ROI From CMMI®
A DACS and SEI Collaboration

8th Annual CMMI Technology Conference
19 November 2008

Robert L. Vienneau
Data & Analysis Center for Software

Dennis R. Goldenson
Software Engineering Institute

Thomas McGibbon, CSDP
Data & Analysis Center for Software
Outline

• Introduction and Background
• Current Status of SEI and DACS Sites
• Desired User Displays and Issues
• Data Identification and Vetting Process
• Tasks
Introduction

- Many expect or have experienced improved performance with CMMI
- Some who have not tried, are skeptical
- SEI and DACS need evidence to address skeptics’ concerns, especially business-oriented evidence
- SEI and DACS web sites present CMMI performance data
- We seek improvements without duplicating effort
Background

• Widespread demand exists for credible, quantitative evidence on the results of process improvement based on CMMI models

• Collaborative Agreement between CMU/SEI & ITT/DACS
  – Initiates a strategic partnership to at least 31 May 2012
  – Supports mutual goal to provide info about performance effects of CMMI-based process improvement …
  – … That is empirically valid and of practical use for the software & systems engineering community
Background (Cont’d)

• Purpose: Harmonize two websites containing similar information
  – SEI’s “CMMI Performance Results”
  – DACS “ROI Dashboard”

• Access to that information is in mutual interest of SEI, DACS, & wider community they both serve
Outline

• Introduction and Background
• Current Status of SEI and DACS Sites
• Desired User Displays and Issues
• Data Identification and Vetting Process
• Tasks
Current Status of SEI and DACS Web Sites for CMMI Performance

- DACS: [https://www.thedacs.com/databases/roi/](https://www.thedacs.com/databases/roi/)
SEI CMMI Performance Results

- Summarizes Results through 2005
- Results through 2007
- Published in DACS Software Tech News (March 2007 issue edited by Dennis Goldenson)
## CMMI Performance Results

**View by Performance Category**

The performance results examples contain brief assertion statements and their sources and sometimes are accompanied by graphic illustrations. To view the graphic or source for a statement, click the View link.

- **Cost**
  - 20 percent reduction in unit software costs as the organization integrated its engineering processes
  - 15 percent decrease in defect find and fix costs as the organization integrated its engineering processes
  - Reduced cost of poor quality from over 45 percent to under 30 percent over a three year period as the organization moved from SW-CMM maturity level 5 towards CMMI maturity level 5
  - 5 percent improvement in cost performance index with a 34 percent decline in variation as the organization improved from SW-CMM maturity level 3 to CMMI integration level 3

- **Schedule**

- **Productivity**

- **Quality**

- **Customer Satisfaction**

- **Return on Investment**

---

**Organization**

- Lockheed Martin Management and Data Systems
- Siemens Information Systems Ltd.
- Raytheon North Texas
Assertion Statement Detail

Statement

20 percent reduction in unit software costs as the organization integrated its engineering processes

Organization

Lockheed Martin Management and Data Systems

Graph

Source

DACS ROI Dashboard©

- **Objective:** Transition from Anecdotal Evidence to Industry Trends
- **Captures 10 Years of Open and Public ROI Data from Industry and Acquisition Organizations**
- **Organizes and Displays Data from Similar Improvements and Benefits**
Box Plot

Impact on Quality (% defect reduction)

CMM, Software, Process, Improvement

For further explanation of boxplots and hinges please see (Tukey 1977) J. W. Tukey, Exploratory Data Analysis, Addison Wesley.
# Tabular Display

## Results for - CMMI Process Improvement

### Improvement: CMMI Process Improvement

<table>
<thead>
<tr>
<th>Metric</th>
<th>Total Data Points</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Median</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>25th Percentile</th>
<th>75th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROI</td>
<td>9</td>
<td>2.36</td>
<td>13.69</td>
<td>10.56</td>
<td>4.61</td>
<td>3.69</td>
<td>2.25</td>
<td>5.57</td>
</tr>
<tr>
<td>Impact on Cycle Time</td>
<td>5</td>
<td>8% decrease</td>
<td>50% decrease</td>
<td>20% decrease</td>
<td>32.6% decrease</td>
<td>14.62% decrease</td>
<td>17.5% decrease</td>
<td>45% decrease</td>
</tr>
<tr>
<td>Reduction in Defects (Defect Reduction)</td>
<td>29</td>
<td>0.5% defect reduction</td>
<td>95% defect reduction</td>
<td>45% defect reduction</td>
<td>47.64% defect reduction</td>
<td>29.23% defect reduction</td>
<td>25.5% defect reduction</td>
<td>67% defect reduction</td>
</tr>
<tr>
<td>Impact on Productivity</td>
<td>12</td>
<td>5% improvement</td>
<td>25% improvement</td>
<td>29% improvement</td>
<td>57% improvement</td>
<td>67.5% improvement</td>
<td>13.5% improvement</td>
<td>66.5% improvement</td>
</tr>
<tr>
<td>Impact on Schedule Variance</td>
<td>1</td>
<td>3% decrease</td>
<td>50% decrease</td>
<td>40% decrease</td>
<td>41.67% decrease</td>
<td>7.64% decrease</td>
<td>35% decrease</td>
<td>50% decrease</td>
</tr>
<tr>
<td>Impact on Quality (CS of defects found)</td>
<td>1</td>
<td>92% defects found</td>
<td>93% defects found</td>
<td>98% defects found</td>
<td>98% defects found</td>
<td>98% defects found</td>
<td>0% defects found</td>
<td>0% defects found</td>
</tr>
<tr>
<td>Reduction in Project Cost</td>
<td>2</td>
<td>20% decrease</td>
<td>40% decrease</td>
<td>30% decrease</td>
<td>30% decrease</td>
<td>14.14% decrease</td>
<td>20% decrease</td>
<td>40% decrease</td>
</tr>
<tr>
<td>Cost of the Improvement</td>
<td>1</td>
<td>1.1% of total engineering effort</td>
<td>1.1% of total engineering effort</td>
<td>1.1% of total engineering effort</td>
<td>0% of total engineering effort</td>
<td>0% of total engineering effort</td>
<td>0% of total engineering effort</td>
<td>0% of total engineering effort</td>
</tr>
</tbody>
</table>
ROI Dashboard© Provides Visibility into Data

In a 1994 SEI ROI study, GTE Government Systems Corporation observed a 6.8 to 1 ROI from the overall SPI effort.

In moving from CMM Level 2 to Level 5, Motorola invested $98,100 and Saved $633,200 on rework, for a ROI of 570%.

Based on a sample in 1996 of six large real-time embedded projects, Raytheon’s Software Systems Laboratory achieved a 5.7 annual ROI while moving from CMM Level 1 to CMM Level 5. Investment was approximately $1 million per year, and the sampled projects used about 50% of SSL labor resources. Approximately $9.2 million in reduced rework was saved by 1999, of which $4.48 million were saved in 1996. ($315.8 million was saved by 1992.)

Oklahoma Cit-ALO gathered ROI information for 18 of 44 software process improvements. They invested $462,400 for a return of $2,933,000, a ROI of 6.35 to 1.
Details Available When Needed

From 1993 to 2000, Northrop Grumman Information Technology implemented the following improvements:
- CMMI Process Improvement
- PSP / TSP

BACKGROUND:
- Development of Inventory Tracking System (ITS) for the USAF/AEC/CMIO
- 107.3 KLOC (96.5 KLOC new code)

OBSERVED RESULTS:
Northrop Grumman Information Technology observed the following changes:
- Number of defects observed per unit output was 6.6 per KLOC measured before the improvements and 2.1 per KLOC measured after the improvements
- The Return-on-Investment (Cost Savings/Cost of Improvement) was 13.3 ratio measured after the improvements (based on a Time saved on Defect resolution)

SOURCE:

Copyright 2008 by ITT Industries
Timeline

CMMI Process Improvement
Impact on Quality (% defect reduction) Over Time

- Anonymous Company - 2003 to 2004, 44% defect reduction
- IBM Rational Medical Carline Systems, McKinney, TX - 2001 to 2003, 44% defect reduction
Improvement Area Matrix

The following table shows which pairs of improvements are commonly performed together by organizations currently in the DACS ROI Database. Each cell contains the total count of records found in our database (where the improvement pair is defined by the row and column). You can view the matching records by clicking on the total count.

<table>
<thead>
<tr>
<th>Improvement Area</th>
<th>Agile Development</th>
<th>CMMI Software Process Improvement</th>
<th>CMMI Process Improvement</th>
<th>Cleanroom</th>
<th>ISO 9001</th>
<th>Inspections</th>
<th>Measurement Program</th>
<th>PSP / TSP</th>
<th>Reuse</th>
<th>Six Sigma</th>
<th>Systems Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agile Development</td>
<td>22</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CMMI Software Process Improvement</td>
<td>54</td>
<td>64</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CMMI Process Improvement</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cleanroom</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ISO 9001</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Inspections</td>
<td>0</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Measurement Program</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PSP / TSP</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Reuse</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Six Sigma</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Systems Engineering</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

DACN Gold Practice Initiative | ROI Dashboard
### Analysis of ROI Dashboard© Data

<table>
<thead>
<tr>
<th>Number of Reports</th>
<th>Agile Development</th>
<th>CMM SPI</th>
<th>CMM PI</th>
<th>Cleanroom</th>
<th>Inspections</th>
<th>Measurement Program</th>
<th>PSP/TSP</th>
<th>Rince</th>
<th>ISO 9001</th>
<th>Six Sigma</th>
<th>Systems Engineering</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality: % Defect Reduction</td>
<td>6</td>
<td>26</td>
<td>20</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>86</td>
</tr>
<tr>
<td>Quality: % Defects Found</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Quality: Reduction in Rework</td>
<td>6</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total Quality Related</strong></td>
<td><strong>7</strong></td>
<td><strong>36</strong></td>
<td><strong>22</strong></td>
<td><strong>1</strong></td>
<td><strong>15</strong></td>
<td><strong>1</strong></td>
<td><strong>7</strong></td>
<td><strong>2</strong></td>
<td><strong>1</strong></td>
<td></td>
<td></td>
<td><strong>91</strong></td>
</tr>
<tr>
<td>Cost: Productivity Impacts</td>
<td>14</td>
<td>29</td>
<td>12</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>73</td>
</tr>
<tr>
<td>Cost: Reduction in Program Costs</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td><strong>Total Cost Related</strong></td>
<td><strong>14</strong></td>
<td><strong>31</strong></td>
<td><strong>14</strong></td>
<td><strong>2</strong></td>
<td><strong>3</strong></td>
<td><strong>1</strong></td>
<td><strong>2</strong></td>
<td><strong>14</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
<td></td>
<td><strong>52</strong></td>
</tr>
<tr>
<td>Schedule: Impact on Cycle Time</td>
<td>6</td>
<td>14</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>13</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Schedule: Schedule Variance Impact</td>
<td>10</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>Total Schedule Related</strong></td>
<td><strong>6</strong></td>
<td><strong>24</strong></td>
<td><strong>8</strong></td>
<td><strong>1</strong></td>
<td><strong>2</strong></td>
<td><strong>13</strong></td>
<td><strong>0</strong></td>
<td><strong>1</strong></td>
<td><strong>0</strong></td>
<td></td>
<td></td>
<td><strong>56</strong></td>
</tr>
<tr>
<td>ROI: Return on Investment</td>
<td>1</td>
<td>18</td>
<td>9</td>
<td>1</td>
<td>15</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>51</td>
</tr>
<tr>
<td>Cost of Improvement</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Benefits Observed</strong></td>
<td><strong>28</strong></td>
<td><strong>110</strong></td>
<td><strong>54</strong></td>
<td><strong>5</strong></td>
<td><strong>34</strong></td>
<td><strong>5</strong></td>
<td><strong>13</strong></td>
<td><strong>33</strong></td>
<td><strong>2</strong></td>
<td><strong>1</strong></td>
<td></td>
<td><strong>286</strong></td>
</tr>
</tbody>
</table>
Queries For 1 Year By Registered DACS Users

<table>
<thead>
<tr>
<th>Improvement Type</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMMI</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>112</td>
<td>20</td>
<td>31</td>
<td>90</td>
<td>102</td>
<td>59</td>
<td>45</td>
<td>50</td>
<td>64</td>
<td>575</td>
</tr>
<tr>
<td>Agile</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>96</td>
<td>37</td>
<td>19</td>
<td>39</td>
<td>18</td>
<td>43</td>
<td>32</td>
<td>41</td>
<td>30</td>
<td>357</td>
</tr>
<tr>
<td>CMM</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>103</td>
<td>25</td>
<td>12</td>
<td>20</td>
<td>16</td>
<td>26</td>
<td>31</td>
<td>44</td>
<td>26</td>
<td>303</td>
</tr>
<tr>
<td>Six Sigma</td>
<td>28</td>
<td>84</td>
<td>23</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>162</td>
</tr>
<tr>
<td>ISO 9001</td>
<td>40</td>
<td>72</td>
<td>16</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>4</td>
<td>146</td>
</tr>
<tr>
<td>Systems Engineering</td>
<td>35</td>
<td>37</td>
<td>10</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>8</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>107</td>
</tr>
<tr>
<td>Measurement Program</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>5</td>
<td>4</td>
<td>9</td>
<td>11</td>
<td>9</td>
<td>5</td>
<td>29</td>
<td>8</td>
<td>92</td>
</tr>
<tr>
<td>Reuse</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>26</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>0</td>
<td>4</td>
<td>8</td>
<td>61</td>
</tr>
<tr>
<td>Inspections</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>2</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>14</td>
<td>9</td>
<td>58</td>
</tr>
<tr>
<td>Achieving CMMI L3</td>
<td>11</td>
<td>20</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>47</td>
</tr>
<tr>
<td>PSP / TSP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>3</td>
<td>10</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>37</td>
</tr>
<tr>
<td>Achieving CMM L2</td>
<td>6</td>
<td>20</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Cleanroom</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>15</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Achieving CMMI L4</td>
<td>3</td>
<td>15</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Achieving CMM L4</td>
<td>4</td>
<td>14</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Achieving CMM L2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Achieving CMM L5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Achieving CMM L3</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Achieving CMM L5</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>144</td>
<td>278</td>
<td>71</td>
<td>387</td>
<td>99</td>
<td>81</td>
<td>184</td>
<td>164</td>
<td>180</td>
<td>138</td>
<td>213</td>
<td>185</td>
<td>2124</td>
</tr>
</tbody>
</table>
Current User Displays

• **SEI:**
  - Statistics Table
  - Assertions by Organization
  - Assertions by Performance Category
  - Graphs Associated with Each Assertion
  - Links to source documents

• **DACS:**
  - Statistics
    - Interactive Graphs
    - Interactive Tables
  - Facts by Performance Category
  - Timelines
Performance Categories

• SEI:
  – Cost
  – Schedule
  – Productivity
  – Quality
  – Customer Satisfaction
  – Return On Investment

• DACS:
  – Cost: Productivity Impacts
  – Cost: Reduction in Project Costs
  – Cost of Improvement
  – Schedule: Impact on Cycle Time
  – Schedule: Schedule Variance Impact
  – Quality: % Defect Reduction
  – Quality: % Defects Found
  – Quality: Reduction in Rework
  – Return On Investment
Statistics

• SEI:
  – Number of data points
  – Median
  – Minimum
  – Maximum

• DACS:
  – Number of data points
  – Mean
  – Standard Deviation
  – Median
  – 25th percentile
  – 75th percentile
  – Minimum
  – Maximum
Outline

• Introduction and Background
• Current Status of SEI and DACS Sites
• Desired User Displays and Issues
• Data Identification and Vetting Process
• Tasks
Using the Results

• Case descriptions alone cannot be generalized widely elsewhere

• They can show what can and has happened elsewhere ... and provide guidance about what has worked well or poorly in otherwise similar situations

• What is needed is better ways to help find examples that are most similar to one’s own situation
Desired User Displays

• User-controllable filters to control aggregation of performance measurements
• User-controllable filters to segment by context
  – Size of organizations
  – Application domain
  – Combination of process improvements
• In principle, any user-defined context
Making Meaningful Comparisons

• Major maturity level improvement initiatives
• Finer grained capability improvements implemented at a particular maturity level
• Varying definitions of performance measures
• Size, sector of the economy, domain, time period, additional context
Issue: Variation in CMMI Implementations

• CMMI implementations often accompanied with other process initiatives (e.g. Six Sigma, ISO 9001, Agile)

• Can results for different CMMI levels be meaningfully aggregated?

• Variation in names and definitions of measures

• Are negative results reported (File drawer problem)?
Issues with Organization

• Organizations change their name, get taken over, spun off
• Organization level data may not record for how many projects
• Data at a lower level than a project or company. Some only for selected phase or development process
A Proposed Future System

DB Maintenance/Update Interface

WS Client

Process Improvement Performance Results

Web Services

Web Services

WS Client
Outline

• Introduction and Background
• Current Status of SEI and DACS Sites
• Desired User Displays and Issues
• Data Identification and Vetting Process
• Tasks
Data Identification and Vetting Process

• To identify, record, validate, verify, & select candidate information. Process includes:
  – Monthly review of new sources
  – Tracking of choices between candidate articles and selected articles
  – Approval of SEI/DACS oversight group
  – Analysis of impact on data, analysis, and displays
Data Identification and Vetting Process
Current Sources in ROI Dashboard

• Journals
  – American Programmer (now Cutter Consortium)
  – Communications of the ACM
  – Computerworld
  – Crosstalk
  – DACS Software Tech News
  – IBM Systems Journal
  – IEEE Computer
  – IEEE Internet Computing
  – IEEE Software

• Others, Including
  – SEPG and CMMI Conference Proceedings
  – CMU/SEI Technical Reports
  – Information Week
  – Journal of Systems and Software
  – Management Science
  – Software Practice and Experience
  – Software Process Improvement and Practice
  – Software Process Newsletter

• User-Supplied Data
Dimensionless Numbers

Percent Improvement = 100 \frac{X_{End} - X_{Start}}{X_{Start}}

• Take additive inverse when improvement is a decrease (e.g., fault density)
• Start and end values may be company-proprietary
• Can combine different units (e.g., SLOC per Person-Hour, FP per Person-Month)
Outline

• Introduction and Background
• Current Status of SEI and DACS Sites
• Desired User Displays and Issues
• Data Identification and Vetting Process
• Tasks
Tasks

- Initial focus on maintenance and enhancement

- Expert SEI & DACS staff will work collaboratively:
  - To define process to identify credible quantitative results
  - To design & prototype innovative displays and summaries
  - To extend, refine, and harmonize databases

- Data acquired with a Non Disclosure Agreement not shared
Comments? Questions?
Contact Information

Dennis R. Goldenson
Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213-3890
412.268.8506
dg@sei.cmu.edu

Thomas McGibbon
Data & Analysis Center for Software, Director
775 Daedalian Dr.
Rome, NY 13441
315.838.7094
Tom.McGibbon@itt.com

Robert L. Vienneau
Data & Analysis Center for Software
775 Daedalian Dr.
Rome, NY 13441
315.838.7118
Rob.Vienneau@itt.com