A Framework to Manage and Evaluate Remote Software Testing Using the CMMI for Services Constellation

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• Process presented was used during the development and release of two SAS Products for the Manufacturing Solutions Group in 2006
Agenda

• Introduction
• Geographically Distributed Product Development and Service Delivery
• Analysis of a Real-world Case Study
• Use of SAM PA for Product Development and Service Delivery
• Conclusions
Distributed Development Scenario at SAS Manufacturing Solutions Group

- Software development typically driven from the US
- Remote development organizations located in India
- System/Integration Software Testing performed in India

- Product Management owns product roadmap and is located in US
- Senior Management for Development organization located in US
- Consulting Group responsible to customize and implement software solutions in the field
Geographic Distribution

- **Software (Product) Development**
  - Project Management
  - Development Manager
  - 2/3 Development Team
  - 1/3 Development Team

- **Software Verification**
  (System and Integration Testing)

- **Consulting Group**
- **Product Management**
- **Release Engineering**
- **R&D Senior Mgmt**

Improving Collaborative Development and Service Delivery

US

India
Findings CMMI Internal Appraisal – 1 –

• Strengths

– Organizational policy to manage external suppliers exist
– Supplier Agreements for COTS products are developed
– COTS products are evaluated against requirements

– Supply Chain Management handles the purchasing of commercial components for HW, SW and contractors
– All teams use common RE, CM, and Defect Tracking tools
Findings CMMI Internal Appraisal – 2 –

• Weaknesses

- No organizational policy/procedure to manage remote product development
- No organizational policy/procedure to manage remote service delivery (Testing)
- No formal collaboration agreements are established with remote teams
- Transition of work products (and services) provided by remote organization performed in informal manner
CMMI Practices

* Note: SAM for Product Development and Service Delivery and MA will be the focus of this presentation
Process Area Relationships
Stage 1
Process Area Relationships
Stage 2

RD -> MRS and PRS For Product
RD -> Develop Project Plan
PP

Responsible Product Development Partner
Process Area Relationships
Stage 4

- Responsible Product Development Partner
  - MRS and PRS For Product
  - Develop Project Plan
  - Analyses And Reports
  - Measurement Objectives

- RD
- PP
- MA
- SAM

- Collaboration Agreement for Product Development (SAM)
  - Distributed Product Development
  - Collaboration Agreement for Service Delivery (SAM Service)
  - Distributed VER

- Metrics and Analyses
Process Area Relationships
Stage 5
SAM Specific Goals/Practices - Appraisal Results

- SG1: Establish Supplier Agreements
  - SP 1.1: Determine Acquisition Type
  - SP 1.2: Select Suppliers
  - SP 1.3: Establish Supplier Agreements

- SG2: Satisfy Supplier Agreements
  - SP 2.1: Execute the Supplier Agreement
  - SP 2.2: Monitor Selected Supplier Processes
  - SP 2.3: Evaluate Selected Supplier Work Products
  - SP 2.4: Accept the Acquired Product/Service
  - SP 2.5: Transition Products/Services

**Note:** No procedures for collaboration/sub-contracting of products/services only for COTS
• SG1 - Establish Supplier Agreements
  – SP 1.1 - Determine Acquisition Type
    • Acquisitions may be COTS from third-party vendors, components developed by internal or external partner, or services delivered by internal or external partner
  – SP 1.2 - Select Suppliers
    • Establish criteria for selection of partners and also list of preferred suppliers/collaboration partners
  – SP 1.3 - Establish Agreements with Suppliers
    • Establish formal agreements with suppliers and collaboration partners (service agreements, product development agreements, license agreements, etc)
    • For internal partners the formal Supplier Agreement is a Collaboration Plan, which is part of the Project Plan
SG2 - Satisfy Supplier Agreements
  - SP 2.1 - Execute the Supplier Agreement
    • For internal partners the formal Supplier Agreement is a Collaboration Plan, which is part of the Project Plan
  - SP 2.2 - Monitor Selected Supplier process
    • For internal collaboration partners use internal release process
  - SP 2.3 - Evaluate Selected Supplier Work Products
    • This applies to internal developed components or services such as testing
  - SP 2.4 - Accept the Acquired Product
    • Services such as testing are also considered
  - SP 2.5 - Transition Products
    • Services such as testing are also considered
Remote Verification as a Service Activity - SAM$^{SVC}$

- System and Integration Testing considered as a Service Delivery activity in the organization
- SAM$^{SVC}$ not Implemented in the past in the organization
  - Service Delivery
  - Capacity and Availability Management
  - Problem Management
  - Incident and Request Management
Sample Collaboration Agreement Templates

- Sample Templates derived from SAM PA to be distributed and discussed with attendees:
  - Collaboration Agreement for Remote Product Development
  - Collaboration Agreement Template for Remote Service Delivery (Software Testing/Verification)
MA Process Area

- Measurement Objective
  - To improve “partner’s” satisfaction

- Measures
  - Number of “partner’s” complaints
    - Party or stakeholder involved in collaboration can enter a complaint after a week of not having received response to an issue
  - Level of severity of “partner’s” complaints
    - Low - first entry associated with a complaint
    - Medium - second entry associated with a previous complaint
    - High - more than two entries associated with a previous complaint
MA Process Area

• Data Collection and Storage

  – A partner/stakeholder enters a written complaint in the Complaint Spreadsheet available in the Project Common repository
  – The Complaint Spreadsheet has several sections each regarding the identified type of collaboration
  – The complaints are reviewed weekly at the Senior Management meetings
  – Each manager is responsible to ensure any complaints are properly addressed
  – Complaint Spreadsheet is maintained by Director of Development under CM
MA Process Area

• Analysis of Measurement Data
  – Histogram showing number of complaints clustered by severity level are developed by Director of Development Solutions
MA Process Area

- Reporting of Measurement Data
  - Histogram charts are presented at the end of each month and discussed at the Senior Management Meeting
  - Any corrective actions are tracked to completion by Director of Development Solutions
Discussion on Measurement and Analysis
### Sample of Complaints Sheet 2Q of 2006

<table>
<thead>
<tr>
<th>Complaint #</th>
<th>Severity</th>
<th>Description</th>
<th>Requestor Party</th>
<th>Requested Party</th>
<th>Date Created</th>
<th>Date Expected Resolution</th>
<th>Comments</th>
<th>Date Resolved</th>
<th>Date Second Entry</th>
<th>Date Second Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L</td>
<td>More detailed description of Requirement DS 0012 and no response from Development group in US</td>
<td>R&amp;D India</td>
<td>R&amp;D US</td>
<td>6-Jul-06</td>
<td>13-Jul-06</td>
<td>Details were obtained from Product Manager on 12-Jul-06.</td>
<td>12-Jul-06</td>
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<tr>
<td>2</td>
<td>H</td>
<td>Provide details about Performance Requirements and no response</td>
<td>Test Group</td>
<td>Product Mgmt</td>
<td>6-Jul-06</td>
<td>13-Jul-06</td>
<td>Request passed by Director to Product Manager but no response as of 13-Jul-06. Second request by Director to Product Manager on 20-Jul-06 and no answer.</td>
<td>26-Jul-06</td>
<td>13-Jul-06</td>
<td>20-Jul-06</td>
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<td>3</td>
<td>M</td>
<td>Review of general architecture document for Dashboard module without any response</td>
<td>R&amp;D India</td>
<td>R&amp;D US</td>
<td>12-Jul-06</td>
<td>19-Jul-06</td>
<td>Due to lack of time Dashboard Architecture Document was not reviewed until July 26 of 2006.</td>
<td>28-Jul-06</td>
<td>19-Jul-06</td>
<td>-</td>
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<td>4</td>
<td>M</td>
<td>Give presentation on new requirements on MRD without any response</td>
<td>R&amp;D India</td>
<td>Product Mgmt</td>
<td>13-Jul-06</td>
<td>20-Jul-06</td>
<td>Director reminded Product Manager to give presentation to R&amp;D Group in India. Product Manager responded on July 21 of 2006.</td>
<td>26-Jul-06</td>
<td>20-Jul-06</td>
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<td>5</td>
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<td>Provide feedback on Test Plan and no feedback or notice received yet</td>
<td>Test Group</td>
<td>R&amp;D US</td>
<td>20-Jul-06</td>
<td>27-Jul-06</td>
<td>R&amp;D group will review test Plan.</td>
<td>25-Jul-06</td>
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Sample Histogram of Complaints

2Q Complaints - R&D India to R&D US

Number of Complaints

Complaint Type

High
Medium
Low
Conclusions

1. Geographically dispersed teams at SAS:
   - Product Development
   - System/Integration Testing
2. System /Integration Testing viewed as Service
3. With a low number of distributed projects, an informal method to collaborate was sufficient
4. SAM CMMI PA needed as number of projects increased
5. The practices of the SAM CMMI process area are successfully being used to manage both remote product development and service delivery
Conclusions

• Including the CMMI MA PA helps monitoring effectiveness of process
• Essential to build a lean process
• Focusing on the “most painful” areas was important for buy-in
• Use of SAM process reduced level of frustration in remote “sister” organizations
• Resistance on process came from “responsible” partner
• Use of templates facilitated implementation of SAM process
• Metric was identified by members of the development and testing organizations
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