

## Conclusion & Future Work

- Future Work (beyond this thesis)
  - Use of tool
  - Publication on the use of the tool
  - Implementation of further functions

## Conclusion & Future Work

- Future work (in this thesis)
  - Design of tool
  - Prototypical implementation
  - Testing
  - Interpretation
  - Extrapolation of results
  - List of functions to be developed

## Overview

- Introduction
- The ISO/IEC 15504 Standard
- The Process Reference Model
- Existing Assessment Tools
- Conclusions & Future Work

## APPENDIX C

### C 1 Numbering of the Domains, KPAs and Roadmaps

#### Domain 1: Software Maintenance Process Management

##### KPA 1: Maintenance Process Focus

Roadmap 1: Responsibility and communication

Roadmap 2: Information gathering

Roadmap 3: Findings

Roadmap 4: Action Plan

##### KPA 2: Maintenance Process/ Service Definition

Roadmap 1: Documentation and Standardization of processes/ services

Roadmap 2: Process/ Service Adaptation

Roadmap 3: Communication processes/ services

Roadmap 4: Repository of processes/ services

##### KPA 3: Maintenance Training

Roadmap 1: Requirements, plans, and resources

Roadmap 2: Personal training

Roadmap 3: Initial training of newcomers

Roadmap 4: Projects training on transition

Roadmap 5: User training

- KPA 4: Maintenance Process Performance
  - Roadmap 1: Definition of maintenance measures
  - Roadmap 2: Identification of baselines
  - Roadmap 3: Quantitative management
  - Roadmap 4: prediction models
- KPA 5: Maintenance Innovation and Deployment
  - Roadmap 1: Research of innovations
  - Roadmap 2: Analysis of improvement proposals
  - Roadmap 3: Piloting selected improvement proposals
  - Roadmap 4: Deployment of improvements
  - Roadmap 5: Benefit measurements of improvements

#### Domain 2: Software Maintenance Request Management

- KPA 1: Event and Service Request Management
  - Roadmap 1: Communication and contact structure
  - Roadmap 2: Management of events and service requests
- KPA 2: Maintenance Planning
  - Roadmap 1: Maintenance Planning
  - Roadmap 2: Project transition planning
  - Roadmap 3: Disaster Recovery planning
  - Roadmap 4: Capacity planning
  - Roadmap 5: Versions and upgrade planning
  - Roadmap 6: Impact analysis
- KPA 3: Monitoring and Control of Service Requests and Events
  - Roadmap 1: Follow up on planned and approved activities
  - Roadmap 2: Review and analyze progress
  - Roadmap 3: Urgent changes and corrective measures
- KPA 4: SLAs and Supplier Agreements
  - Roadmap 1: Account Management of users
  - Roadmap 2: Establish SLAs and contracts
  - Roadmap 3: Execute services in SLAs and contracts
  - Roadmap 4: Report, explain and bill services

#### Domain 3: Software Evolution Engineering

- KPA 1: Software Transition
  - Roadmap 1: Developer and owner involvement and communications
  - Roadmap 2: Transition process surveillance and management
  - Roadmap 3: Training and knowledge transfer surveillance
  - Roadmap 4: Transition preparation
  - Roadmap 5: Participation in system and acceptance tests
- KPA 2: Operational Support
  - Roadmap 1: Production software monitoring
  - Roadmap 2: Support outside normal hours
  - Roadmap 3: Business rules and functionality support
  - Roadmap 4: Ad hoc request/ report/ services
- KPA 3: Software Evolution and Correction
  - Roadmap 1: Detailed design
  - Roadmap 2: Construction (programming)
  - Roadmap 3: Testing (unit, integration, regression)
  - Roadmap 4: Documentation
- KPA 4: Software Verification and Validation
  - Roadmap 1: Reviews
  - Roadmap 2: Acceptance tests
  - Roadmap 3: Move to production

#### Domain 4: Support to Software Evolution Engineering

##### KPA 1: Software Configuration Management

Roadmap 1: Change management

Roadmap 2: Baseline configuration

Roadmap 3: Reservation, follow-up, and control

##### KPA 2: Process and Product Quality Assurance

Roadmap 1: Objective evaluation

Roadmap 2: Identify and document non – conformances

Roadmap 3: Follow up on corrections/ adjustments

##### KPA 3: Measurement and Analysis of Maintenance

Roadmap 1: Define measurement program

Roadmap 2: Collect and analyze measurement data

Roadmap 3: Repository of maintenance measures

Roadmap 4: Communicate measurement analysis

##### KPA 4: Causal Analysis and Problem Resolution

Roadmap 1: Investigate defects and defaults

Roadmap 2: Identify causes

Roadmap 3: Analyze causes

Roadmap 4: Propose solutions

##### KPA 5: Software Rejuvenation, Migration and Retirement

Roadmap 1: Re- documentation of software

Roadmap 2: Restructuring of SW

Roadmap 3: Reverse engineering of SW

Roadmap 4: Reengineering of SW

Roadmap 5: SW migration

Roadmap 6: SW retirement

## C 2 Questionnaire

Continuation of Domain 1 Software Maintenance Process Management  
 KPA 1 Maintenance Process Focus  
 Roadmap 2 Information Gathering

3		How do the following statements describe your current situation:	
	1	A process improvement and quality program specifically adapted to SW-maintenance has been initiated. The senior manager has taken over sponsorship of this initiative.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	All middle managers and SW-maintenance employees have been trained in the SW-maintenance process improvement and quality program.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	3	High – level goals for process quality and performance have been established. They are communicated throughout the company’s hierarchy.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	4	Measures considering customer satisfaction are used in a systematic way to determine improvement areas.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	5	Senior management conducts regular employee surveys assessing their moral, satisfaction and the company quality, culture and status (e.g. leadership, teamwork, innovation).	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	6	Interfacing organization(s) (developers, help – desk, sub – contractors) are actively involved in the support process improvement with the aim to improve inter- group communications.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	7	The SW-maintenance organization(s) initiated an improvement group (SEPG). This organization uses existing data available on SW-defects and failures to detect possible process improvement areas for developers, SW-suppliers and operations.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	8	Comparisons between SW-profiles and external benchmarking are used to collect data that indicate possible process improvement areas.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

	9	All SW-maintenance organization(s) are subjected to process assessment regularly considering process capability. The results are used as input to the improvement program.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
4		How do the following statements describe your current situation:	
	1	The process improvement and quality program specific to the SW-maintenance organization is quantitatively managed.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	The entire software maintenance management team has been trained and has developed and applied those techniques within their SW-maintenance process improvement and quality program.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	3	The quantitative objectives of process quality and improvement are established. These objectives take into account current performance levels. The objectives are communicated throughout the companys hierarchy.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	4	Upper management communicates regularly how the software maintenance organization is meeting its objectives. The organization recognizes the personnel achievements towards the objectives.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	5	The SEPG responsibilities are enhanced with the additional responsibility to quantitatively manage the software maintenance improvement program.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	6	The quantitative data issue from the software maintenance improvement program are available to all the personnel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	7	All maintenance organization(s) have obtained a certain capability level and strive quantitatively in progressing in their work, quality and maturity.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

Domain 1 Software Maintenance Process Management  
KPA 2 Maintenance Process/ Service Definition  
Roadmap 1 Documentation and Standardization of process/ services

Level	Number	Question	Rating
		Est-ce que la déclaration suivante décrit votre situation de travail:	

0	1	L'unité organisationnelle de la maintenance du logiciel ne fait pas d'activité de définition des processus et des services offerts avec l'objectif d'établir et de maintenir un répertoire courant et utilisable par sa clientèle.	<input type="checkbox"/> Oui	<input type="checkbox"/> No		
		Est-ce que la déclaration suivante décrit votre situation de travail:				
1	1	Les processus et services, dans l'unité organisationnelle de la maintenance du logiciel, sont informels et basés sur l'expérience des individus.	<input type="checkbox"/> Oui	<input type="checkbox"/> No		
		Est-ce que la déclaration suivante décrit votre situation de travail:				
	2	Des initiatives individuelles de documentation des processus et des services de la maintenance visent principalement des aspects techniques particuliers à certains logiciels ou décrivent, dans un format local, les activités d'une unité organisationnelle spécifique de la maintenance du logiciel.	<input type="checkbox"/> Oui	<input type="checkbox"/> No		
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:				
	1	Il existe au moins une description des processus/services de la maintenance qui est utilisée par la clientèle et l'unité organisationnelle de la maintenance du logiciel de l'organisation.	<input type="checkbox"/> N	<input type="checkbox"/> P	<input type="checkbox"/> L	<input type="checkbox"/> F
	2	Certaines parties des processus et des services de la maintenance sont documentées et utilisées par les unités organisationnelles de la maintenance du logiciel de l'organisation.	<input type="checkbox"/> N	<input type="checkbox"/> P	<input type="checkbox"/> L	<input type="checkbox"/> F
	3	Il existe des activités visant à élaborer des processus et services normalisés au sein de l'organisation de la maintenance du logiciel.	<input type="checkbox"/> N	<input type="checkbox"/> P	<input type="checkbox"/> L	<input type="checkbox"/> F
	4	L'organisation de la maintenance reconnaît et encourage l'utilisation de processus/services normalisés et l'utilisation de normes pertinentes à la maintenance du logiciel (c à d : l'ISO12207 [Iso95], ISO14764 et de l'IEEE1219).	<input type="checkbox"/> N	<input type="checkbox"/> P	<input type="checkbox"/> L	<input type="checkbox"/> F

3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Les ressources (humaines, matérielles, financières, etc.) nécessaires au développement, à la maintenance et à l'exploitation des actifs de l'organisation en matière de processus, sont dégagées conformément à une procédure documentée.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Les processus et services normalisés de maintenance (participation dans les projets, transition, gestion des requêtes, support opérationnel, gestion des versions, mesure, etc.) sont documentés en incluant notamment, une représentation graphique du processus, des différents intervenants et des entrées et sorties principales.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	3	La méthodologie de la maintenance du logiciel utilisée pour les requêtes modifiant le logiciel (corrective, adaptive, perfective et préventive) est établie, documentée et maintenue.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	4	Les processus et services normalisés de la maintenance de l'organisation sont développés et évoluent conformément à une procédure documentée.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	5	Les processus et services normalisés de la maintenance du logiciel sont périodiquement réévalués et améliorés.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
4		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Des techniques de simulation des processus sont utilisées afin d'optimiser les activités de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Il existe un référentiel des processus normalisés (description, directives de personnalisation, normes de codage, procédures d'élaboration) qui est facilement adapté et utilisé dans le cadre de la transition, des activités de support, des requêtes ou de la gestion du contrat de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

Domain 1 Software Maintenance Process Management  
 KPA 3 Maintenance Training  
 Roadmap 1 Requirements, plans, and resources

Level	Number	Question	Rating
0		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	L'unité organisationnelle de maintenance du logiciel ne fait pas d'activité de formation structurée sur les projets en transition vers la maintenance, les logiciels opérationnels existants, les processus ou la motivation du personnel de la maintenance du logiciel.	<input type="checkbox"/> Oui <input type="checkbox"/> No
1		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	La formation, dans l'unité organisationnelle de maintenance du logiciel, est dispensée quand le besoin se fait sentir.	<input type="checkbox"/> Oui <input type="checkbox"/> No
		Est-ce que la déclaration suivante décrit votre situation de travail:	
	2	Des initiatives individuelles de formation visent principalement les aspects techniques internes de la maintenance du logiciel. Une personne senior est assignée à une personne junior et répond à ses questions.	<input type="checkbox"/> Oui <input type="checkbox"/> No
		Est-ce que la déclaration suivante décrit votre situation de travail:	
	3	Les plans de formation du nouveau personnel traitent de sujets généraux en gestion, processus et en maintenance du logiciel.	<input type="checkbox"/> Oui <input type="checkbox"/> No
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Le personnel de la maintenance se familiarise et se re-familiarise avec le logiciel qu'il maintient sur une base régulière.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Le personnel de la maintenance est formé et motivé afin de donner une bonne performance dans le processus et dans son rôle.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

	3	De la formation en communication avec la clientèle est offerte au personnel de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	4	Les comparaisons de formation des ressources du logiciel sous forme d'étalons internes pertinents sont utilisées afin de recueillir des données qui orientent les efforts de formation des ressources la maintenance.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	5	Les ressources financières sont disponibles au niveau de l'unité organisationnelle, pour l'éducation et la formation de chaque ressource.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	6	Il existe un plan d'éducation et de formation pour l'organisation et pour chaque logiciel. Ce plan énonce les besoins de formation, les cours offerts, les crédits, les ressources disponibles et le calendrier des activités.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Tout le personnel chargé d'une activité ayant une incidence sur le logiciel applicatif a accès à une formation régulière appropriée.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Toutes les ressources reçoivent de la formation pour utiliser les outils de base ayant trait à la qualité des processus et des produits de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	3	Les tâches de la maintenance sont définies. Les personnes chargées d'accomplir ces tâches sont qualifiées sur la base d'une formation initiale, d'une formation complémentaire ou d'une expérience appropriée, selon les exigences.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	4	L'élaboration et la mise à jour du matériel de formation interne sont effectuées conformément à une procédure documentée. Le groupe de formation de l'entreprise offre les formations générales de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	5	Les ressources de la maintenance reçoivent une formation sur les processus normalisés, l'infrastructure des processus et les techniques de la maintenance. Cette formation est donnée avant que la ressource soit assignée à une tâche qui utilise ces processus ou ces techniques.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

6	Le personnel de la maintenance reçoit une formation sur l'adaptation des processus normalisés à des cas spécifiques.	N   P   L   F
7	Des dossiers sur la formation sont mis à jour et utilisés par la direction en ce qui a trait aux profils de perfectionnement personnels.	N   P   L   F
8	Les comparaisons des programmes de formation sont élaborées en utilisant des étalons externes pertinents pour recueillir les données qui orientent les améliorations possibles du programme de formation de la maintenance du logiciel.	N   P   L   F
9	Un programme d'éducation et de formation, à l'échelle de l'organisation, détermine les objectifs et les besoins de formation de tout le personnel effectuant des activités qui se répercutent sur les logiciels est a) mis sur pied ; b) tenu à jour ; et c.) communiqué à travers la hiérarchie, conformément à une procédure documentée.	N   P   L   F
10	La détermination du niveau de pré requis d'habiletés et de connaissances d'une personne pour assister à un cours de formation particulière est élaborée, conformément à une procédure documentée.	N   P   L   F
11	Des systèmes corporatifs de l'organisation assurent la planification et le suivi de la formation.	N   P   L   F
12	Les aspects de la motivation et du plan de carrière des ressources de la maintenance sont intégrés dans les plans de formation individuelle.	N   P   L   F
13	L'inventaire de l'éducation, de la formation et des connaissances sert de critère d'assignation des ressources aux tâches de la maintenance.	N   P   L   F
14	Les objectifs ainsi que la qualité de l'éducation et de la formation sont mesurés et les résultats de cette mesure sont utilisés pour permettre l'amélioration continue du programme de formation.	N   P   L   F

4		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	Tous les gestionnaires de la maintenance ont reçu une formation sur la gestion quantitative et ils utilisent ces techniques. Ils communiquent les résultats dans le cadre du programme de formation des ressources de la maintenance du logiciel.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
	N	P	L	F			
2	L'inventaire des styles de communication, de l'éducation, de la formation et des connaissances sert de critère d'assignation et de promotion des ressources en Technologies de l'information.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F	
N	P	L	F				

Domain 1 Software Maintenance Process Management  
 KPA 4 Maintenance Process Performance  
 Roadmap 1 Definition of maintenance measures

Level	Number	Question	Rating				
0		Est-ce que la déclaration suivante décrit votre situation de travail:					
	1	L'unité organisationnelle de la maintenance du logiciel ne fait pas d'activité de mesure de la performance de ses processus.	<table border="1" style="display: inline-table;"> <tr> <td>Oui</td> <td>No</td> </tr> </table>	Oui	No		
Oui	No						
1		Est-ce que la déclaration suivante décrit votre situation de travail:					
	1	Des initiatives individuelles de mesure de processus ou du produit sont effectuées par des individus personnellement intéressés par ce domaine.	<table border="1" style="display: inline-table;"> <tr> <td>Oui</td> <td>No</td> </tr> </table>	Oui	No		
	Oui	No					
	Est-ce que la déclaration suivante décrit votre situation de travail:						
2	2	Quelques mesures qualitatives des processus et des produits sont collectées.	<table border="1" style="display: inline-table;"> <tr> <td>Oui</td> <td>No</td> </tr> </table>	Oui	No		
	Oui	No					
		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail					
1	Certains processus et produits clés de la maintenance possèdent des mesures utilisées au niveau de l'unité organisationnelle de la maintenance du logiciel.	<table border="1" style="display: inline-table;"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F	
N	P	L	F				
	2	Les données de référence de la qualité et de la performance des processus sont accumulées, utilisées et revues avec les différents intervenants (clientèle, parrain, gestionnaire de programme et ressources de la maintenance) pour l'amélioration des processus existants pour chaque unité organisationnelle de la maintenance du logiciel.	<table border="1" style="display: inline-table;"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F				
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	Les gestionnaires de la maintenance du logiciel gèrent les risques pouvant causer l'échec de la mesure des produits, produits intermédiaires et logiciels applicatifs.	<table border="1" style="display: inline-table;"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F				

	2	Les produits, produits intermédiaires et logiciels applicatifs clés de la maintenance du logiciel possèdent des mesures de la qualité et de l'exécution des processus/services.	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F
N	P	L	F				
4		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	Les données estimatives sont conservées dans une base de données pour servir à améliorer les processus et à planifier les requêtes à venir (estimation de la taille d'une requête, données sur les travaux requis, sur la productivité, sur les défauts).	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F
	N	P	L	F			
2	Les unités organisationnelles de la maintenance mesurent leur productivité d'une manière quantitative.	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F	
N	P	L	F				
	3	Les mesures internes de la maintenabilité du logiciel font l'objet d'approfondissement, d'outillage et de gestion quantitative. Elles sont expliquées en termes simples à tous les intervenants.	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F
N	P	L	F				
5		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	Des modèles de croissance et de fiabilité sont utilisés pour la prévision des ressources ou des calendriers à l'aide des paramètres provenant des événements antérieurs (taille, intensité des défaillances initiales et paramètres d'intensité de désintégration). Ces modèles font l'objet d'une mise à jour continue.	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F
N	P	L	F				
	2	Les résultats des analyses intégrées de données sur les processus et les produits sont utilisés pour placer les processus normalisés de l'organisation et ses sous-processus critiques sous contrôle statistique.	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F
N	P	L	F				

Domain 1 Software Maintenance Process Management  
 KPA 5 Maintenance Innovation and Deployment  
 Roadmap 1 Research of innovations

Level	Number	Question	Rating
0		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	L'unité organisationnelle de maintenance du logiciel ne fait pas d'activités de collecte des propositions d'améliorations auprès des entités externes (clientèle, autres groupes, interfaces de la maintenance du logiciel, étalonnages externes, conseillers spécialisés, etc.).	<input type="checkbox"/> Oui <input type="checkbox"/> No
		Est-ce que la déclaration suivante décrit votre situation de travail:	
	2	L'unité organisationnelle de la maintenance du logiciel ne fait pas d'activités d'analyse préalable, d'établissement de constats ou de pilotage des propositions majeures en amélioration des processus ou d'innovations technologiques.	<input type="checkbox"/> Oui <input type="checkbox"/> No
		Est-ce que la déclaration suivante décrit votre situation de travail:	
1	3	L'unité organisationnelle de la maintenance du logiciel ne fait pas de contrôle et de la vérification des bénéfices de ses projets d'amélioration ou d'innovations.	<input type="checkbox"/> Oui <input type="checkbox"/> No
		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	La sélection, le déploiement et la vérification des bénéfices de ses projets d'amélioration ou d'innovations, dans l'unité organisationnelle de la maintenance du logiciel sont élaborés de manière informelle.	<input type="checkbox"/> Oui <input type="checkbox"/> No
		Est-ce que la déclaration suivante décrit votre situation de travail:	
	2	Des initiatives individuelles d'amélioration et d'innovation, visant principalement des aspects techniques internes de la maintenance du logiciel, sont accomplies.	<input type="checkbox"/> Oui <input type="checkbox"/> No

		Est-ce que la déclaration suivante décrit votre situation de travail:					
	3	Les évaluations des nouvelles technologies, méthodologies et nouveaux outils de la maintenance sont réalisées informellement.	<table border="1"> <tr> <td>Oui</td> <td>No</td> </tr> </table>	Oui	No		
Oui	No						
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	On évalue les technologies, les méthodologies et les outils nouveaux ayant du potentiel pour les appliquer dans l'unité organisationnelle de la maintenance du logiciel.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F				
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	La direction et le personnel, selon le cas, participent activement à des groupes de travail, à des cercles de qualité ou à des comités techniques visant à inciter le développement de propositions d'amélioration aux processus de la maintenance du logiciel.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F				
	2	Les gestionnaires et le personnel technique sont systématiquement tenus au courant des projets de déploiement d'améliorations majeures et d'innovations.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F				
	3	On doit systématiquement classer et analyser les propositions d'amélioration des processus et des technologies de la maintenance du logiciel.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F				
	4	L'ensemble des unités organisationnelles de la maintenance du logiciel recherche activement et analyse des innovations potentielles qui auraient pour objectif l'amélioration de la qualité ou de l'exécution des processus et des technologies de l'organisation.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F				

Domain 2 Software Request Management  
 KPA 1 Event and Service Request Management  
 Roadmap 2 Management of event and service requests

Level	Number	Question	Rating
0		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	L'unité organisationnelle de la maintenance du logiciel ne fait pas d'activités de gestion des requêtes et des événements sur les différents logiciels en maintenance.	<input type="checkbox"/> Oui <input type="checkbox"/> No
1		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	La gestion des requêtes et des événements, dans l'organisation de maintenance du logiciel, est pratiquée de manière informelle.	<input type="checkbox"/> Oui <input type="checkbox"/> No
		Est-ce que la déclaration suivante décrit votre situation de travail:	
	2	Une approche individuelle de gestion des requêtes et des événements est principalement basée sur des relations personnelles entre le programmeur de la maintenance et une ressource de l'unité organisationnelle du client.	<input type="checkbox"/> Oui <input type="checkbox"/> No
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Chaque requête et événement font l'objet de création d'une requête de modifications (Rm) ou d'un rapport de problèmes (Rp) du logiciel qui sert de billet de travail de la maintenance.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Chaque requête et événement font l'objet de catégorisation, priorisation et d'une estimation préliminaire de leur taille et de leur ampleur.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	3	Les requêtes de modifications acceptées sont assignées, d'une manière préliminaire, à une version future du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Une communication proactive s'établit au niveau des défaillances et des requêtes de maintenance préventives affectant la clientèle.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

2	On détermine, pour chaque requête et événement, si elles sont acceptées, rejetées ou si elles ont besoin de plus d'analyse.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F			
3	Des instructions sur la création, l'aiguillage et la fermeture des requêtes (billets) dans le système de gestion des requêtes de la maintenance, sont publiées et mises à jour.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F			
4	Les rapports des clients, tels des défaillances et des requêtes de modifications, sont saisis et suivis formellement dans un référentiel de la maintenance, conformément à une procédure documentée et supportée par un système de gestion des requêtes.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F			
5	Les données obligatoires et optionnelles devant figurer sur un rapport de problèmes ont été normalisées au système de gestion des requêtes.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F			
6	Le processus de gestion des requêtes est lié au processus d'amélioration des processus.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F			
7	Des rapports normalisés de gestion décrivant les requêtes et les événements sont développés et mis à la disposition de tous les intervenants des Technologies de l'information et de la clientèle.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F			
8	Un processus formel de réalisation des requêtes de services en attente est utilisé pour résorber les files d'attente.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F			

Domain 2 Software Request Management  
 KPA 2 Maintenance Planning  
 Roadmap 6 Impact analysis

Level	Number	Question	Rating
0		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	L'unité organisationnelle de la maintenance du logiciel ne fait pas d'activité de planification.	<input type="checkbox"/> Oui <input type="checkbox"/> No
1		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	La planification dans l'organisation de maintenance du logiciel s'effectue de manière informelle.	<input type="checkbox"/> Oui <input type="checkbox"/> No
		Est-ce que la déclaration suivante décrit votre situation de travail:	
	2	Des initiatives individuelles de planification visent principalement à informer la clientèle, verbalement, de la possibilité de traiter une requête spécifique et ponctuelle.	<input type="checkbox"/> Oui <input type="checkbox"/> No
		Est-ce que la déclaration suivante décrit votre situation de travail:	
	3	Les requêtes de la clientèle et des transitions de logiciel de l'unité organisationnelle de la maintenance sont traitées d'une manière réactive plutôt que d'une manière planifiée.	<input type="checkbox"/> Oui <input type="checkbox"/> No
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Le responsable de la maintenance est désigné comme responsable des activités de planification sur les requêtes visant son logiciel opérationnel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Le plan de la maintenance est utilisé pour faire le suivi des activités et pour communiquer l'état de situation des requêtes.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	3	L'assignation des priorités aux différentes requêtes s'effectue en étroite collaboration avec le client, conformément à une procédure documentée.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

	4	Toutes les questions relatives au fonctionnement intergroupes sont documentées et négociées. Les problèmes non résolus sont acheminés aux gestionnaires concernés.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Dans le cadre d'un service de la maintenance, les engagements pris envers des personnes et des groupes extérieurs à l'organisation, à partir d'une certaine taille/criticité, font l'objet d'une revue avec le gestionnaire intermédiaire avant de s'engager.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Les modifications aux engagements qui sont approuvées et qui affectent les livrables, sont communiquées aux intervenants et aux autres groupes concernés.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	3	Les données de planification sont enregistrées aux fins de leur utilisation dans le cadre du suivi et de la supervision des requêtes.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	4	L'organisation suit une politique écrite exigeant que les requêtes soient planifiées, conformément à une procédure documentée.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	5	Les priorités utilisées pour planifier le travail d'allocation des requêtes sont flexibles et contrôlées par le client.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	6	Un plan, également appelé analyse d'impact, est effectué et autorisé pour chaque requête de modifications par la ressource de la maintenance, avant d'initier le travail technique associé à la modification.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
4		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Le cycle annuel de support aux usagers reçoit des indicateurs d'étapes significatives du support, de sa progression, marquant ainsi la différence entre la maintenance et les opérations.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	La planification annuelle est basée sur des techniques de planification utilisant des approches quantitatives.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

	3	La planification s'appuie sur des modèles de productivité spécifiques à chaque catégorie de service de la maintenance.	<table border="1"> <tr> <td data-bbox="1114 226 1182 262">N</td> <td data-bbox="1182 226 1251 262">P</td> <td data-bbox="1251 226 1319 262">L</td> <td data-bbox="1319 226 1388 262">F</td> </tr> </table>	N	P	L	F
N	P	L	F				
	4	Des outils de simulation d'impact sont disponibles, connus, configurés et utilisables pour chaque produit en maintenance.	<table border="1"> <tr> <td data-bbox="1114 367 1182 403">N</td> <td data-bbox="1182 367 1251 403">P</td> <td data-bbox="1251 367 1319 403">L</td> <td data-bbox="1319 367 1388 403">F</td> </tr> </table>	N	P	L	F
N	P	L	F				
	5	L'analyse d'impact fait l'objet d'une mesure permettant d'identifier le risque et le poids des options disponibles.	<table border="1"> <tr> <td data-bbox="1114 517 1182 553">N</td> <td data-bbox="1182 517 1251 553">P</td> <td data-bbox="1251 517 1319 553">L</td> <td data-bbox="1319 517 1388 553">F</td> </tr> </table>	N	P	L	F
N	P	L	F				
	6	On utilise les modèles de prédiction pour communiquer les efforts par types de requêtes, ce qui réduit les temps d'investigation avant de fournir une estimation.	<table border="1"> <tr> <td data-bbox="1114 667 1182 703">N</td> <td data-bbox="1182 667 1251 703">P</td> <td data-bbox="1251 667 1319 703">L</td> <td data-bbox="1319 667 1388 703">F</td> </tr> </table>	N	P	L	F
N	P	L	F				

Domain 2 Software Request Management

KPA 3 Monitoring and Control of Service Requests and Events

Roadmap 1 Follow up on planned and approved activities

Level	Number	Question	Rating				
0		Est-ce que la déclaration suivante décrit votre situation de travail:					
	1	L'unité organisationnelle de la maintenance du logiciel ne fait pas d'activité de suivi et de supervision des engagements, plans et logiciels opérationnels.	<table border="1"> <tr> <td>Oui</td> <td>No</td> </tr> </table>	Oui	No		
Oui	No						
1		Est-ce que la déclaration suivante décrit votre situation de travail:					
	1	Le suivi et la supervision, dans l'unité organisationnelle de maintenance du logiciel, sont effectuées de manière informelle.	<table border="1"> <tr> <td>Oui</td> <td>No</td> </tr> </table>	Oui	No		
Oui	No						
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	Les ressources de la maintenance assurent la surveillance et la coordination des activités de résolution des problèmes techniques des logiciels en production.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
	N	P	L	F			
	2	Les engagements des différents intervenants, tel qu'entendu dans les planifications de la maintenance du logiciel, font l'objet d'un suivi périodique.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F				
3	Le suivi et la supervision des niveaux de service des logiciels en production, dans l'unité organisationnelle de maintenance du logiciel, sont effectués durant la réunion interne hebdomadaire du progrès du travail.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F	
N	P	L	F				
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	Des représentants de toutes les fonctions concernées des Technologies de l'information travaillent en collaboration avec des représentants de la maintenance du logiciel pour assurer la surveillance et la coordination des activités de résolution des problèmes techniques sur les logiciels en production.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L	F
N	P	L	F				

	2	Le suivi et la supervision, dans l'organisation de maintenance du logiciel, sont effectuées en utilisant les valeurs actuelles et les planifications approuvées par la clientèle et les autres intervenants.	<table border="1"> <tr> <td data-bbox="1114 226 1182 262">N</td> <td data-bbox="1182 226 1251 262">P</td> <td data-bbox="1251 226 1319 262">L</td> <td data-bbox="1319 226 1388 262">F</td> </tr> </table>	N	P	L	F
N	P	L	F				
	3	Le suivi et la supervision des transitions s'intègrent aux étapes du cycle de vie de développement du développeur (ou fournisseur) et qui décrivent, pour chaque étape du projet de développement/acquisition du logiciel, ce qui doit être fait pour obtenir une transition douce et efficace.	<table border="1"> <tr> <td data-bbox="1114 450 1182 486">N</td> <td data-bbox="1182 450 1251 486">P</td> <td data-bbox="1251 450 1319 486">L</td> <td data-bbox="1319 450 1388 486">F</td> </tr> </table>	N	P	L	F
N	P	L	F				
	4	Le suivi et la supervision des requêtes individuelles faisant partie de la prochaine version sont opérés pour s'assurer de rencontrer la planification des versions.	<table border="1"> <tr> <td data-bbox="1114 745 1182 781">N</td> <td data-bbox="1182 745 1251 781">P</td> <td data-bbox="1251 745 1319 781">L</td> <td data-bbox="1319 745 1388 781">F</td> </tr> </table>	N	P	L	F
N	P	L	F				

Domain 2 Software Request Management  
 KPA 4 SLAs and Supplier Agreement  
 Roadmap 2 Establish SLAs and contracts

Level	Number	Question	Rating
0		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	L'unité organisationnelle de la maintenance du logiciel n'a pas encore reconnu le besoin d'une entente de services et de contrats formels.	<input type="checkbox"/> Oui <input type="checkbox"/> No
1		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	Les ententes avec les clients, les sous-traitants et l'impartiteur sont élaborées à partir de gabarits, documents et contrats du fournisseur et des sous-traitants.	<input type="checkbox"/> Oui <input type="checkbox"/> No
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Les deux parties (client et fournisseur) s'entendent sur la nécessité d'une entente de services et des contrats plus formels s'appliquant à la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Le mainteneur choisit et réévalue ses fournisseurs. Ce choix est basé sur une évaluation de leurs capacités à rencontrer les conditions spécifiées et les critères établis.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Les gabarits des ententes de services et des contrats sont établis, normalisés et déployés pour tous les clients et sous-traitants de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Les sous-traitants alignent leurs niveaux de services et les clauses contractuelles avec l'entente de services de la clientèle.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

	3	Les possibilités de contrôler et de mesurer les services sont étudiées et établies avant la signature des ententes de services et contrats avec les sous-traitants.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	4	À chaque logiciel est assigné un niveau de criticité qui aide dans l'assignation des priorités du travail de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	5	Les ententes de services indiquent, pour chaque logiciel, si le processus d'escalade normalisé, ou un processus d'escalade spécifique à ce logiciel sera utilisé.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	6	Chaque logiciel possède sa description spécifique de services par rapport aux services normalisés de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	7	L'entente de services décrit la catégorie de processus de continuité ainsi que la dernière date d'exécution d'essai de continuité pour chaque logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	8	L'entente de services décrit, pour chaque logiciel, la couverture des heures de support ainsi que le minimum d'interruption de son fonctionnement pendant les heures normales de travail.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
4		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	La clientèle est impliquée, pour chaque logiciel, pour obtenir/mettre à jour les besoins de services de la maintenance avant la mise en service du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Les services de la maintenance sont intégrés à une entente de services incluant tous les intervenants en support et maintenance des Technologies de l'information.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

Domain 3 Software Evolution Engineering  
 KPA 1 Software Transition  
 Roadmap 4 Transition preparation

Level	Number	Question	Rating
0		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	L'unité organisationnelle de maintenance du logiciel ne fait pas d'activités de transition du logiciel vers la maintenance.	Oui Non
1		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	La transition, dans l'unité organisationnelle de maintenance du logiciel, est opérée de façon informelle, quand le besoin se fait sentir.	Oui Non
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	L'unité organisationnelle de la maintenance développe, adapte et utilise une liste de vérification sur les sujets et activités clés de la transition du logiciel.	N P L F
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Le mainteneur reconnaît l'importance d'être actif dans le projet et de participer à des livrables afin d'acquérir des connaissances sur le logiciel.	N P L F
	2	Le mainteneur offre un échange de ressources humaines pendant et après le projet de développement.	N P L F

Domain 3 Software Evolution Engineering  
 KPA 2 Operational Support  
 Roadmap 1 Production Software monitoring

Level	Number	Question	Rating
0		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	L'unité organisationnelle de maintenance du logiciel ne fait pas d'activité de support opérationnel.	<input type="checkbox"/> Oui <input type="checkbox"/> Non
1		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	Le support opérationnel, dans l'unité organisationnelle de maintenance du logiciel, est fait de façon informelle.	<input type="checkbox"/> Oui <input type="checkbox"/> Non
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Le calendrier d'opération existe et est élaboré sur la base de la capacité des ressources et de la charge de travail de l'ensemble des logiciels.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Le mainteneur et l'unité organisationnelle de la maintenance connaissent leurs responsabilités conjointes de surveillance des logiciels opérationnels. Le mainteneur surveille de façon proactive la capacité mémoire des liens de télécommunications et de l'espace disque des logiciels.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Les logiciels automatisés du fournisseur et certaines adaptations à ces logiciels sont utilisés pour intégrer l'ordonnancement des travaux d'opération, l'automatisation de la sous-charge ou de la surcharge, le ré-ordonnancement des travaux et les réponses automatiques d'opération.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Des logiciels sont utilisés qui permettent d'anticiper des problèmes liés à la continuité des opérations, d'apporter des corrections et de les signaler.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

4		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:				
	1	Les outils de performance utilisés par le centre de traitement sont disponibles, connus, configurés et utilisables en développement et en maintenance.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L
N	P	L	F			

Domain 3 Software Evolution Engineering  
KPA 4 Verification and Validation  
Roadmap 2 Acceptance tests

Level	Number	Question	Rating			
0		Est-ce que la déclaration suivante décrit votre situation de travail:				
	1	L'unité organisationnelle de maintenance du logiciel ne fait pas d'activité de vérification et de validation du logiciel.	<table border="1"> <tr> <td>Oui</td> <td>Non</td> </tr> </table>	Oui	Non	
Oui	Non					
1		Est-ce que la déclaration suivante décrit votre situation de travail:				
	1	L'unité organisationnelle de maintenance du logiciel ne fait pas d'activité de vérification et de validation du logiciel de manière structurée et coordonnée.	<table border="1"> <tr> <td>Oui</td> <td>Non</td> </tr> </table>	Oui	Non	
Oui	Non					
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:				
	1	Les activités de vérification et de validation sont documentées, connues et planifiées. Les plans en sont documentés, conformément à une procédure documentée.	<table border="1"> <tr> <td>N</td> <td>P</td> <td>L</td> <td>F</td> </tr> </table>	N	P	L
N	P	L	F			

Domain 4 Support to Software Evolution Engineering  
 KPA 1 Software Configuration Management  
 Roadmap 1 Change management

Level	Number	Question	Rating
0		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	L'unité organisationnelle de maintenance du logiciel ne fait pas d'activité de gestion de la configuration du logiciel.	<input type="checkbox"/> Oui <input type="checkbox"/> Non
1		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	L'unité organisationnelle de maintenance du logiciel n'accomplit pas d'activité de gestion de la configuration du logiciel d'une manière structurée et coordonnée.	<input type="checkbox"/> Oui <input type="checkbox"/> Non
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Les requêtes de modifications font l'objet de documentation, de priorisation et d'autorisation auprès de la clientèle avant de procéder et d'implanter un changement au logiciel opérationnel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Traçabilité entre exigences et conception, conception et code source, scénarios d'essais et code source, code source et documentation du système et utilisateur.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Un conseil de priorisation (tableau de commande de la configuration) est implanté pour superviser le processus de changement des logiciels ainsi que l'ensemble des requêtes de modifications en attente.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
4		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Tous les produits intermédiaires et toute la documentation (de l'utilisateur et interne) se trouvent sous le contrôle de la gestion de la configuration.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

	2	Tous les outils servant à la maintenance et à l'exploitation relèvent de la gestion de la configuration.	<input type="checkbox"/> N	<input type="checkbox"/> P	<input type="checkbox"/> L	<input type="checkbox"/> F
	3	Un seul référentiel au niveau de l'organisation est créé, diffusé et utilisé formellement, conformément à une procédure documentée.	<input type="checkbox"/> N	<input type="checkbox"/> P	<input type="checkbox"/> L	<input type="checkbox"/> F
		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:				
5	1	L'historique complet des décisions et des raisonnements sur la maintenance et l'exploitation est documenté saisi et mis sous le contrôle de la gestion de la configuration.	<input type="checkbox"/> N	<input type="checkbox"/> P	<input type="checkbox"/> L	<input type="checkbox"/> F

Domain 4 Support to Software Evolution Engineering  
 KPA 2 Process and Product Quality Assurance  
 Roadmap 2 Identify and document non-conformances

Level	Number	Question	Rating				
0		Est-ce que la déclaration suivante décrit votre situation de travail:					
	1	L'unité organisationnelle de maintenance du logiciel ne fait pas d'activité d'assurance qualité du logiciel.	<table border="1" style="display: inline-table;"> <tr> <td style="width: 50px;">Oui</td> <td style="width: 50px;">Non</td> </tr> </table>	Oui	Non		
Oui	Non						
1		Est-ce que la déclaration suivante décrit votre situation de travail:					
	1	L'assurance qualité, dans l'unité organisationnelle de maintenance du logiciel, est effectuée de façon informelle.	<table border="1" style="display: inline-table;"> <tr> <td style="width: 50px;">Oui</td> <td style="width: 50px;">Non</td> </tr> </table>	Oui	Non		
Oui	Non						
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	La responsabilité, l'autorité et les interrelations entre les personnes chargées de la gestion, de l'exécution et de la vérification de travaux ayant une incidence sur la qualité, sont définies.	<table border="1" style="display: inline-table;"> <tr> <td style="width: 25px;">N</td> <td style="width: 25px;">P</td> <td style="width: 25px;">L</td> <td style="width: 25px;">F</td> </tr> </table>	N	P	L	F
	N	P	L	F			
	2	Un programme d'assurance de la qualité est établi, documenté, approuvé et tenu à jour, conformément à une procédure documentée.	<table border="1" style="display: inline-table;"> <tr> <td style="width: 25px;">N</td> <td style="width: 25px;">P</td> <td style="width: 25px;">L</td> <td style="width: 25px;">F</td> </tr> </table>	N	P	L	F
	N	P	L	F			
	3	Les produits sont fabriqués, livrés, installés, acceptés et maintenus, conformément à une procédure documentée, couverte par le système de qualité.	<table border="1" style="display: inline-table;"> <tr> <td style="width: 25px;">N</td> <td style="width: 25px;">P</td> <td style="width: 25px;">L</td> <td style="width: 25px;">F</td> </tr> </table>	N	P	L	F
	N	P	L	F			
4	La fonction d'assurance de la qualité du maître d'oeuvre surveille les activités d'assurance de la qualité de l'impartiteur, conformément à une procédure documentée.	<table border="1" style="display: inline-table;"> <tr> <td style="width: 25px;">N</td> <td style="width: 25px;">P</td> <td style="width: 25px;">L</td> <td style="width: 25px;">F</td> </tr> </table>	N	P	L	F	
N	P	L	F				
5	Des échantillons représentatifs des biens livrables intermédiaires et finaux sont passés en revue afin de s'assurer de leur conformité aux exigences du processus concerné.	<table border="1" style="display: inline-table;"> <tr> <td style="width: 25px;">N</td> <td style="width: 25px;">P</td> <td style="width: 25px;">L</td> <td style="width: 25px;">F</td> </tr> </table>	N	P	L	F	
N	P	L	F				
6	Les écarts constatés dans les activités de développement, de maintenance et d'exploitation sont documentés et traités, conformément à une procédure documentée.	<table border="1" style="display: inline-table;"> <tr> <td style="width: 25px;">N</td> <td style="width: 25px;">P</td> <td style="width: 25px;">L</td> <td style="width: 25px;">F</td> </tr> </table>	N	P	L	F	
N	P	L	F				

3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	Des pratiques sont mises en place pour s'assurer que les besoins en matière de qualité de l'organisation, des clients et des utilisateurs soient satisfaits.	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F
	N	P	L	F			
	2	Un système étendu d'audits planifiés et documentés de la qualité interne est systématiquement appliqué pour vérifier si les activités du programme de qualité sont conformes aux dispositions prévues et pour évaluer l'efficacité du système qualité établi conformément à une procédure documentée.	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F
N	P	L	F				
3	La qualité du produit est mesurée, analysée et comparée aux objectifs quantitatifs de qualité du produit.	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F	
N	P	L	F				
4		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:					
	1	L'organisation effectue régulièrement des mesures et des comparaisons par rapport aux organisations exemplaires dans le monde. Elle a en place un programme visant à s'assurer que les capacités de ses processus et la qualité de ses produits se comparent à celles des chefs de file mondiaux.	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F
	N	P	L	F			
2	Des outils de génie logiciel permettent de supporter, de façon entièrement automatique, l'application ou le renforcement des normes.	<table border="1"><tr><td>N</td><td>P</td><td>L</td><td>F</td></tr></table>	N	P	L	F	
N	P	L	F				

Domain 4 Support to Software Evolution Engineering  
 KPA 3 Measurement and Analysis of Maintenance  
 Roadmap 2 Collect and analyze measurement data

Level	Number	Question	Rating
0		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	L'unité organisationnelle de maintenance du logiciel ne fait pas d'activité de mesure ou d'analyse de la maintenance du logiciel.	<input type="checkbox"/> Oui <input type="checkbox"/> Non
1		Est-ce que la déclaration suivante décrit votre situation de travail:	
	1	La mesure et l'analyse, dans l'unité organisationnelle de maintenance du logiciel, est effectuée de façon informelle, par chaque gestionnaire.	<input type="checkbox"/> Oui <input type="checkbox"/> Non
2		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Le mainteneur a défini des mesures opérationnelles de base, s'alignant avec les objectifs de la mesure de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Le mainteneur procède à des analyses et produit des rapports, de base, pour répondre à des requêtes spécifiques.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
3		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Le mainteneur établit et tient à jour les objectifs de la mesure. Ces objectifs sont dérivés des besoins d'information identifiés et des objectifs de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Spécifiez des mesures opérationnelles dérivées pour adresser les objectifs de la mesure de la maintenance du logiciel.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	3	Les procédures de collecte de données et d'emmagasinage du mainteneur spécifient comment les données de mesure sont obtenues et sont emmagasinées.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

	4	Le mainteneur documente de quelle façon les données de la mesure seront analysées et rapportées.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	5	Le mainteneur procède à la collecte des mesures de base, crée les mesures dérivées, et vérifie l'intégrité des données.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	6	Le mainteneur gère et emmagasine les données de la mesure, les spécifications de mesure et les résultats d'analyse.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	7	Le mainteneur fait parvenir et explique les rapports et analyses à tous les intervenants pertinents.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
4		Comment est-ce que les déclarations suivantes décrivent-elles votre situation de travail:	
	1	Le mainteneur utilise des outils pour automatiser la collecte de données et son emmagasinement.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	2	Analyser et interpréter les données de mesure.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F
	3	Le mainteneur documente les critères d'évaluation de l'utilité des résultats d'analyse et de la conduite des activités de mesure et analyse.	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> F

## APPENDIX D

### D 1 Project Management

#### Reviews

Review considering the program version<sup>10</sup> received on the 14.07.2004

#### Process selection dialogue

##### Domain 1

KPA 1	1.1.3.9	Missing
KPA 2	1.2.1.2	Missing
	1.2.2.5 – 1.2.2.7	Unnecessary because nonexistent
	1.2.3.6 – 1.2.3.9	Unnecessary because nonexistent
	1.2.4.3 – 1.2.4.7	Unnecessary because nonexistent
KPA 4	1.4.2.1	Missing
KPA 5	1.5.3.4	Missing

##### Domain 2

<sup>10</sup> The different versions/ stages of the program will be added on a cd-rom attached to this thesis. The corresponding version can be found in the folders with the appropriate date.

KPA 2	2.2.2.3 (after 2.2.1.3)	Should be 2.2.1.3
KPA 3	2.3.2.1 – 2.3.2.4	Is double, should be 2.3.3.1-2.3.3.4
KPA 4	2.3.0.1	Should be 2.4.0.1 etc
	After 2.4.2.3	Should follow 2.4.3.1 – 2.4.3.8
		Same with 2.4.4.1, 2.4.4.2

### Domain 3

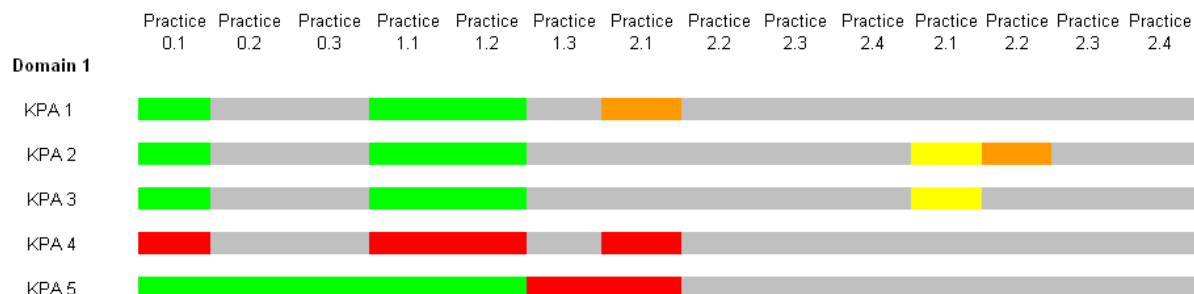
KPA 3 is not existent in this version of the tool.

KPA 4	After 3.4.2.1	The question/practices are unnecessary because nonexistent
-------	---------------	--

### Information about results:

First a representation of the NPLF-rating takes place. Therefore the answer to each question/practice is displayed as shown below.

I will provide you with the information of how to represent the capability levels later.



### Comments:

#### Phase de preparation:

The left side should already contain the information about the names of the Domains & KPAs  
The reason for this is that the description on the right will contain explanatory text concerning the different items on the left.

#### Phase de réponse:

The questions should be displayed as well. Not only the numbers.

### Part 2

Please make sure that the rating order is correct. It should be NPLF.

We will also take Domain 4 KPA 4 Roadmap 1 out of the assessment. So please delete it.

### Details for coding:

The “phase de réponse”, as already mentioned, should also display the questions not only the numbers. This can be realized by

- context sensitive appearance of the question when the cursor is positioned over the question
- writing down the sentence after the numbers

The “one shot” perspective should be preserved.

Furthermore the dialogue should contain a field to enter comments (e.g. justification for a specific rating). These comments have to be attached to the corresponding questions/practices.

The notes that could have been entered in the step “phase de préparation” to some/ all question/practices should be displayed when the question/practice is treated in the assessment.

Missing translation:

Domain 3 KPA 1 Roadmap 3 Préparation de la transition

Domain 4 KPA 3 Roadmap 1 Collection et analyse des données mesurées

Review considering the program version received on the 21.07.2004

**Input dialogue:**

- change order of input windows:
  - o first: données de la compagnie
  - o second: l'évaluateur
  - o third: données de l'évaluation

**Alterations**

- disable English and German in the language selection dialogue
- delete practice 1.4.2.2

**Additions to: saisir les données de l'évaluateur**

- add a field «type of certificate» and activate it when certification is answered with «yes»

**Additions to: saisir les données de l'évaluation**

- rename département in département à évaluer
- rename taille in taille du département à évaluer
- add sponsor
- relationship of sponsor towards organization being assessed
- purpose of the assessment
- the order should be
  - o 1.Sponsor
  - o 2.Sponsor's relationship
  - o 3.unit being assessed (department à évaluer)
  - o 4. size
  - o 5.purpose
  - o 6.type of assessment
  - o 7.date of assessment
  - o 8.starting time of assessment

**Additions to: sélectionner les pratiques**

- move the Level selection dialogue to the top
  - o to make sure that the people start with selecting a capability level the practices selection dialogue should be “disabled”. It will be activated, as soon as a level has been chosen
- the Domains and KPAs will be named in the listings. The questions will appear in the description field in bold with the description following (in normal text) after a short paragraph

- add the descriptions for Domains, KPAs and practices. Note, that it is possible that some practices do not have a description.

### **Additions to: phase de réponse**

- provide a field that contains the question and its description when a “number” has been chosen
- provide a field that allows to enter the collected evidence and comments that the assessor will write to support and secure his judgment considering the given rating. It is mandatory to provide this possibility for every single question!

### **Information considering the rating**

Level 0 and Level 1 only consist of a “yes/ no” rating. This means that only the colours for “fully achieved” (green) and “not achieved” (red) are of interest.

#### Level 0

Practices answered with “yes” are marked as “not achieved” and are therefore displayed as “red” in the diagram

Practices answered with “no” are marked as “fully achieved” and therefore are displayed as “green”

All the practices within this level have to be answered. At the end, if even one practice has been rated with “yes” the assessment of this KPA is over and the next KPA should be tackled. When all the practices have been answered with “no”, the assessment proceeds to level 1

#### Level 1

Practices answered with “yes” are marked as “not achieved” and are therefore displayed as “red” in the diagram

Practices answered with “no” are marked as “fully achieved” and therefore are displayed as “green”.

All the practices within this level have to be answered. At the end, if even one practice has been rated with “yes” the assessment of this KPA is over and the next KPA should be tackled. When all the practices have been answered with “no”, the assessment proceeds to level 2.

#### Higher Levels

From Level 2 onwards the NPLF-rating is applied.

In contrast to Level 0 & Level 1 the assessment proceeds even if some practices were rated with “not achieved” within one level.

All the (remaining) practices have to be answered.

We have to make sure, that all the questions within the different levels have really been answered. Otherwise it is not possible to go on with the assessment.

### **Additional dialogue**

After all the questions have been answered and before the “Analysis” a window should appear that contains the following as input requests:

- date
- ending time of the assessment

With this information the duration of the assessment is calculated. When the assessment is a quick assessment the date entry field is not necessary and should be disabled. Only if a full assessment is performed the date is needed, as well.

Review considering the program version received on the 30.07.2004

Additional information

- considering Level 0

The order is: first answer the questions then check if at least one question was answered with “yes”. If so, move on to next KPA.

The same applies for Level 1.

- considering the “preparation” dialogue

The preparation is the basis for the “reponse” dialogues. This means that the selection that was made in the preparation step is displayed at the response step. Not more and not less.

Preparation dialogue

„selectionner“

Dom1 KPA2	1.2.2.5 – 1.2.2.7	Unnecessary because nonexistent
	1.2.3.6 – 1.2.3.9	Unnecessary because nonexistent
	1.2.4.3 – 1.2.4.7	Unnecessary because nonexistent
Dom1 KPA4	After 1.4.5.2	Unnecessary because nonexistent
Dom2 KPA2	After 2.2.2.2	Should be 2.2.2.3 instead of 2.2.3.3 Should be 2.2.2.4 instead of 2.2.3.4
Dom3 KPA1	3.1.3.1 – 3.1.3.2	Delete
Dom3 KPA3		Disable the possibility to select it or delete it completely
Dom3 KPA4	3.4.2.2 & 3.4.2.3	add
Dom4 KPA 4		Disable the possibility to select it or delete it completely

“Reponse” dialogue

Dom2 KPA3	2.3.1.2	Delete
	2.3.1.3	Delete
	2.3.2.4	Delete
	2.3.3.1 – 2.3.3.2	Add
Dom3 KPA1	Niveau 3	Delete

Please

- change in the “évaluateur” dialogue the type of the certification into a text field.
- disable the “full assessment” possibility in the “évaluation” dialogue.
- disable the date in the “fin d’évaluation” dialogue
- add the legend to the “analyse” dialogue

The representation of the KPAs vs Niveaux should be:

Domain 1 with all its KPAs

Domain 2 with all its KPAs

Etc.

Please refer to the “representation of results” for more details.

## Part 2

Please alter the format of

- the date into dd.mm.yyyy, example:03.08.2004
- the time into hh:mm, example: 14:30

The format has to be displayed, example: date d'évaluation (jj.mm.aaaa)  
temps debut (hh:mm)

Please take out the pop-ups indicating “maintenant il faut aller au niveau...”

In the selection dialogue:

- it is possible to select the different practices within the KPAs. The ones that are not selected have to be disabled in the response dialogue.

The “cancel”- and “ok” – button have the same behaviour. This has to be changed.

The first cancel button should end the program. After that a cancel button should have the behaviour of a “back”button which means to jump to the preceding dialogue.

Example: if you are in the “saisir les donnes de l'évaluation” dialogue and you press the cancel button, this should take you back to the “saisir les données de l'évaluateur ” dialogue. And so on.

## Supplement

Example of format for the type of certification: Lead TickIT auditor

Review considering the program version received 03.08.04

The decision was made that the selection is done at the level of KPAs and not at the level of practices, for now.

Further review has been postponed to the next version because the changes were marginal and it was promised that the next version would be a great leap forward.

Review considering the program version received 05.08.04

- The spelling in the “données de la campagne”
  - o Données de l'entreprise
  - o Nom de l'entreprise
  - o Département à évaluer
  - o Adresse
  - o Personne de contact
  - o Courriel

Please swap the positions of the comments with the practice/ description fields

It is possible to let your program crash (and it is repeatable).

It happens in the practices selection dialogue when the following steps are performed:

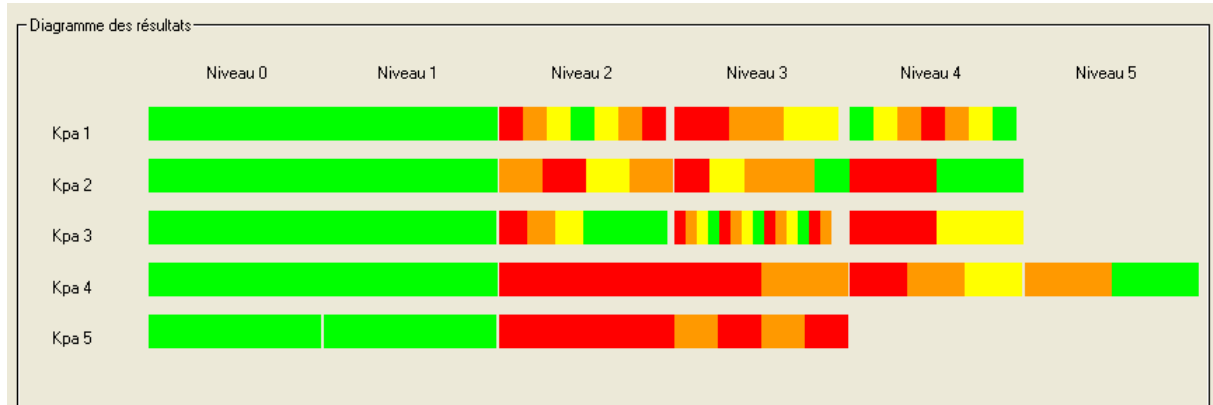
1. enlarge the domains
2. click on one of the domains
3. program crashes

This is possible no matter which domain you choose.

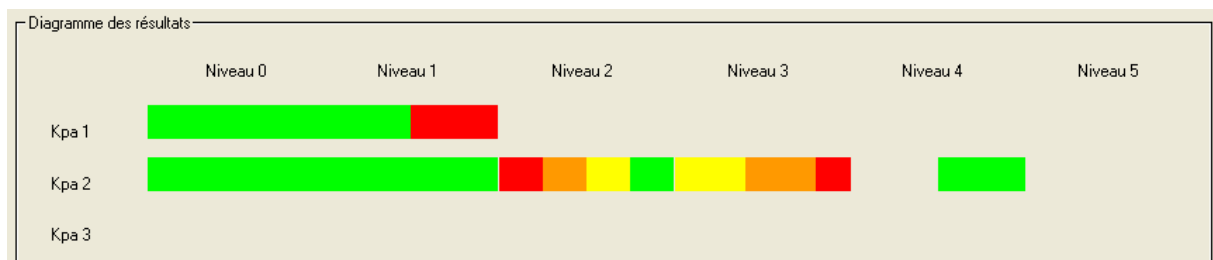
## Output

Please enter an indicator of where one level ends and the other one starts

As can be seen in the screenshot below some gaps appear. Please fix this problem (in this example it is DOM1 KPA1-5)



In the following screenshot you can see that there is a big gap between level 3 and 4 although all questions have been answered. It does not show the results of the first practice at level 4 when it is rated “N”. (DOM1 KPA2)



Please rework the representation of the results and make sure that all the results are displayed correctly and without gaps.

Domain vs. Capability levels

The representation for this output is as follows

- consider all the KPAs for the Domain and count the total number of practices for the different levels (taking all the KPAs into consideration)
- count all the “F” rated practices within the KPAs of the Domain per level
  - o e.g. (fictitious) Domain 1 has 5 KPAs. 3 times a practice was rated with “F” (KPA 1, 3 and 5) and 2 (KPA 2, 4) times with “N”. The total number of practices in this case is 5. This means that only 3/5 of the field for Level 0 is filled as shown below.

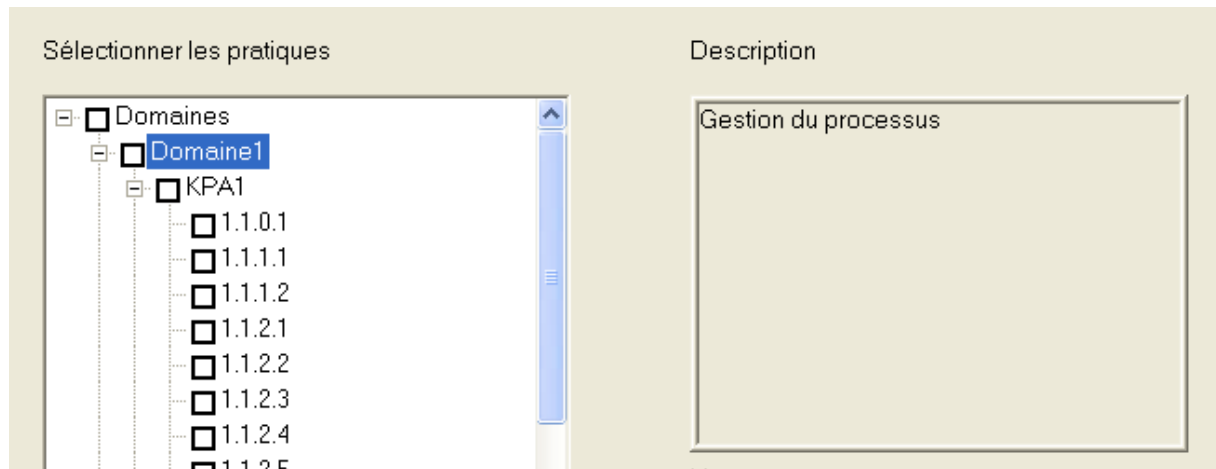


You can also see that the “F” are grouped together and leaving “blank” spaces. This is intended because it shows that some levels are not yet completely fulfilled. The context sensitive approach helps to identify the practices that are not fully achieved.

Review of program version received on the 07.08.04

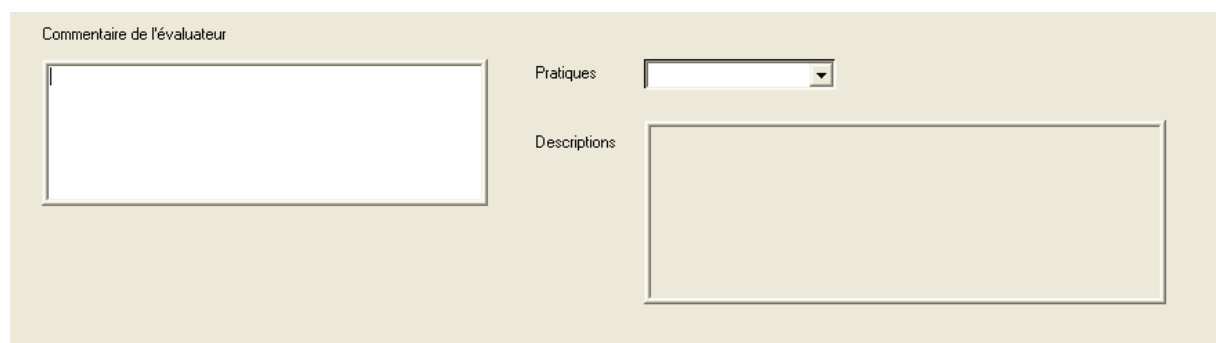
Please refer to the screenshot below:

- On the right side the Domain1, Domain2 etc. should be named (this was already done in your former versions)
- The descriptions are not shown.
- It is possible to move on without having made a selection



- when a selection is made it is not displayed in the assessment dialogue. All the KPAs and practices remain in the dialogue.
- it is the same with the levels

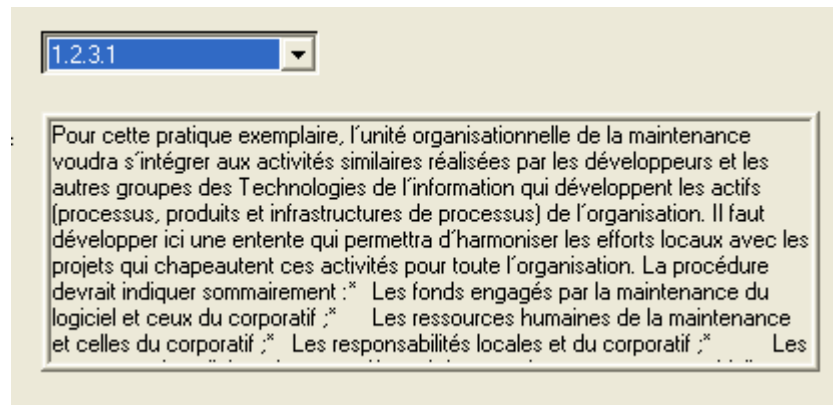
The position of the fields hasn't been changed



The order should be practices and description on the left side and the comments on the right side.

The pop-ups saying "maintenant il faut aller au niveau..." are still there.

Descriptions for the practices in the assessment dialogue appear. A problem occurs when the description is longer. The description is cut-off at the end of the description field as can be seen in the screenshot on the next page.



Another problem occurring is, that sometimes information not belonging to the practice is displayed (example 1.1.4.7). Sometimes the description is repeated in the field (example 1.1.0.1).

- there still exist some difficulties with the output  
some practices are not displayed correctly e.g.DOMAIN3 KPA2 Level3 practice1.  
This practice is not represented in the output

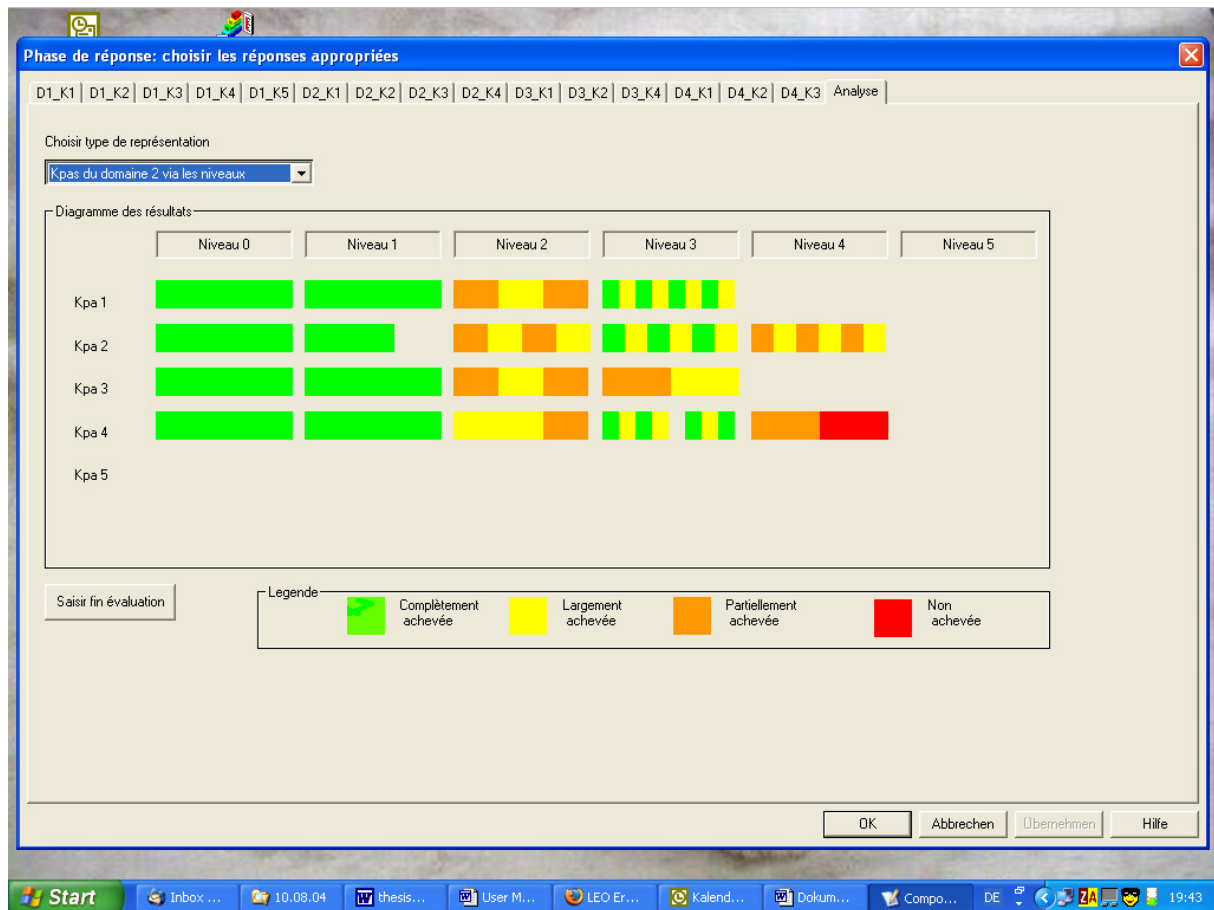
The context sensitive help for the output does not show up.

- saving is not possible.

#### Review of program version received on the10.08.04

- flaws occur in D2 KPA2 niveau 1  
KPA4 niveau 2 & 3

I will include the evaluation.txt to make it easier for you to see which practice caused the problem



- D4\_KPA1: Level 5 is a "yes/no" selection it should be NPLF

Please disable the help for now.

Additional changes performed after the end of the cooperation:

The message boxes “Maintenant il faut aller..” were disabled and the messages indicating the next move in the assessment were altered in a more generic way. This means that it says “Ce KPA est fini on va vous diriger pour continuer l’évaluation » instead of « il faut aller au KPA 2 du Domain 3 » because it is not known beforehand whether or not a specific KPA is included in the assessment or not.

The possibility to minimize the window was added as well as the missing titles in some dialogues.

Program changes after the cooperation (not performed through the programmer)

- disabled the message boxes “Maintenant il faut aller...”
- changed representation of date in the “fin d’évaluation” dialogue into dd.mm.yyyy
- altered the messages “Il faut aller au KPA x du domain y” into a more generic message: “Ce KPA est fini, on va vous diriger pour continuer l’évaluation”

## **APPENDIX E**

### **E 1 Tools used**

UML modelling

Enterprise Architect v4.00 build 729

30 day Evaluation copy

Sparx Systems

<http://www.sparxsystems.com.au>

Writing & Figures (partly)

Microsoft Office (Word and Excel)

Pdf-conversion

CutePdf

Freeware

<http://www.acrosoftware.com>

Programming

Microsoft Visual C++ 6.0

## **SELBSTÄNDIGKEITSERKLÄRUNG**

Ich versichere hiermit, dass ich die vorliegende Diplomarbeit selbstständig, ohne unzulässige Hilfe Dritter und ohne Benutzung anderer als hier angegebenen Hilfsmittel angefertigt habe. Die aus fremden Quellen direkt oder indirekt übernommenen Gedanken sind als solche kenntlich gemacht.

Lahr, 08.09.04

Isabelle Côté