Supporting Time Planning Aligned with CMMI-DEV and PMBOK

GQS – Software Quality Group
INCoD - The National Institute of Science and Technology for Digital Convergence

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Introduction

Software development projects still have problems to be delivered on time and budget.

One of the main problems is the lack of project management.

Best practice models such as CMMI and PMBOK are used to improve this situation.

Yet, a large part of the market is composed of SMEs.
Objective

Support for time planning in SMEs aligned with PMBOK and CMMI:
- Generic process model
- Enhancement of open-source tool

PMBOK

A project is a temporary endeavor undertaken to create a unique product, service, or result.

Project management is the application of knowledge, skills, tools and techniques to project activities to meet their requirements.

- Initiate a new project or phase and obtain the authorization.
- Establish the project goals, scope, and to define the actions to the project meet its goals.
- Monitoring & Controlling
  - Monitor and adjust the project performance, realizing corrective actions.
  - Perform to finalize all project activities in a formal way.
- Executing
  - Execution of the project during which the work is carried out.
PMBOK – Time Planning

According to PMBOK, time planning requires processes to:

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>Define Activities.</td>
</tr>
<tr>
<td>6.2</td>
<td>Sequence activities.</td>
</tr>
<tr>
<td>6.3</td>
<td>Estimate activities resources.</td>
</tr>
<tr>
<td>6.4</td>
<td>Estimate duration of activities.</td>
</tr>
<tr>
<td>6.5</td>
<td>Develop schedule.</td>
</tr>
</tbody>
</table>

CMMI-DEV

The Capability Maturity Model Integration (CMMI) provides a framework for the improvement of the development process for software products and services.

Time planning specific practices recommend by CMMI-DEV:

<table>
<thead>
<tr>
<th>Practice</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP/SP 1.1</td>
<td>Estimate the Scope of the Project.</td>
</tr>
<tr>
<td>PP/SP 1.2</td>
<td>Establish Estimates of Work Product and Task Attributes.</td>
</tr>
<tr>
<td>PP/SP 2.1</td>
<td>Establish the Budget and Schedule.</td>
</tr>
<tr>
<td>PP/SP 2.4</td>
<td>Plan for Project Resources.</td>
</tr>
<tr>
<td>PP/SP 1.4</td>
<td>Determine Estimates of Effort and Cost.</td>
</tr>
</tbody>
</table>
Unified Best Practices

<table>
<thead>
<tr>
<th>UBP</th>
<th>PMBOK 4ed:2008</th>
<th>CMMI-DEV v1.3:2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Define Activities</td>
<td>PP/SP 1.1 Estimate the Scope of the Project</td>
</tr>
<tr>
<td>P2</td>
<td>Establish Estimates of Work Product and Activity Attributes</td>
<td>PP/SP 1.2 Establish Estimates of Work Product and Task</td>
</tr>
<tr>
<td>P3</td>
<td>Sequence Activities</td>
<td>PP/SP 2.1 Establish the Budget and Schedule</td>
</tr>
<tr>
<td>P4</td>
<td>Plan for Project Resources</td>
<td>PP/SP 2.4 Plan for Project Resources</td>
</tr>
<tr>
<td>P5</td>
<td>Estimate duration of activities.</td>
<td>PP/SP 2.1 Establish the Budget and Schedule</td>
</tr>
<tr>
<td>P6</td>
<td>Estimate Effort</td>
<td>PP/SP 1.4 Determine Estimates of Effort and Cost</td>
</tr>
<tr>
<td>P7</td>
<td>Develop Schedule</td>
<td>PP/SP 2.1 Establish the Budget and Schedule</td>
</tr>
</tbody>
</table>


Generic process model

We harmonized CMMI-DEV and PMBOK processes/practices for time planning.

Focused on techniques applied in SMEs context.

Developed the generic process model for time planning.
Generic process model for time planning

Tool support - dotProject
**Evolution of tool support - 1**

- Support to define project WBS.
- Management of WBS items.
- Highlighting of WBS work packages.

### WBS Table

<table>
<thead>
<tr>
<th>ID</th>
<th>WBS Item</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time planning enhancement for dotProject</td>
<td>X</td>
</tr>
<tr>
<td>1.1</td>
<td>Time planning best practices</td>
<td>X</td>
</tr>
<tr>
<td>1.1.1*</td>
<td>CMNI practices for time planning</td>
<td>X</td>
</tr>
<tr>
<td>1.1.2*</td>
<td>PMBOK process for time planning</td>
<td>X</td>
</tr>
</tbody>
</table>

**Evolution of tool support - 2**

- Support of the derivation technique.
- Definition of project activities.

### Activities Definition

1. Time planning enhancement for dotProject
2. Time planning best practices

1.1.1 - CMNI practices for time planning

1.1.2 - PMBOK process for time planning

Download CMNI-DEV v1.3 guide.
Evaluate all time planning practices and document results.
Evolution of tool support - 3

- Precedence diagram method.
- Support of the logical sequence of activities.

Evolution of tool support - 4

- Estimation of resources
- Estimation of duration
- Estimation of effort.

- Estimation of size.
- Register of estimation minutes
- Schedule development.
evaluation

Definition of goals

Design and Instrumentation

Selection and Invitation

Collection of data

Analysis of results

*CEPSH certificate no. 01844812.9.0000.0121

**GQM
Goal / Question / Metric

- Questionnaires
- Manuals
- Approval by ethical committee

- PMs in SMEs
- Invited 34 specialists

- Expert Panel
- Obtained 10 answers

- Affirmations:
  - Scale of 1-5
- Open Questions:
  - Strong points
  - Improvement points

Evaluation

Goal 1 - Evaluate, if the enhancement of dotProject is helpful to support time planning in software projects in SMEs

Median: 5

Goal 2 - Analyze if the generic process model is complete, consistent, and adequate for SMEs.

Median: 4

Goal 3 - Identify the strengths and opportunities for improvement of the proposed solution.

Harmonization between PMBOK and CMMI.

Clear separation of concepts between work packages and project activities.

Enhancement of the open-source tool.

Likert scale: 1 – Completely disagree to 5 – Completely agree.
## Evaluation

**Goal 4 - Compare the degree of alignment of the enhancements of dotProject with dotProject v2.1.6.**

<table>
<thead>
<tr>
<th>UBP</th>
<th>dotProject v2.1.6</th>
<th>dotProject enhanced version</th>
</tr>
</thead>
<tbody>
<tr>
<td>P01. Define Activities</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td>P02. Establish Estimates of Work Product and Activity Attributes</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>P03. Sequence Activities</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td>P04. Plan for Project Resources</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td>P05. Estimate Activity Durations</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td>P06. Estimate Effort</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>P07. Develop Schedule</td>
<td>***</td>
<td>***</td>
</tr>
</tbody>
</table>

- Does not provide any support.
- * Offers basic support, covering less than half of the UBP.
- ** Covers more than half of the UBP.
- *** Offers a complete set of elaborate functionalities for this UBP.

The enhanced tool is available in the official dotProject repository: sourceforge.net/projects/dotmods/

### The results are useful?

The enhanced tool is available in the official dotProject repository:

- Directory: Alignment with PMBOK and CMMI-DEV
  - monitoring.tar
  - risks.tar
  - human_resources.tar

354 downloads just for time planning
1334 downloads at all
Conclusions

- Support developed for time planning in SMEs aligned with PMBOK and CMMI-DEV has been indicated as useful:
  - generic process model
  - Evolution of dotProject
- Contributing to the improvement of time planning in SMEs increasing their competitiveness.

Future work

- Improve the integration between dotProject modules developed by GQS.
- Analyze and improve the tool usability.
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http://www.gqs.ufsc.br/evolution-of-dotproject/