National Defense Industrial Association

Consensus Measures for Continuous Iterative Development

An industry/DoD collaboration

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for PSM / NDIA / INCOSE CID Measurement WG

NDIA SE Division, December 2019

Overview – SW Measurement Framework

DSB SW

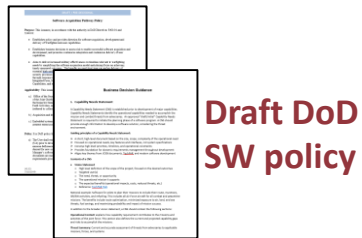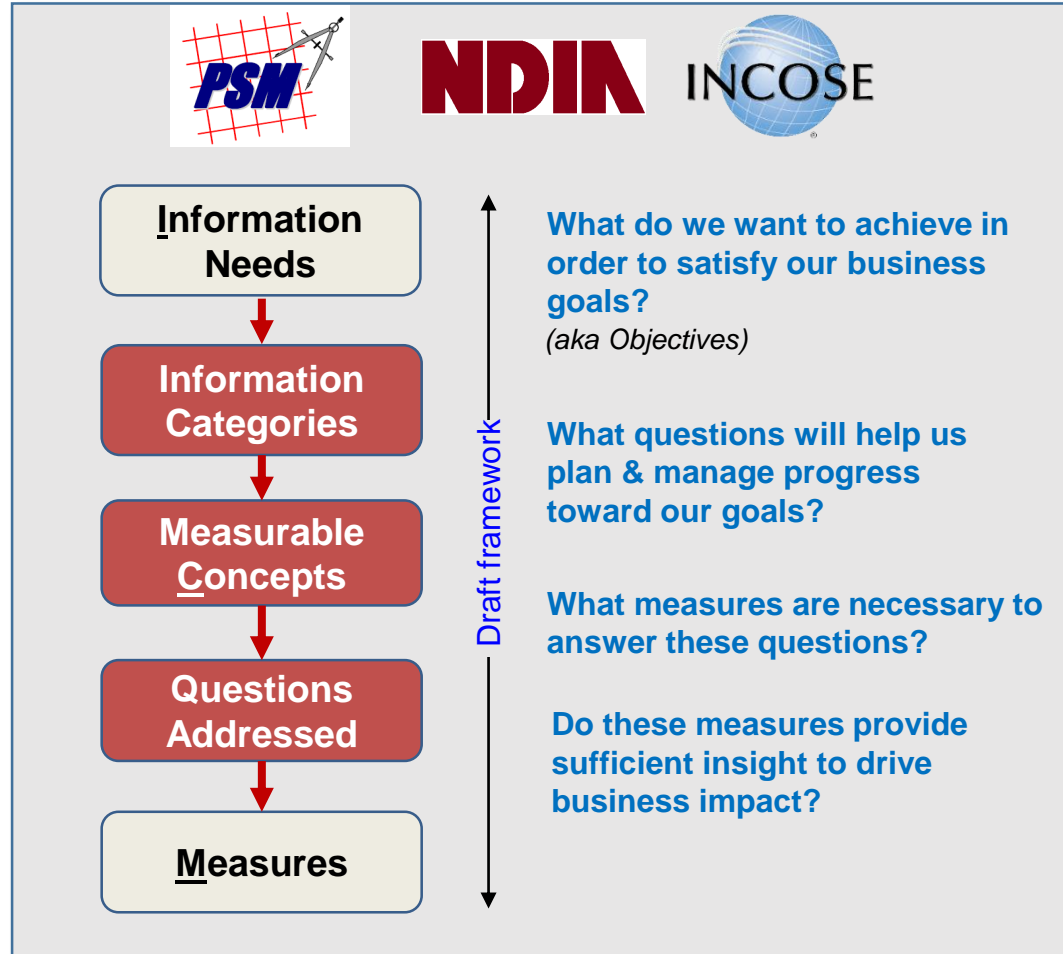**DIB SWAP**

Software Is Never Done
Refactoring the Acquisition Code for Competitive Advantage

Info Needs
Measures
Surveys
- PSM
- NDIA
- INCOSE
- SERC

Draft DoD SW policy

Velocity

Usefulness
Sample Count	
Mean	2.
Median	2.
Std Dev.S	1.
Var.S	1.

Effectiveness
Sample Count	
Mean	2.
Median	2.
Std Dev.S	0.
Var.S	0.

PSM   NDIA   INCOSE

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?

Measures

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

https://www.ndia.org/divisions/systems-engineering/studies-and-publications

NDIA WG recommendations: DSB #3 (measures)

Picture of Success (end state)	
Consensus frameworks	• Objectives first - measures aligned and tailored from information needs, goals and constraints, at program and enterprise levels
Modernized measures	• Migration toward consensus alternatives to traditional waterfall and phase-based SW measures (LOC, EVM, milestones, …) • Derived from SW factory processes, automated by toolchain • Basis for measuring cost and schedule vs. plan
History-based estimates	• Repositories collect performance-based measures (e.g., WBS, staff, cost, productivity) supporting future comparisons, basis of estimates, proposals, and program monitoring
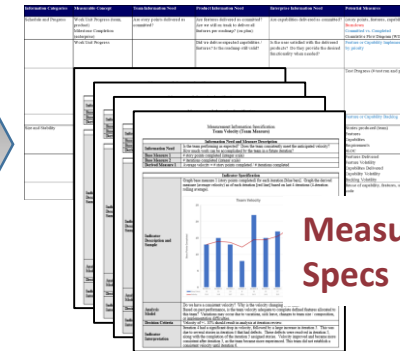
ICM Table
- Information Categories
- Measurable Concepts
- Information Need (team, product, enterprise)
- Potential measures

Measurement Specs
- Information Need
- Measures (base, derived)
- Indicator description, sample
- Analysis model
- Decision criteria
- Interpretation, guidance
- Implementation considerations

Acceleration	Automated Test Coverage	Burndown (Sprint/Release)	Defect Containment
Defect Escapes	Defect Resolution	Cycle Time	Lead Time
Release Frequency	Velocity	Committed vs. Completed	…

NDIA/INCOSE/PSM Continuous Iterative Development and Sustainment WG

PSM CID Measurement Framework

http://psmsc.com/CIDMeasurement.asp

Measurement specs (10)

White paper (intro, concepts, terms)

Work products (v0.5 draft > v1.0 final Dec 2019)

ICM Table (Information needs, Concepts, Measures)

PSM, NDIA, and INCOSE are collaborating on a consensus industry/government measurement framework for continuous iterative development. Final products will be distributed for NDIA approval to publish in December.

NDIA Continuous Iterative Development and Sustainment WG

Candidate Measures

DSB

Deployment Rate

- *Sprint burndown
- *Epic and release burndown

Response Rate

- *Velocity
- *Cycle time (control chart)
- Cumulative flow

DIB SWAP

Deployment Rate

- *Time from launch to MVP *(initial lead time)*
- *Time to field high priority functions *(incremental lead time)*
- Time to fix new security hole *(patch cycle time)*
- *Time from code commit to use *(factory cycle time)*

Response Rate

- *Time for automated regression test
- Time required to restore service (MTTR)

Code Quality

- *Automated test coverage
- *# of bugs caught in test vs. field *(defect containment)*
- *Change failure rate *(rollback)*

Draft OUSD A&S SW Policy

Agile Process Metrics

- Story points
- *Velocity
- Story completion rate
- *Sprint burndown chart

Agile Quality Metrics

- Recidivism rate
- *Defect count
- Number of blockers

Agile Product Metrics

- Delivered features
- Delivered value points
- Level of user satisfaction

DevSecOps Metrics

- Mean Time to Restore (MTTR)
- *Deployment frequency
- *Change fail rate – defect counts

Cost Metrics

- *Total cost estimate
- Burn rate

PSM **Draft**

Deployment Rate

- **Burndown (sprint/release)**
- **Velocity**
- **Acceleration**

Response Rate

- **Cycle time**
- **Lead time**
- **Release frequency**

Code Quality

- **Defect containment**
- **Defect escapes**
- **Defect resolution**
- **Automated test coverage**

Core PSM framework:
- Cost (est. vs. actual)
- Schedule (est. vs. actual)
- Staffing
- …etc.

* = addressed in draft PSM framework

See PSM framework for details.
- Information categories
- Measurable concepts
- Information needs
- Cross-reference mappings

Additional candidate measures are defined in draft ICM table but not implemented in first release.

Industry Survey Feedback
(usefulness, effectiveness)

Aligning the PSM framework and measures with DoD SW policy and enterprise improvement

Baseline — **Factory** — **Deployment** — **Field**

Tickets

Backlog
Release n-1
Vulnerability

Cycle Time
Lead Time
Code committed to use
Coding, Functional Test
Regression Test (Automated)

Vulnerability

Latent Defect Escape

Time to Recovery
• Defect resolution
Mean Time to Restore
▶MTTR

Detection Time
▶MTTD

Diagnosis

Repair Time
Field or Factory

Testing

Return to Normal Operations

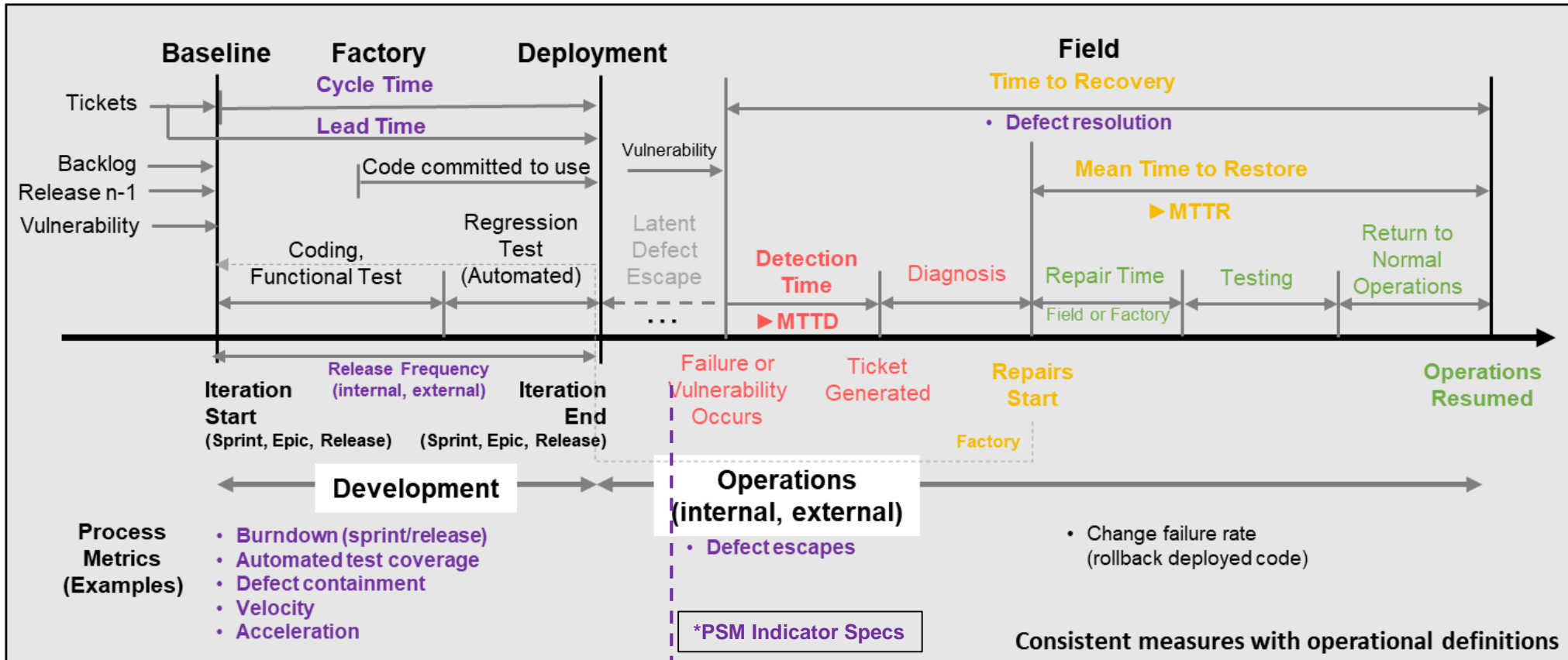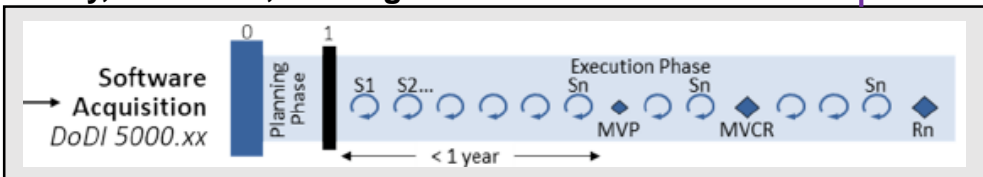Release Frequency (internal, external)

Iteration Start (Sprint, Epic, Release)

Iteration End (Sprint, Epic, Release)

Failure or Vulnerability Occurs

Ticket Generated

Repairs Start
Factory

Operations Resumed

Development

Operations (internal, external)

Process Metrics (Examples)
- Burndown (sprint/release)
- Automated test coverage
- Defect containment
- Velocity
- Acceleration

- Defect escapes

*PSM Indicator Specs

- Change failure rate (rollback deployed code)

Consistent measures with operational definitions

Policy, Guidance, Oversight

Software Acquisition DoDI 5000.xx

Planning Phase

Execution Phase
S1 S2... Sn   Sn   Sn
MVP   MVCR   Rn

< 1 year

Measures, goals, and priorities are tailored and aligned based on objectives and information needs

Program ▶ Product ▶ Enterprise

References:
- Defense Science Board, Design and Acquisition of Software for Defense Systems, Feb 2018
- Defense Innovation Board Metrics for Software Development, version 0.9, 9 Jul 2018
- MTTR, MTBF, or MTTF? A Simple Guide to Failure Metrics. https://limblecmms.com/blog/mttr-mtbf-mttf-guide-to-failure-metrics/