Protocol to design techniques for implementing software development best practices

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Agenda

• Introduction
• Overview
• Protocol proposed
• Case Study
• Conclusions
• Future Work
Introduction

• Software engineering best practices allow significantly improving the software development
• Best practices for software development projects contributes to its success only if there are techniques suitable for this implementation

Establish a set of research projects focused on the definition of techniques and mechanisms to improve the way the software development projects are performed
Introduction - target

This paper proposes a guide to identify, select and design techniques that contribute to implement best practices for software development.

The guide establishes a systematic and organized way to: identify, select, validate and propose techniques for implementing best practices in software development.

This guide is called “protocol” because it includes the definition of a systematic and repeatable process.

It can be used for any research project in software engineering that requires or includes the creation of techniques for implementing best practices.
Introduction – Construction Process

Identify the different components that make up the protocol

It has been adopted as the standard method for conducting the selection and prioritization of best practices

is the base for the pilot phase included in the protocol

Protocol
Overview

Process Improvement

Is an iterative activity (measuring, analyzing and modeling to introduce changes)

Best practices for Software Development

Is a method or technique to be replicated with a very high probability of success

Mechanisms, methods or tools that SMEs can adopt and adapt for software development

Techniques
**Protocol proposed**

**Characteristics:**

1. **Repeatability**
   - Systematically apply the procedure as many times as necessary to design techniques

2. **Agility**
   - It is described and documented to generate results in an agile way

3. **Process optimization**
   - Optimize processes that rely on best practices from a better selection of techniques

4. **Quality validation**
   - Evaluate the quality of best practices selected and implemented through validating the techniques

5. **Easy creating of techniques**
   - Establish steps and examples
Protocol - Phases

Establish a plan for studying the process or area susceptible to improve in the software development

Select and prioritize best practices that enable the achievement of the objectives to improve a defined process

Study and analyze the implementation technique related to the best practices selected

Experiment, evaluate and institutionalize the process
## Phase 1. Planning

### Protocol – Planning phase

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Task</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal and scope of the study</td>
<td>1.1. Select process area</td>
<td>Processing area described</td>
</tr>
<tr>
<td>Reference Model</td>
<td>1.2. Describe process area</td>
<td></td>
</tr>
<tr>
<td>Models</td>
<td>1.3. Identify models</td>
<td>List of selected models</td>
</tr>
</tbody>
</table>
## Phase 2. Selection

### Protocol – Phase Selection of Best Practices

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Task</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of selected models</td>
<td>2.1. Review detailed of model</td>
<td>List of selected practices</td>
</tr>
<tr>
<td>Describe process area</td>
<td>2.2. Compare and analyze</td>
<td></td>
</tr>
<tr>
<td>Method for comparing models</td>
<td>2.3. Select practices</td>
<td></td>
</tr>
</tbody>
</table>

**Inputs**
- List of selected models
- Describe process area
- Method for comparing models

**Task**
- 2.1. Review detailed of model
- 2.2. Compare and analyze
- 2.3. Select practices

**Outputs**
- List of selected practices
## Phase 3. Standardization

### Protocol – Phase Standardization of Techniques

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Tasks</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of selected practices</td>
<td>3.1. Describe best practices</td>
<td>Standardized and described technique</td>
</tr>
<tr>
<td></td>
<td>3.2. Create Technique</td>
<td>Date base for assets</td>
</tr>
<tr>
<td></td>
<td>3.3. Create assets</td>
<td></td>
</tr>
</tbody>
</table>
Phase 4. Validation

Protocol – Creation of techniques best practices

**Inputs**
- Data base for assets
- Standardized and described technique
- Study case of testing

**Tasks**
1. Implement the technique in the case study
2. Evaluate implementation results
3. Document recommendations and lessons learned
4. Institutionalize the technique

**Outputs**
- Analysis of the results
- Technique
- Recommendations and lessons learned
Case Study

- **Goal:** Identify mechanisms, techniques and methods for the implementation and adaptation of best practices for software development in a multi-model environment.

**Multi-model environment:** approach used in process improvement that is characterized because it seeks the integration of multiple models for improving software development processes.

This type of environment is a good solution to reduce the complexity of process improvement in small and medium enterprises in Latin America.

It allows selecting and focusing on the best practices for small organizations, considering various models that complement and strengthen the identified practices.
Case Study

• **Target**: Identify a set of best practices that enables to improve the process of risk management in a medium sized enterprise
Case Study - Outcomes

- Researchers & teachers
- Software professionals
- Group of graduate students

Selection of a team of experts

Weighted average of a preliminary list of proposed areas

Identification of best practices

- Traceability Requirements
- Risk Management
- Quality Management

Incorporating fuzzy logic concepts to achieve a risk prioritization and subsequent analysis

The design of a method is defined to identify and analyze the risks

- Risk classification (for a better identification through a taxonomy of risks)
Case Study

• Technique defined: “Design of a method for identifying and analyzing the risks”

It is based on the following elements:

a) Risk taxonomy based on questions proposed by the Software Engineering Institute,

b) Risk analysis matrix based on fuzzy logic.

• These techniques help to decrease the sense of vagueness in defining the measures in the risk analysis when qualitative values are used.
Case Study

- Technique defined: “Design of a method for identifying and analyzing the risks”

Taxonomy of risks

- Planning next cycle
- Examine each element
- Taxonomy of risks
- Select the set of questions “Taxonomy-Based Risk Identification”
- Perform a plenary session
- Review previous effort in similar projects
- Risk analysis matrix
- Document identified risk
- Examine Lessons learned
- Select items from the taxonomy
- Risk analysis matrix

Risk analysis matrix

- Context
- Conditions
- Consequences
Case Study

- Technique defined: “Design of a method for identifying and analyzing the risks”

  - The implementation of the method in a software tool a software prototype is achieved.
    - Using this functional prototype a pilot validation of the technique starts.
  - Proposed: Evaluate the software tool in its first phase. From this assessment it is pretended to raise experimental project engineering software for validation of the technique.
Case Study

- Technique defined: “Design of a method for identifying and analyzing the risks”

– Results:
  - 67% indicated that it was easy to identify risks applying the technique and making use of the tool,
  - 33% considers that it was not easy to identify the risks
Conclusions

• The adoption and adaptation of best practices proposed on international models and standards, is not an easy task to perform especially in small enterprises due to financial resources and the time required to make a large investment in improving its processes.

• This improvement is necessary to improve its product quality, increase productivity, and respond in the best way to the market.

• This project aims to facilitate small organizations, the instantiation of software development best practices in their own processes.
Conclusions

• This paper presents a protocol that is one of the outstanding results of this project

• The strengths of the proposed protocol:

  - Defines and implements techniques for adopting and adapting best practices

  - Incorporate a set of best practices in an agile way, reducing the effort and time
Future Work

• Improve the prototype to get a computer tool

• Experiment the technique in software development projects of medium and small organizations
Thanks for your attention
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