A Business Case for CMMI<sup>SM</sup>-Based Process Improvement

Dave Walden
Director – Integrated Process & Quality

GENERAL DYNAMICS
Advanced Information Systems

CMMI is a service mark of Carnegie Mellon University.
Note: This presentation was also given at the PSM Conference, July 2002. Repeated here upon request.
Topics

- Why Perform a Business Case?
- Business Case Process
  - Key Considerations
  - Business Drivers/Inputs
  - Costs
  - Benefits
  - Outputs
- Business Case Lessons Learned
- Summary and Conclusions
Why Perform a Business Case?

- Do our process improvement goals make sense from a business perspective?
- What is the benefit of being “assessed at” a level vs. “operating at” a level?
- What is the benefit of moving from CMM/CMMI Level m to Level n?
- What is the relative return on the SW CMM vs. the CMMI?

The business case is a tool to validate our process improvement goals from a financial perspective.
Business Case Process

- Collaborative team effort to:
  - Identify business drivers and inputs
  - Define alternative scenarios
  - Identify costs of scenarios
  - Identify benefits of scenarios
  - Evaluate results
  - Prepare presentations
- Benefits structured around a Balanced Scorecard
- Organizational and industry data applied where appropriate and available
- Output is team consensus
Key Considerations

- Just maintaining a CMM/CMMI level requires investment.
- Benefits result from operating at an improved level of maturity, not from just getting there.
- Some benefits may not be financial, but can still be "valued".
- Weaknesses at lower levels of maturity increase risk and cost of achieving higher levels of maturity.
- Attractiveness of alternatives depends on actions of current and potential competitors and customers.
- Costs and benefits must be determined separately for each scenario.
Business Drivers

- External Factors
  - Table Stakes
  - Marketplace Competitiveness
  - Industry Standards Superseded
    - SEI SW CMM to CMMI (Dec 2003)
  - Competition
  - Customer Expectations and Satisfaction

- Internal Factors
  - Enabler to Meet Company Financial Commitments
    - productivity
    - delivery/ performance
    - quality
  - Support Projected Growth Objectives
  - Company Integration
  - Internal Customer Satisfaction
Business Case Inputs

Each business unit answered the following questions:

1. What are the major business areas involving engineering?
2. What types of contract vehicles are used?
3. How much engineering development and support activity goes on?
4. How much new business opportunity depends on engineering?
5. What are the current levels of performance?
6. What is the current level of employee satisfaction?

Solid inputs are key to a successful business case.
Need to Determine Scenarios

- Candidates depend on where you are and where you want to go. Some options:
  - Do not invest -- agree to regress
  - Maintain existing CMM/CMMI levels
  - Advance to SW CMM Level $n$ [operating at, assessed at]
  - Advance to CMMI Level $n$ [operating at, assessed at]
  - Others? (e.g., ISO 9001:2000, 14000, 18000)

- Select scenarios carefully
  - Determines the magnitude of the business case task
  - Determines the presentable outputs

Select the minimum number of scenarios.
Cost Elements for the Business Case

- Process improvement activities
  - SEPG, EPG, CMM, CMMI, etc.
- CMM/CMMI External Assessments
  - External assessment team (both fees & costs)
  - Internal assessment participants
- Training
  - Ongoing development, delivery, and maintenance
- Project Impact
  - Cost of adopting on projects
- Management Attention
  - Involvement and participation

Output → team consensus of costs by year for each scenario.
## Typical SW CMM Costs
(Industry data, per the SPC)

<table>
<thead>
<tr>
<th>Cost Element</th>
<th>Current State</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEPG</td>
<td>2 – 10% of software staff</td>
</tr>
<tr>
<td>External Assessment Team</td>
<td>$40,000 – 100,000 per event</td>
</tr>
<tr>
<td>Assessment Participants</td>
<td>400 hours per event</td>
</tr>
<tr>
<td>Training</td>
<td>4 – 8 hours per KPA per person</td>
</tr>
</tbody>
</table>
Benefits Organized Around a Balanced Scorecard Approach
Benefit Elements for the Business Case

- Financial performance
  - Profits → Adjust Current Margin
  - Sales/Market Share → Increased Probability of Win
- Customer
  - Cost/Schedule Performance → Increased Predictability
- Internal Business Processes
  - Productivity → Increased Productivity
  - Quality → Decreased Delivered Defects
  - Cycle Time → Decreased Elapsed Time
- Learning and growth
  - No credit taken
## CMM/CMMI Benefits Multipliers Used

<table>
<thead>
<tr>
<th>Benefit Element</th>
<th>How Estimated</th>
<th>CMM L2→L3</th>
<th>CMMI L2→L3</th>
<th>CMM L3→L5</th>
<th>CMMI L3→L5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profits</td>
<td>Value Network</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales/Market Share</td>
<td>Increased Probability of Win</td>
<td>1.05</td>
<td>1.1</td>
<td>1.1</td>
<td>1.15</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>Increased Predictability</td>
<td>1.1</td>
<td>1.15</td>
<td>1.56</td>
<td>1.75</td>
</tr>
<tr>
<td>Productivity</td>
<td>Output per Hour</td>
<td>1.08</td>
<td>1.08</td>
<td>1.15</td>
<td>1.15</td>
</tr>
<tr>
<td>Quality</td>
<td>Defect Rate</td>
<td>0.46</td>
<td>0.4</td>
<td>0.3</td>
<td>0.25</td>
</tr>
<tr>
<td>Cycle Time</td>
<td>Elapsed Time</td>
<td>1.0</td>
<td>1.0</td>
<td>0.95</td>
<td>0.9</td>
</tr>
<tr>
<td>Learning &amp; Growth</td>
<td>No Credit Taken</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes: Values reached by team consensus. Some values adjusted for GDAIS environment or actual data.

CMMI multipliers assume some nominal (conservative) increase over SW CMM in some cases.
Benefits Value Network

- Total Revenue
- Reduce Standby
- Total Opportunities
- Incr. Win Probability
- FFP Revenue
- Incr. Productivity
- CPAF Revenue
- Reduced Overhead
- Margin
- New Revenue
- Cost Avoidance
- Incr. Award Fee
- Predictability
- Cycle Time
- Defect Rate

- Indirectly affected
- Directly affected
- Primary relationship
- Secondary relationship

- Total Opportunities
- Incr. Win Probability
- New Revenue
- Cost Avoidance
- Incr. Award Fee
- Predictability
- Cycle Time
- Defect Rate

General Dynamics
Advanced Information Systems

NDIA/SEI CMMI Presentation -- November, 2002
Business Case Outputs

- Financial return based on costs and benefits converted into a series of annual cash flows
  - Annualized Return on Investment (ROI)
  - Net Present Value (NPV)
  - Internal Rate of Return (IRR)
- Calculated for each scenario of interest
  - Operating At
  - Assessed At
  - CMM vs CMMI

The scenarios showed a significant positive return.
Lessons Learned

- Business case process from the SPC was invaluable
- Take the time to provide solid inputs and cost estimates
  - Inputs from the LRSP and SBUs take time and effort
  - Industry expert from the SPC was key
  - Team consensus and organizational buy-in critical
- Use a conservative benefits model with a Balanced Scorecard approach
  - Leverage industry data for SW CMM, derate some factors
  - Estimate conservative CMMI improvements over SW CMM
  - Delete questionable benefits factors
  - Derate the realized benefits (e.g., 25%, 50%, 100% by year)
- Work with the intended audience in advance
  - Senior leadership
  - Don’t neglect Finance
  - Use concise presentation material, be flexible
Summary & Conclusions

- GDAIS used a business case to validate our process improvement goals from a business perspective
- GDAIS partnered with the SPC to produce the business case
- The business case was a success
  - Allowed all the key questions to be answered
  - Showed positive returns
  - Was accepted by the senior leadership team