Using Business Process Management Technology to Implement a CMMI-compliant Agile Software Development Approach

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Introduction

- This presentation will show how Business Process Management (BPM) technology may be used to create process support tools that let Scrum developers be agile while still being CMMI-compliant.
  - Scrum is a popular agile software development method developed by Ken Schwaber and Jeff Sutherland in the early 1990s.

What is BPM?

- BPM tools are next-generation software development tools oriented to process implementation.
- The BPM community has blossomed in the past five years:
  - There are more than 50 leading tools.
  - Gartner Group predicts the BPM tool license market alone (not including implementation services) will exceed $3B in 2006 .
- BPM provides a rapid, low-cost means to develop process support tools that are designed to meet each organization's specific processes.

BPM Capabilities

- BPM is more than work-flow automation, though work-flow and BPM tools have much in common.
- The typical capabilities of BPM tools are to:
  - Model a process, typically in a graphical format,
  - Integrate a variety of processes, external applications, and databases with the defined process,
  - Manage step-by-step process execution across multiple personnel roles,
  - Create exception handling and alternative processes,
  - Monitor the health and fulfillment cycle of the process,
  - Simulate the execution of the defined process based on either empirical results or user-provided parameters,
  - Assign roles to personnel either by user direction within the process or based on current workload queues, and
  - Collect metrics on process execution.

BPM Tool Specifics

- This presentation is based on the use of Metastorm Inc.'s "Metatstorm BPM" tool (formerly e-Work) because:
  - It is prominent in Gartner's survey of BPM tools on a continuing year-to-year basis,
  - It has an appreciable share of the BPM license market, and
  - The author's familiarity with the use of the tool. (Most important!)

What are Agile Software Development Methods?

"The Manifesto for Agile Software Development" summarizes agile methods as those that value:

"Individuals and interactions	over	**processes and tools**
Working software	over	**comprehensive documentation**
Customer collaboration	over	**contract negotiation**
Responding to change	over	**following a plan**

That is, while there is value in the items on the right, we value the items on the left more."

Some Scrum Vocabulary

- The project leader is called a Scrum Master—abbreviated here as SM.
- The list of requirements to be implemented is called a product backlog.
- One cycle in the project life cycle is a sprint. Sprints last for 30 days.
- The list of requirements to be worked in a particular sprint is a sprint backlog.
- A daily status meeting is a daily scrum.
- That accomplishments of the sprint are reviewed and demonstrated to the customer at the end of each sprint.

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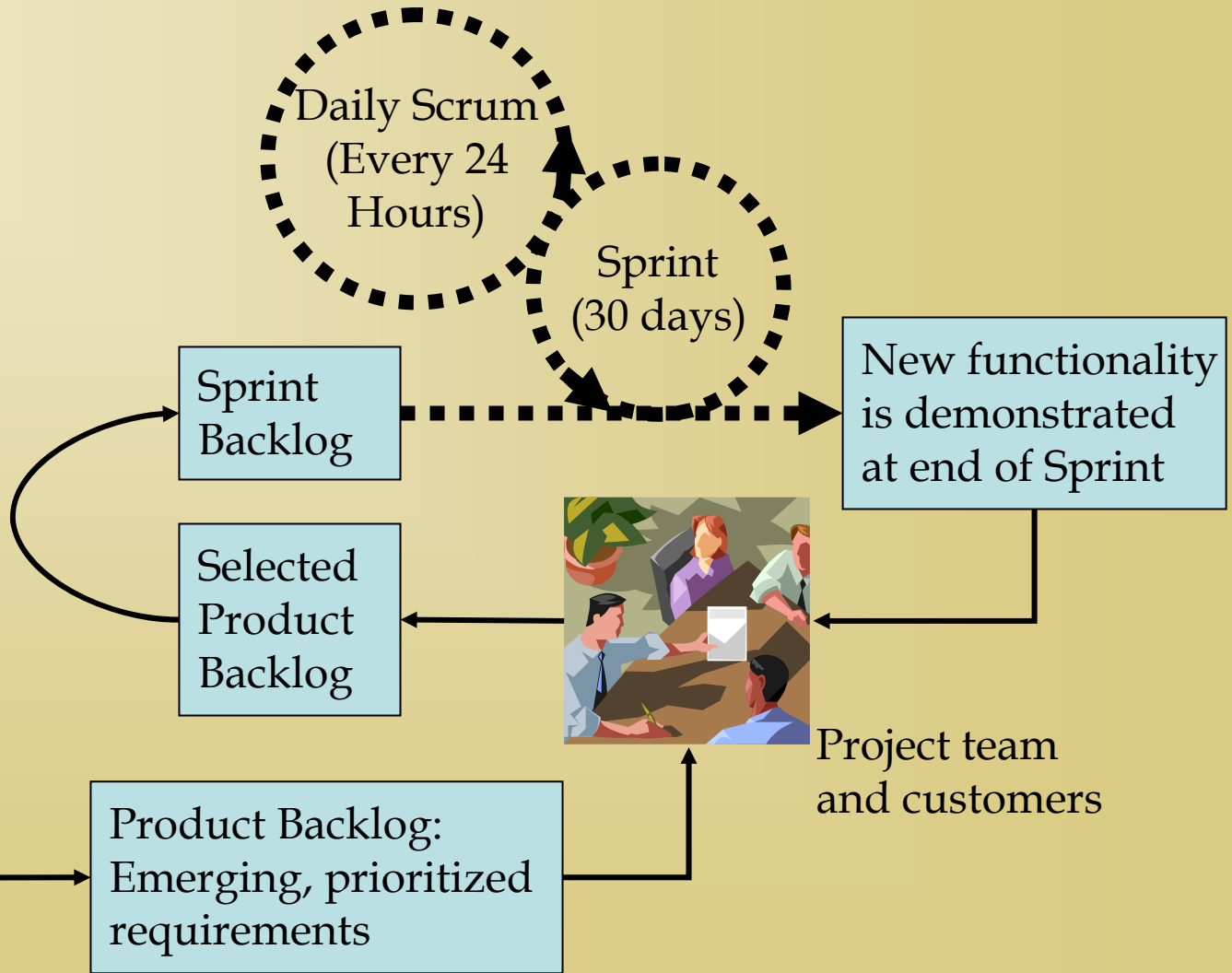
What is Scrum?

According to Ken Schwaber's Agile Project Management with Scrum, Scrum operates as follows:



The Agile Development vs. CMMI Challenge

- Agile software developers often believe that CMMI compliance and the benefits of an agile approach are incompatible.
- Likewise, many CMMI practitioners view the typical agile implementation as a "do what you want to do" rather than a disciplined environment.
- These perceptions are false, yet they persist.

Why Do Agile Developers Feel Agile is Incompatible with CMMI?

- Many agile "gurus" characterize CMMI implementations as documentation-heavy and more interested in process adherence than satisfying customer needs.
- Agile thinking is often somewhat counter-cultural and CMMI is viewed as a creation of the military-industrial establishment.

Why Do CMMI Implementers View Agile Methods Like Scrum as Undisciplined?

- Scrum is an empirical process control method. This tends to emphasize:
  - Short planning cycles—hence fewer formally documented planning artifacts that are used over long periods.
  - Personal interaction among the development team—hence fewer formally documented project monitoring and control artifacts.
  - Personal interaction between the team and the customer—hence fewer formally documented requirements management artifacts.
  - Adjusting the process implementation to suit the situation as it is actually being experienced—hence PPQA process compliance audits are less clear.

Fundamental Premises

1. CMMI and Scrum are compatible.
   - This statement is offered without direct proof.
   - However, compatibility will be demonstrated using examples from a BPM implementation of Scrum processes with mapping to CMMI artifact requirements.
2. Being able to achieve Maturity Level 2 or better is sufficient evidence of a process's compliance with CMMI.
   - Note: Scrum contains a subset of the ML 2 specific and generic goals:
     - Scrum addresses many practices associated with PP, PMC, and REQM.
     - The implementing project or organization must still address CM, PPQA, and SAM in addition to Scrum implementation.
     - Some aspects of MA are covered by implementation of the Scrum processes through the BPM tool.

How Does the BPM Implementation of Scrum Support CMMI?

- BPM supports Scrum in a CMMI context in two ways:
  - By supporting the natural implementation of Scrum in a manner that does not differ from the way developers expect Scrum to be implemented:
    - The BPM tool provides sprint planning and management tools.
  - By accumulating direct and indirect artifacts needed for a successful CMMI appraisal:
    - Capturing planning, project monitoring, requirements management, and stakeholder interaction artifacts without interfering in the Scrum implementation,
    - Capturing key metrics associated with the processes, and
    - Providing process audit trails that support CMMI appraisals and PPQA audits.

How We Will Proceed

- The BPM environment can support process implementation much more comprehensively than described here.
  - However, in this case the BPM environment was used to implement a Scrum process, so support is limited to what Scrum itself does.
  - For more information on general BPM support of CMMI implementation, see http://www.biztransform.net/
- We won't cover every aspect of every process, but provide the highlights to guide the way to how CMMI and Scrum are mutually reinforced through the BPM tool support.

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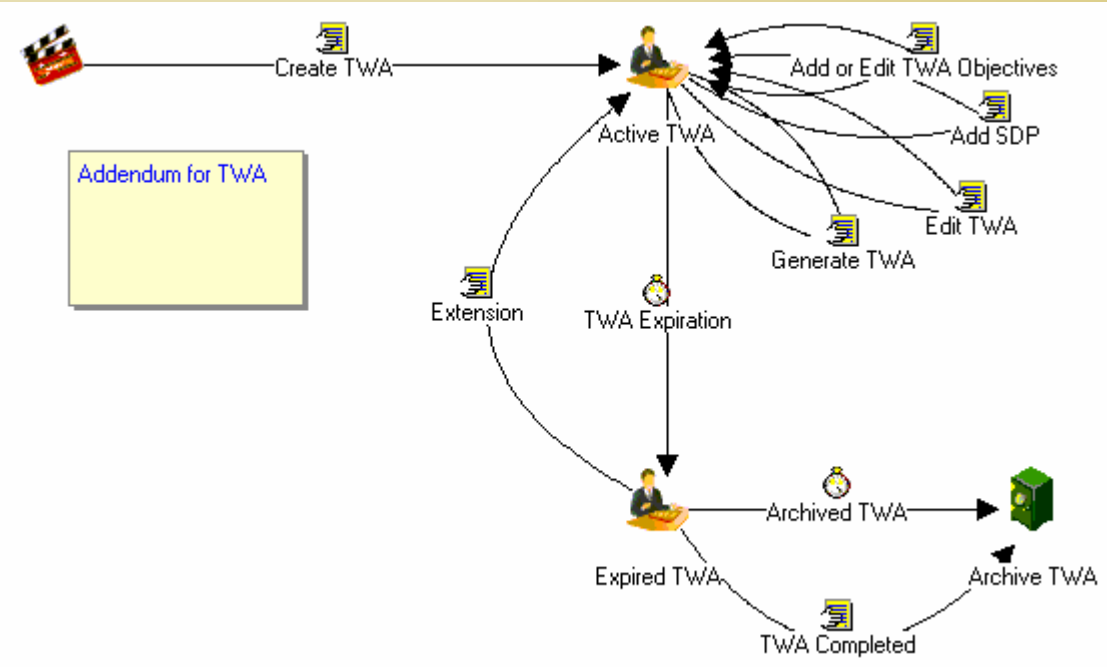
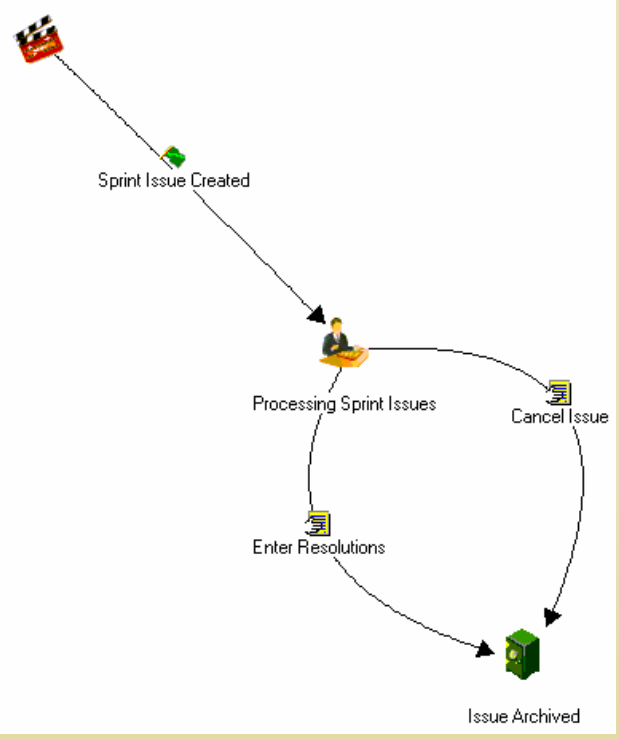
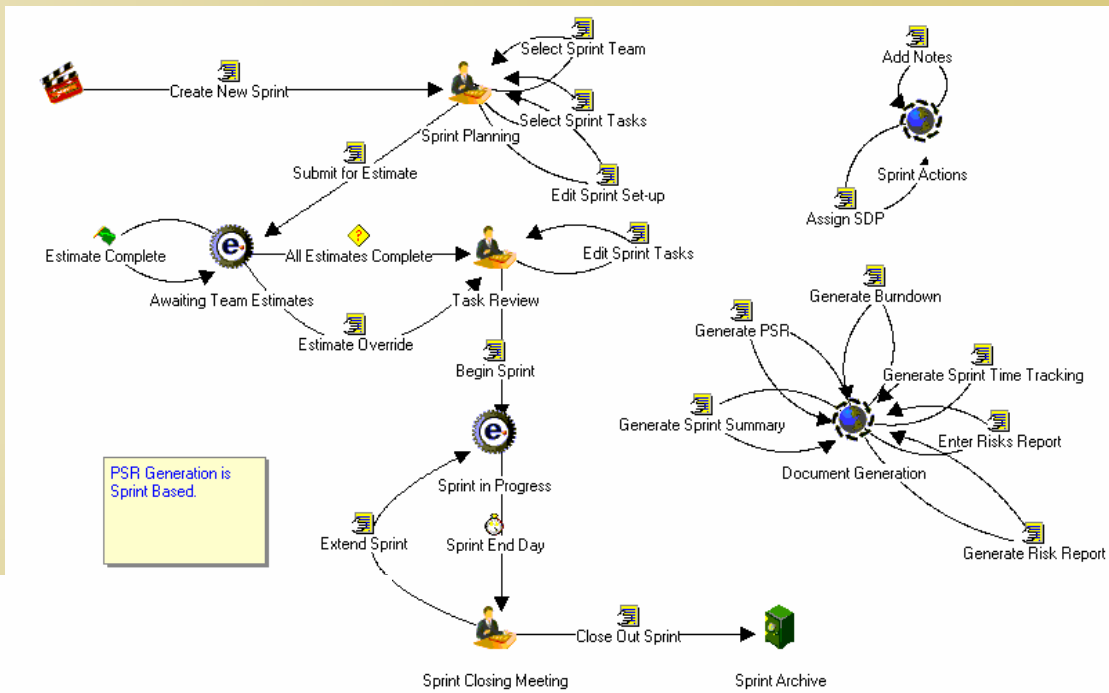
Tactical Working Agreement Process Map

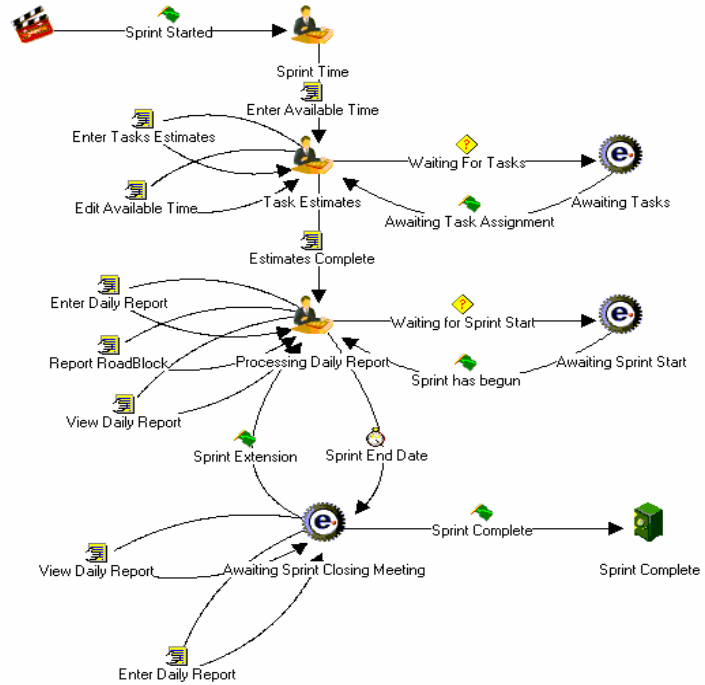
- This is a high-level agreement with the customer that covers the general work objectives.
  - Not standard Scrum terminology.



Sprint Planning and Execution Process Maps







Specific Practices General Discussion

- At the simplest level of implementation, a BPM tool provides a static electronic checklist that requires the user to record the actions that he or she is executing while following the process.
  - The checklist, like any quality checklist, is built to reflect the steps and roles involved in the process.
  - As the checklist is completed inside the BPM environment, the tool records an indelible audit trail of who completed each checklist step and when the step was completed.
    - This audit trail can be used to monitor implementation of the process.
    - The audit trail is also an indirect artifact that can be used in a CMMI appraisal.

Specific Practices
General Discussion (continued)

- In a more sophisticated implementation, the BPM Scrum tool provides an executable process checklist for PP, PMC, and REQM practices.
  - The tool begins by allowing selected users to commence a process.
    - For example, start prioritizing the product backlog with the customer (REQM).
  - As the process begins, the user is presented with potential next steps that can be taken in the process
    - For example, determine customer sub-objectives for the next sprint given the customer's stated objectives (needs and wants) (REQM).

Specific Practices
General Discussion (continued)

- At each step along the way, the tool informs each user involved in the process about the list of process steps that the user must execute due to a triggering activity.
  - For example, in response to the team members completing their estimates of how much time a sub-objective task will take (PP), the tool presents the SM with the team's estimates and prompting the SM to finalize the sprint plan (PP).
- The BPM tool also records an audit trail of activities completed, completion dates and times, and personnel involved. It also prepares end-of-sprint reports used by management to understand progress and status (PMC).

Specific Practices
General Discussion (continued)

- From the CMMI appraisal perspective, the tool captures:
  - Direct artifacts: outputs from executing the process (e.g., product backlog discussions and task estimates) with respect to:
    - PP—Specific practices 1.1, 1.2, 1.4, 2.1, 2.2, 2.6, 2.7, 3.2, 3.3
    - PMC—Specific practices 1.1, 1.2, 1.3, 1.5, 2.1, 2.2, 2.3
    - REQM—Specific practices 1.1, 1.2, 1.3
  - Indirect artifacts: the audit trail is an indirect artifact for the SPs listed above.

Measurement and Analysis Specific Practices 2.1-2.4

- The BPM Scrum tool provides the means to collect data on any given task's execution duration.
- This data can be stored and run through a variety of different analyses.
- The raw data, and the analyses, can be automatically exported to other tools or sent directly to a "management dashboard" that displays measurement information.
- From an appraisal perspective, the tool provides:
  - Direct artifacts: collected data and records of data collection, records of analyses, evidence of data and analyses storage, evidence of data reporting to managers
  - Indirect artifact: the tool itself is a resource for MA and can be used as an indirect artifact.

Generic Practice 2.1 (PP, REQM, PMC)

- Although the BPM Scrum tool can help in advertising a policy's existence by reminding users of the policy at crucial process steps, it cannot create a policy.
- As we have implemented it, the Scrum process as represented inside the BPM environment is the *only* way to accomplish the activities associated with certain PP-, PMC-, and REQM-related processes.
  - For example, the only way to get review and approval of a sprint plan is through the sub-objective construction and task estimation process in the BPM tool.

Generic Practice 2.1 (continued)

- Given that a policy's essence is that it expresses the expectations of an organization's leaders, this "locking down" of how work may be performed is an expression of the policy.
  - If management declares that the product backlog prioritization and task estimation processes must be followed, and no other means of accomplishing a desired result is available except through the BPM Scrum tool then adherence to management's policy is more effective than any written policy document could ever be.
- From the appraisal perspective, the tool provides:
  - Direct artifacts: Demonstration using the BPM Scrum tool of the enforcement of the processes as described above in the specific practice discussions for the PP, PMC, and REQM process areas.
  - Affirmations: Testimony that there is no alternative method for accomplishing the intended results of the process.

Generic Practice 2.2 (PP, REQM, PMC)

- Planning a process involves laying out the approach to be taken, in the context of an organization or project, to implement the process.
- The BPM-implemented Scrum process does *not* provide all the plans to be used by the project in implementing all process.
  - The BPM Scrum tool does put into practice the process to be followed in creating particular plans, such as software development and project management plans.

Generic Practice 2.2 (PP, REQM, PMC) [continued]

- From the appraisal perspective, the tool provides:
  - Direct artifacts: The BPM tool itself encapsulates the plan for some PP-, PMC-, and REQM-related processes since it creates and publishes the Working Agreement (contract equivalent), Service Delivery Plan (project plan equivalent and requirements specifications), and the 30 day sprint plan (requirements analysis and task planning).
  - Indirect artifacts: Records of the activities completed, completion dates, and personnel involved in executing the planning processes.

Generic Practice 2.3 (PP, REQM)

- The BPM Scrum tool has a directory of personnel in various roles that may perform work in implementing the software project.
- At the start of each overall project and sprint planning cycle, the BPM Scrum tool provides this directory to the SM as a list of names to be assigned to working on the customer's sub-objectives (requirements), working agreement creation, and service delivery plan creation.
- The tool causes each personnel resource to estimate their availability on a weekly basis throughout the duration of the next sprint.

Generic Practice 2.3 (PP, REQM) [continued]

- From the appraisal perspective, the tool provides:
  - Direct artifacts:
    - The BPM Scrum tool is a resource in supporting the planning process, so the existence of the process as implemented in the BPM tool is itself an artifact for GP 2.3 in PP and REQM.
    - The records of personnel availability and subsequent assignment to work based on task estimates are also direct artifacts.
  - Indirect artifacts: the audit trail records showing the assigned personnel working on the requirements, project planning, and project implementation processes.

Generic Practice 2.4 (PP, PMC, REQM)

- The BPM Scrum tool helps a SM assign responsibility in two ways:
  - Each Scrum process has a set of roles associated with each process step. This set of roles provides the basis for assigning responsibility.
  - The tool provides the SM with an inventory of personnel who are available to work on a process, to whom the SM can then assign responsibilities.
    - As SM associates personnel with the process, the tool documents this assignment and informs the personnel thus assigned about their responsibilities as the process is executed.

Generic Practice 2.4 (PP, PMC, REQM) [continued]

- From an appraisal perspective, the tool provides:
  - Direct artifacts: records of assignment of personnel to roles and the association of roles with Scrum activities.
  - Indirect artifacts: The record of personnel fulfilling their assigned responsibilities as captured by the BPM Scrum tool's audit trail.

Generic Practice 2.5 (all supported Process Areas)

- The BPM Scrum tool provides context-sensitive help for users engaged in any given process step.
- The tool also guides the user through implementing the process by limiting their choices with respect to the next possible steps.
- From an appraisal perspective, the tool:
  - Direct artifacts: records of the user referencing the context-sensitive help (a weak direct)
  - Indirect artifacts: none

Generic Practice 2.6 (PP, PMC, REQM)

- A BPM Scrum tool does not *directly* manage the configuration of items produced by the process.
- However, the tool can forward designated products resulting from process execution to the configuration management (CM) system.
  - For example, when a sprint plan is being circulated during construction and approval, the BPM tool can capture the plan at various stages and provide it to the CM system for version control or baselining.
- The BPM Scrum tool is part of the CM system since the products to be controlled through this mechanism may be selected from the PP-, PMC-, and REQM-related PA's designated configuration (or control) items (CIs) and the stages at which the CIs are to be captured is programmed into the BPM Scrum tool.

Generic Practice 2.6 (PP, PMC, REQM) [continued]

- From an appraisal perspective, the tool provides:
  - Direct artifacts: a demonstration of the BPM tool's ability to capture CIs at different stages in support of the CM system is a direct artifact.
  - Indirect artifacts: none

Generic Practice 2.7 (PP, PMC, REQM)

- By its nature, a BPM-implemented process requires the identification and involvement of stakeholders who are relevant to each process step.
  - As any given process (e.g., processes related to PP, PMC, REQM) is programmed in the BPM environment, the roles associated with each process step must be designated.
  - Either before or during process execution, these roles are associated with specific personnel.
  - These personnel are the CMMI's "relevant stakeholders".
  - As the process executes in the BPM Scrum environment, these personnel are involved in whichever step(s) of the process is assigned to them.

Generic Practice 2.7 (PP, PMC, REQM) [continued]

- From an appraisal perspective, the tool provides:
  - Direct artifacts:
    - The creation of process roles and the assignment of personnel to these roles are jointly demonstrate "identifying stakeholders". T
    - The BPM Scrum tool audit trail demonstrates "involving relevant stakeholders" requirement by recording the involvement of the designated personnel in the processes.
  - Indirect artifacts: none.

Generic Practice 2.8 (PP, PMC, REQM, technical activities)

- The BPM Scrum tool assists the SM in monitoring and controlling a process in two ways:
  - The SM can monitor project participants recording of their daily Scrum meeting minutes, recording of time spent on tasks, and completion of assigned sprint tasks in real time through his or her process "watch list".
  - The BPM Scrum environment can also feed data into a "management dashboard" that provides metrics on the sprint's status with respect to tasks completed, amount of time spent on tasks, etc.
- From an appraisal perspective, the tool provides
  - Direct artifact: the tools ability to provide information, along with proof that management is using these functions, jointly provide a direct artifact.
  - Indirect artifact: none.

Generic Practice 2.9 (all supported Process Areas)

- The BPM Scrum tool does not itself directly provide objective insight into the adherence of PP-, PMC-, or REQM-related processes to their descriptions, standards, etc.
- However, BPM Scrum helps an organization comply with generic practice 2.9 as follows:
  - First, implementation of a process (e.g., sprint reviews, sprint planning, backlog prioritization) in the tool means that the personnel who are executing the process cannot deviate from the process as defined.
  - The inability to circumvent process steps (or the entire process) reduces the need to monitor process execution as closely as is normally required with "paper-based" processes.
  - Additionally, the BPM Scrum tool process audit trail provides a log of the process steps performed, by whom the steps were performed, and when they were performed.

Generic Practice 2.9 (all supported Process Areas) [continued]

- From an appraisal perspective, the tool provides:
  - Direct artifacts: none.
  - Indirect artifacts: the audit trail is an indirect artifact if it is used in assessing process compliance.

Generic Practice 2.10 (all supported Process Areas)

- The BPM Scrum tool supports higher-level management's reviews with respect to a process in a several ways:
  - The higher level manager can have a set of process activities (e.g., sprint planning, task status) on his or her "watch list". This enables the manger to view activity status of the processes at any time.
  - The BPM Scrum tool can also feed data into a "management dashboard" that provides measurement data on sprint planning duration, task duration, requirements approved by the customer.
- From an appraisal perspective, the tool provides:
  - Direct artifacts: a demonstration of the BPM tool's ability to provide information, along with proof that this information is supporting higher level management's reviews, is jointly a direct artifact.
  - Indirect artifacts: none.

Summary

- BPM supports Scrum in conjunction with CMMI by:
  - Helping the Scrum Master and project team members plan and manage sprints.
  - By accumulating direct and indirect artifacts needed for a successful CMMI appraisal without project members realizing the CMMI is going on in the background.
- This presentation covers the basics.
  - For more information about applying BPM in a CMMI context, see http://www.biztransform.net/
  - For more information on Scrum see any of the books published by Ken Schwaber (just ignore what he says about CMM/CMMI processes).

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