HELPING YOU IMPROVE YOUR ENGINEERING PROCESS

www.processgroup.com/newsletter.htm

March 2009

IMPLEMENTING SCRUM (AGILE) AND CMMI® TOGETHER

By Neil Potter and Mary Sakry

Introduction

If you are a software engineer or IT professional, your group has very likely shown a strong interest in reducing costs, improving quality and productivity. Your group might also have looked at various pre-packaged frameworks, such as Agile (e.g., Scrum and Extreme Programming), CMMI, and Six Sigma.

At first glance, each of these frameworks might look at odds with each other, making it difficult to use two or more. This typically occurs because much of the information shared regarding these frameworks is from success and failure stories, rather than understanding the specifics of each framework. Each framework can be implemented successfully depending on how much care is placed on its implementation.

In this article we compare CMMI and Scrum since they are two commonly used frameworks, and ones we have seen groups struggle with when using them together.

First, let us define each briefly.

Scrum

Scrum is a pre-defined development lifecycle based on Agile principles. Agile methodologies promote a project-management process that encourages frequent inspection and adaptation, and a leadership philosophy using teamwork, self-organization and accountability. [See sidebar on page 2.]

CMMI for Development

CMMI is a collection of practices that organizations (software, hardware and IT) can adopt to improve their performance. The CMMI comes with two main views (representations), Staged and Continuous. Staged shows all the Process Areas (groups of related practices) in the form of a road map, allowing organizations to focus on basic improvements before attempting advanced topics. The Continuous representation has the same content but allows for any topic (Process Area) to be selected in an a la carte style. [See www.sei.cmu.edu/cmmi/models]

The Level 2 Process Areas focus on change and project management. Level 3 focuses on engineering skills, advanced project management and organizational learning. Levels 4 and 5 focus on the use of statistics to improve the organization’s performance by statistically controlling selected processes and reducing variation.

So the question is, how do these two frameworks relate, and how can an organization use both?
Scrum is an example implementation of some of the Maturity Level 2 practices. Below we have listed the main practices of CMMI that map cleanly to Scrum process steps. This doesn’t mean that an organization could not eventually add additional CMMI practices to its projects; it just means that in Scrum, there is no clear equivalent called out.

Although the practices of Scrum provide good implementation examples of many Level 2 CMMI practices, one catch is the level of artifacts needed to appraise at CMMI Level 2. If a Scrum team either discards or loses its project artifacts, then being appraised Level 2 will not be possible since there will be little evidence showing what happened. If however, a project team stores these data, an appraisal team can then use them for verification. Ideally, Scrum team members would naturally want to store their work so that they could refer to past iterations during lessons-learned sessions.

CMMI and Scrum mapping
In the tables below we show several CMMI practices (using CMMI text taken from the model definition) and how Scrum can implement each practice. To appraise Level 2, it is assumed that the Scrum implementation is robust and shows evidence of the CMMI practice being performed.

REQUIREMENTS MANAGEMENT:
The purpose of Requirements Management (REQM) is to manage the requirements of the project’s products and product components and to identify inconsistencies between those requirements and the project’s plans and work products.

[Continued on page 3.]
The purpose of Project Planning (PP) is to establish and maintain plans that define project activities.

### PROJECT PLANNING

The purpose of Project Planning (PP) is to establish and maintain plans that define project activities.

<table>
<thead>
<tr>
<th>REQM</th>
<th>CMMI Practice</th>
<th>Scrum Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 1.1</td>
<td>Develop an understanding with the requirements providers on the meaning of the requirements.</td>
<td>• Review of Product Backlog (requirements) with Product owner and team.</td>
</tr>
<tr>
<td>SP 1.2</td>
<td>Obtain commitment to the requirements from the project participants.</td>
<td>• Release planning and Sprint planning sessions that seek team member commitment.</td>
</tr>
</tbody>
</table>
| SP 1.3 | Manage changes to the requirements as they evolve during the project. | • Add requirements changes to the Product Backlog. 
• Manage changes in the next Sprint planning meeting. |
| SP 1.5 | Identify inconsistencies between the project plans and work products and the requirements. | • Daily standup meeting to identify issues. 
• Release planning and Sprint planning sessions to address inconsistencies. 
• Sprint burndown chart that tracks effort remaining. 
• Release burndown chart that tracks story points that have been completed. This shows how much of the product functionality is left to complete. |

### REVIEW OF PLANS

The purpose of Review of Plans is to understand project commitments.

<table>
<thead>
<tr>
<th>PP</th>
<th>CMMI Practice</th>
<th>Scrum Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 1.1</td>
<td>Establish a top-level work breakdown structure (WBS) to estimate the scope of the project.</td>
<td>• The standard tasks used in a Scrum process combined with specific project tasks (Scrum Backlog).</td>
</tr>
<tr>
<td>SP 1.2</td>
<td>Establish and maintain estimates of the attributes of the work products and tasks.</td>
<td>• Story points, used to estimate the difficulty (or relative size) of a Story (requirement).</td>
</tr>
<tr>
<td>SP 1.3</td>
<td>Define the project life-cycle phases upon which to scope the planning effort.</td>
<td>• The Scrum process.</td>
</tr>
<tr>
<td>SP 1.4</td>
<td>Estimate the project effort and cost for the work products and tasks based on estimation rationale.</td>
<td>• Scrum Ideal Time estimate (similar to billable hours or Full-time Equivalents).</td>
</tr>
</tbody>
</table>
| SP 2.1 | Establish and maintain the project’s budget and schedule. | • Scrum estimates (in Ideal Time). 
• Estimates of what work will be in each release. 
• Sprint Backlog. 
• Project Taskboard. |
| SP 2.4 | Plan for necessary resources to perform the project. | • Scrum estimates in Ideal Time 
• Release plan, Sprint Backlog and assignments. |
| SP 2.6 | Plan the involvement of identified stakeholders. | • Scrum process roles (including team, Scrum Master, Product Owner). 
• [Note: The stakeholders listed in Scrum might not be the complete list of stakeholders for the project, e.g., customers, other impacted teams.] |
| SP 2.7 | Establish and maintain the overall project plan content. | • Scrum release plan. 
• Sprint Backlog. 
• Project Taskboard. 
• [Note: The term “plan” in CMMI refers to additional plan components (such as risks and data management) that are not called out specifically in Scrum.] |
| SP 3.1 | Review all plans that affect the project to understand project commitments. | • Sprint planning meeting. 
• Daily Scrum meeting. |
| SP 3.2 | Reconcile the project plan to reflect | • Sprint planning meeting. |
SP 3.3 Obtain commitment from relevant stakeholders responsible for performing and supporting plan execution.

- Daily Scrum meeting.
- Sprint planning meeting.
- Daily Scrum meeting.
- [Note: The stakeholders listed in Scrum might not be the complete list of stakeholders for the project.]

**PROJECT MONITORING AND CONTROL**

The purpose of Project Monitoring and Control (PMC) is to provide an understanding of the project’s progress so that appropriate corrective actions can be taken when the project’s performance deviates significantly from the plan.

<table>
<thead>
<tr>
<th>PMC</th>
<th>CMMI Practice</th>
<th>Scrum Practice</th>
</tr>
</thead>
</table>
| SP 1.1 | Monitor the actual values of the project planning parameters against the project plan. | • Sprint burndown chart that tracks effort remaining.  
• Release burndown chart that tracks completed story points. This shows how much of the product functionality is left to complete.  
• Project Task Board used to track stories (requirements) that are done, in progress, or ones that need verification. |
| SP 1.2 | Monitor commitments against those identified in the project plan. | • Discussions on team commitments at the:  
– Daily Scrum meeting.  
– Sprint review meeting.  
• Sprint burndown chart that tracks effort remaining.  
• Release burndown chart that tracks story points that have been completed. This shows how much of the product functionality is left to complete. |
| SP 1.5 | Monitor stakeholder involvement against the project plan. | • Discussions at the:  
– Daily Scrum meeting.  
– Sprint review meeting.  
• [Note: The stakeholders listed in Scrum might not be the complete list of stakeholders for the project, e.g., customers, other impacted teams.] |
| SP 1.6 | Periodically review the project's progress, performance, and issues. | • Daily Scrum meeting.  
• Sprint review meeting.  
• Retrospectives. |
| SP 1.7 | Review the accomplishments and results of the project at selected project milestones. | • Sprint review meeting. |
| SP 2.1 | Collect and analyze the issues and determine the corrective actions necessary to address the issues. | • Notes from the:  
– Daily Scrum meeting.  
– Sprint review meeting.  
[Note: Some teams track their outstanding actions on the Product Backlog. It doesn’t matter where or how the items are tracked, as long as they are.] |
| SP 2.2 | Take corrective action on identified issues. | • Actions from the:  
– Daily Scrum meeting.  
– Sprint review meeting. |
| SP 2.3 | Manage corrective actions to closure. | • Tracking of actions from:  
– Daily Scrum meeting.  
– Sprint review meeting.  
• [Note: This assumes that teams will track (and not lose) actions.] |
How about the other components of Level 2?

**Configuration Management (CM)**
CM is not specifically called out in Scrum. However, in an Agile environment it is pretty easy to add a layer of CM to protect your work. Even for groups that like to use white boards, you can be creative and at least establish some basic protection by labeling items (e.g. “V1.1,” or “Story dated 1/2/YY”) and taking a photo. The CM Process Area does require more than just versioning, but versioning is an easy start.

**Product and Process Quality Assurance (PPQA)**
Some basic PPQA activities are being done naturally when the Scrum Master checks that the Scrum process is being followed. Other PPQA activities are completed when a team performs code reviews, document reviews and testing. The Scrum Master also plays a role of removing process barriers and inefficiencies. However, Scrum does not specifically call out a level of objective process and product check, nor does it state that particular standards or processes should be defined and used. Therefore Scrum does not automatically implement PPQA. However, refinements can be made such that it does.

**Supplier Agreement Management**
There are no practices in Scrum that deal with the selection and management of suppliers.

**Generic Practices**

**Measurement and Analysis**
The purpose of Measurement and Analysis (MA) is to develop and sustain a measurement capability that is used to support management information needs. There are no practices in Scrum that establish a measurement program similar to the expectations of MA. However, the measures in Scrum can be used to implement MA. A mapping showing the relationship between CMMI and Scrum measurements is at [www.processgroup.com/scrum-cmmi-mapping-ma-gp-v1.pdf](http://www.processgroup.com/scrum-cmmi-mapping-ma-gp-v1.pdf).

How about Level 3?

There are two main areas where Scrum has gaps compared to Level 3. One is in the CMMI expectation that project data and lessons are shared among projects via a common process asset library (or repository). Second, the expectation that the engineering phases of requirements, design, implementation, verification, integration and validation are well defined and implement the Level 3 engineering practices. These CMMI concepts can be done in an Agile/Scrum environment, but they don’t come with the common Scrum definition.

Scrum does suggest implementing Communities of Practice, to reach across teams to share lessons learned, and Retrospectives within a team. These ideas could certainly be used to populate an asset library and thereby codify best practices and tailoring guidelines. The following Level 3 components therefore are not readily implemented by Scrum without additional work:

- Organizational Process Focus
- Organizational Process Definition
- Organizational Training
- Integrated Project Management
- Risk Management
- Decision Analysis and Resolution
- Some engineering Specific Practices (e.g., requirements validation and verification data analysis)
- Generic Goal 3 (i.e., using an organization-wide and tailored process with measurements)

**Summary**
Scrum is a good implementation for some of the practices in Level 2. Therefore, a group can use Scrum and CMMI together. All the remaining practices in Levels 2 and 3 can be implemented while using Scrum.

*Neil Potter is Scrum Master, certified High Maturity CMMI Lead Appraiser, and Six Sigma Greenbelt.*

*Mary is a High Maturity certified CMMI Lead Appraiser and Six Sigma trained.*
Practical Solutions for Your Project Challenges

Also available: Webinar-style sessions to save on travel, and onsite coaching to save on time.

- Run your software development projects faster and incrementally, using Agile project management techniques.
  Customized SCRUM coaching sessions.

- Achieve more with your time. Make your staff more productive.
  One-day workshop, TIME MANAGEMENT.

- Understand how to save money, produce more and work faster.
  Two-day workshop, DOING MORE FOR LESS.

- Understand customer needs. Clarify product requirements early.
  Two-day workshop, IN SEARCH OF EXCELLENT REQUIREMENTS.

- Manage projects effectively. Meet project deadlines and reduce risks.
  Three-day workshop, PROJECT PLANNING AND MANAGEMENT.

- Meet project deadlines. Scope and estimate the project work.
  One-day workshop, PROJECT ESTIMATION.

- Avoid schedule delays caused by needless product rework. Find defects rapidly.
  Two-day workshop, INSPECTION (PEER REVIEWS).

- Hands-on SEI CMMI. Perform a CMMI gap-analysis.
  The following workshops are available:
  - Overview (half day), LEVEL 2 (one day), LEVEL 3 (two days).
  - SEI INTRODUCTION TO CMMI (three days).

- Identify critical changes to improve organizational results.
  Benchmark against the CMMI.
  A PROCESS APPRAISAL examines your organization’s engineering and management practices and generates a focused list of the critical areas for improvement. Our SEI-authorized Lead Appraisers conduct customized CMMI-based appraisals.

- Clarify and refine business/project measures and analysis.
  One-day workshop, MEASUREMENT AND ANALYSIS.

- Systematically evaluate decision alternatives.
  Half-day workshop, DECISION ANALYSIS AND RESOLUTION.

- Goal/problem-based improvement.
  Two-day workshop, MAKING PROCESS IMPROVEMENT WORK.

- Manage your suppliers.
  One and one-half-day workshop, SUPPLIER MANAGEMENT.

- Tailored assistance. Dedicated phone-based assistance.
  This service consists of customized education and coaching on your specific problems (e.g., meeting deadlines, quality and cultural change).

Detailed information on our services is available at www.processgroup.com/services.htm. Contact us at 972-418-9541 or help@processgroup.com to discuss your needs.

Read our book!
Also available in Chinese and Japanese.
See www.processgroup.com/tpgbook.htm

Here is the book’s Table of Contents:

Foreword by Karl Wiegers

Preface
Acknowledgements

Chapter 1. Developing a Plan
- Scope the Improvement
- Develop an Action Plan
- Determine Risks and Plan to Mitigate
- Chapter Summary

Chapter 2. Implementing the Plan
- Sell Solutions Based on Need
- Work with the Willing and Needy First
- Keep Focused on the Goals and Problems
- Align the Behaviors of Managers and Practitioners
- Chapter Summary

Chapter 3. Checking Progress
- Are We Making Progress on the Goals?
- Are We Making Progress on our Improvement Plan?
- Are We Making Progress on the Improvement Framework?
- What Lessons Have We Learned So Far?
- Chapter Summary

Conclusion
Appendices
References

The Process Group
Telephone: 972-418-9541
Fax: 866-526-4645
E-mail: help@processgroup.com
Web: www.processgroup.com
POST back issues are on line