The Evolution of DoD SW Acquisition and Measurement

An industry/DoD collaboration

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NDIA SE Division – Feb 2020
The Evolution of DoD SW Acquisition and Measurement

National Defense Strategy 2018

"Performance at the speed of relevance" Streamline rapid, iterative approaches

2018 NDAA (Sec. 872)
• DIB analyze SW regs

2019 NDAA (Sec. 868)
• Implement DSB recommendations

2020 NDAA
• Implement DIB recommendations

DSB SW
Feb 2018
7 recommendations
• SW factories
• CID
• Risk reduction, metrics
• Current & legacy programs
• Workforce
• IV&V for machine learning

DIB SW
May 2019

NDIA/INCOSE/PSM
CID WG
Mar 2019

http://www.ndia.org/divisions/systemsengineering/studies-and-publications

Industry recommendations for implementing DSB findings

PSM Continuous Iterative Development (CID) Measurement Framework

http://www.psmsc.com/CIDMeasurement.asp

“The Evolution of DoD SW Acquisition and Measurement”

Jeff Boleng
Special Ass’t for SW Acquisition

Hon. Ellen M. Lord
USD (A&S)

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Industry recommendations for implementing DSB findings

PSM Continuous Iterative Development (CID) Measurement Framework

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Software Acquisition Products
- Capability Needs Statement (CNS)
- User Agreement (UA) (end user engagement)
- Acquisition Strategy (AS)
- Cost estimates
- Product Roadmap
- Test Strategy (DT/OT)
- Secure Software & Cybersecurity Plan
- Metrics plan
- Value assessments (annual)

Key Concepts and Considerations
- Acquisition agility, tailoring
- Integration (SW, SE, PM, Security, DT/OT)
- Enterprise services
- DevSecOps pipeline (secure software, Continuous ATO)
- Architecture-centric development
- Rapid delivery (MVP, MVCR)
- Continuous integration/delivery
- Actionable performance measures
**Overview – SW Measurement Framework**

PSM, NDIA, and INCOSE collaborated on development of a consensus industry measurement framework for agile/CID

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### Draft Framework

- **Information Needs**
  - What do we want to achieve in order to satisfy our business goals? (aka Objectives)

- **Information Categories**
  - What questions will help us plan & manage progress toward our goals?

- **Measurable Concepts**
  - What measures are necessary to answer these questions?

- **Questions Addressed**
  - Do these measures provide sufficient insight to drive business impact?

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### NDIA WG recommendations: DSB #3 (measures)

<table>
<thead>
<tr>
<th>Information Categories</th>
<th>Measurable Concepts</th>
<th>Information Need (team, product, enterprise)</th>
<th>Potential measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Analysis model</em></td>
<td><em>Decision criteria</em></td>
<td><em>Interpretation, guidance</em></td>
<td><em>Implementation considerations</em></td>
</tr>
</tbody>
</table>

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### V1.0 of the PSM CID measurement framework

V1.0 of the PSM CID measurement framework prioritizes the most critical information needs and measures based on stakeholder surveys and feedback

http://www.psmsc.com/CIDMeasurement.asp

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### measurement framework

<table>
<thead>
<tr>
<th>Automated Test Coverage</th>
<th>Burndown (Sprint/Release)</th>
<th>Committed vs. Completed</th>
<th>Cumulative Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle Time / Lead Time</td>
<td>Defect Detection</td>
<td>Defect Resolution</td>
<td>MTTR / MTTD</td>
</tr>
<tr>
<td>Release Frequency</td>
<td>Team Velocity</td>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

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PSM Continuous Iterative Development (CID) Measurement Framework

http://www.psmsc.com/CIDMeasurement.asp
Acknowledgments

Thank you to the many contributors from PSM, NDIA, and INCOSE that helped to develop the CID Measurement Framework!
PSM CID Measurement Framework

Examples
PSM CID Measurement Concepts
Terminology, Releases

<table>
<thead>
<tr>
<th>Term</th>
<th>Synonyms</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal release</td>
<td></td>
<td>A release that is ready for internal use outside of the development team. It may be used for integration, testing, or demonstration.</td>
</tr>
<tr>
<td>Candidate Release</td>
<td>External Release</td>
<td>An release that has been through the pipeline and system test, and is ready for transition to the user.</td>
</tr>
<tr>
<td>Operational Release</td>
<td>Deployment Release</td>
<td>A release that has been approved for operational use.</td>
</tr>
<tr>
<td>Iteration</td>
<td>Sprint</td>
<td>A small internal time block in which the development team develops and delivers a set of Stories. The iteration is a full development cycle that can result in a Release. In some methodologies, an iteration is called a Sprint.</td>
</tr>
<tr>
<td>MVP / MVC R / NVP</td>
<td>Minimum Visible Product (MVP): An early version of the software that has just enough working features to meet basic minimum functional capabilities and fill a user’s need. The goal of an MVP is to quickly deliver basic capabilities into users’ hands for evaluation, feedback, and improvements. Minimum Visible Capability Release (MVC R): as used in DoD software policy, a set of features suitable to be delivered to an operational environment. It provides value and capability on a reduced delivery timeline. The MVC R is analogous to a Minimum Marketable Product (MMP) for a commercial industry. Next Visible Product (NVP): the next set of features in the succeeding product delivery.</td>
<td></td>
</tr>
</tbody>
</table>

See glossary for terms and definitions used in PSM CID measurement framework.
Measurement Context

PSM Continuous Iterative Development (CID) Measurement Framework

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## 7. ICM Table

### Table 5: Issues, Categories, and Measures

<table>
<thead>
<tr>
<th>Information Categories</th>
<th>Measurable Concept</th>
<th>Team Information Need</th>
<th>Product Information Need</th>
<th>Enterprise Information Need</th>
<th>Potential Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule and Progress</td>
<td>Work Unit Progress (team, product) Milestone Completion (enterprise)</td>
<td>Are story points delivered as committed? Are we still on track to deliver all story points per roadmap? (on plan)</td>
<td>Are features/capabilities delivered as committed? Are we still on track to deliver all features/capabilities per roadmap? (on plan) What are the features/capabilities at risk of not being completed as scheduled?</td>
<td>Are capabilities delivered as committed? Are we still on track to deliver all capabilities per roadmap? (on plan) What are the capabilities at risk of not being completed as scheduled?</td>
<td>Burndown, Committed vs. Completed Velocity</td>
</tr>
<tr>
<td>Work Unit Progress</td>
<td>Did we deliver expected capabilities / features? Is the roadmap still valid?</td>
<td></td>
<td>Is the user satisfied with the delivered products? Do they provide the desired functionality when needed?</td>
<td></td>
<td>Feature or Capability Implementation</td>
</tr>
<tr>
<td>Work Unit Progress</td>
<td></td>
<td></td>
<td></td>
<td>Test Progress</td>
<td></td>
</tr>
<tr>
<td>Work Backlog</td>
<td>How much outstanding technical or mission debt exists?</td>
<td></td>
<td></td>
<td>Cumulative Flow, Feature or Capability Backlog</td>
<td></td>
</tr>
</tbody>
</table>
Example PSM CID Measurement Spec

PSM Continuous Iterative Development (CID) Measurement Framework

- Description
- Relevant Terminology
- Information Need
- Base Measures
- Derived Measures

- Indicator Description and Sample
- Analysis Model
- Decision Criteria
- Additional Analysis Guidance
- Implementation Considerations

- Information Category
- Measurable Concept
- Relevant Entities
- Attributes
- Data Collection Procedure
- Data Analysis Procedures
Example PSM CID Measurement Indicators

Team, Product, or Enterprise Measures

- **Automated Test Coverage**
  - Automated Test Coverage (Project)
  - Figure 9: Automated Test Coverage (Project Level)

- **Burndown**
  - Burndown Chart
  - Figure 10: Release Burndown

- **Committed vs. Complete**
  - Stories Completed vs Committed
  - Figure 14: Stories Completed versus Committed

- **Cumulative Flow**
  - Cumulative Flow Diagram (CFD)
  - Figure 14: Cumulative Flow Diagram

- **Cycle Time / Lead Time**
  - Cycle Time/Lead Time Chart
  - Figure 19: IBEA Control Chart focusing on an area of interest

- **Defect Detection**
  - Defect Resolution Log Time
  - Figure 18: Defect Resolution Log Time

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Example PSM CID Measurement Indicators

Team, Product, or Enterprise Measures

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**Defect Resolution**

![Defects Detected vs. Defects Resolved](image1)

*Figure 21: Defects Detected versus Resolved*

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**MTTD / MTTR**

![Operations Outage Summary](image2)

*Figure 24: Operation Outage Summary*

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**Release Frequency**

![Release Duration for Product Tango](image3)

*Figure 27: Release Duration for Product Tango*

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**Team Velocity**

![Team Velocity](image4)

*Figure 29: Team Velocity*
Next Steps

☑️ Publish PSM v1.0 CID measurement framework
  • Collect community feedback. Publish source specs for org tailoring. Support adoption and use.

Consider additional Phase 2 measures to address highest priority business needs
  • Additional focus on enterprise-level and end user information needs and measures.
  • Workshop kickoff: Feb 12-13, 2020 (Lockheed Martin Global Vision Center, Arlington VA)
    (POC: Cheryl Jones, cheryl.l.jones128.civ@mail.mil)

Ongoing community participation to improve the PSM CID framework
  • Join the PSM/INCOSE/NDIA WG (bi-weekly teleconferences)
  • Outreach and engagement with stakeholder groups (e.g., Security WG)

PSM User’s Group and Workshop, Aug 10-14, 2020