Software Best Practices Clearinghouse

Promoting Adoption and Effective Implementation

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Presentation Objectives

- **Share** with you our thinking on why we believe programs face challenges implementing best practices and how we overcome those challenges
- **Inform** you about the Best Practices Clearinghouse Initiative
- **Encourage** you to think about your experiences with considering or implementing best practices
- **Request** your feedback and motivate you to get involved

How Do We Encourage Broader Use of Best Practices?
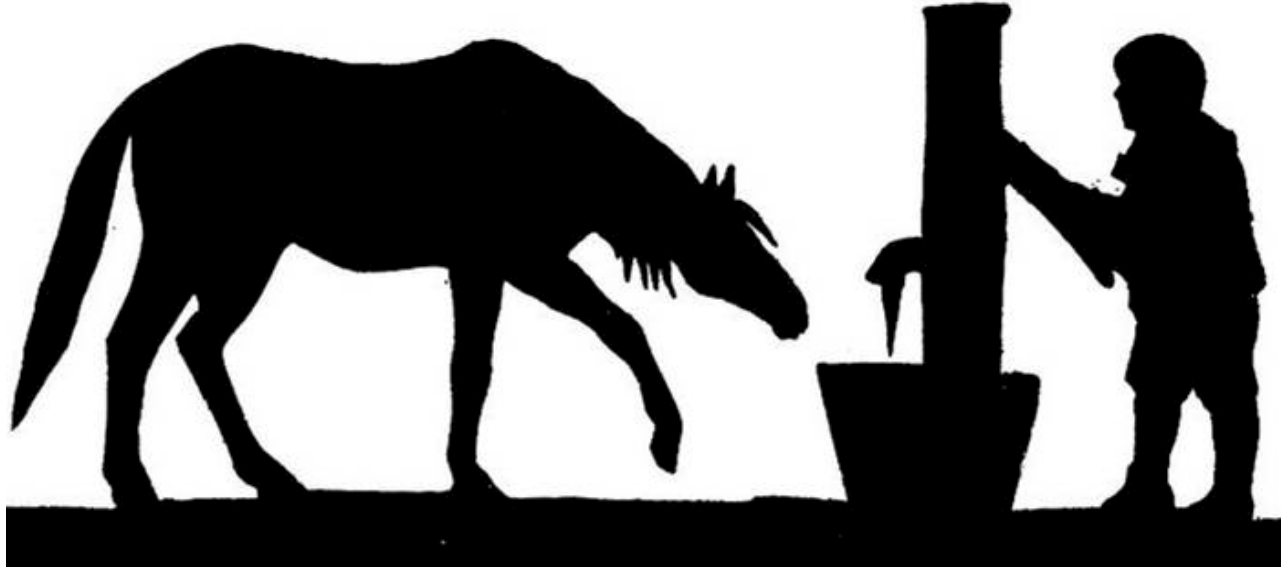
- **Through the Best Practices Clearinghouse**
  - Promote and assist in the adoption and effective utilization of "best practices"
  - Provide central access to validated, actionable practice information
  - Target the needs of the Department of Defense software acquisition and development community

Implementation Barriers

- Programs are aware of "best practices," but they don't often choose to implement them
    - Too many lists to choose from
    - No basis for selecting specific practices
    - Proof of effectiveness is not generally available
    - Not easy to see connection between practices and specific program risks or issues
    - Practice's success factors not well understood
    - Resources are limited and the return on practice investment is unknown
    - Implementation guidance is inadequate

Traditional Best Practices

- Are disciplines rather than specific practices (e.g., Risk Management)
- Have problematic descriptions
  - If descriptions too generic or abstract, hard to apply; if too context specific, don't seem relevant
  - Implementation directions insufficient, ineffective, imprecise
  - Rarely supported by data
- Take energy and resources to implement, but benefits may come (much) later or are hard to quantify
- Implementation does not always work
  - Often depend on other practices
  - Are not implemented as designed
  - Depend on project context (size, complexity, life-cycle phase)

What Do We Mean By 'Supported By Data'?

- Example: NASA Software Engineering Laboratory Ground Support Systems Software Development
    - Used experiments and data to evaluate, select, implement and track the impact of development practices
    - By feeding back actual performance data into their work, and using only practices their data showed effective, they:

  Decreased Development Defect rates by
  75% (1987 - 1991)   **37%** (1991 - 1995)

  Reduced Cost by
  55% (1987 - 1991)   **42%** (1991 - 1995)

  Improved Reuse by
  300% (1987 - 1991)   **8%** (1991 - 1995)

  Increased Functionality five-fold (1976 - 1992)

Practice Analysis Examples

- ## Best practice: Smaller modules have less defects
  - Reality: Observation and analysis showed sweet spot
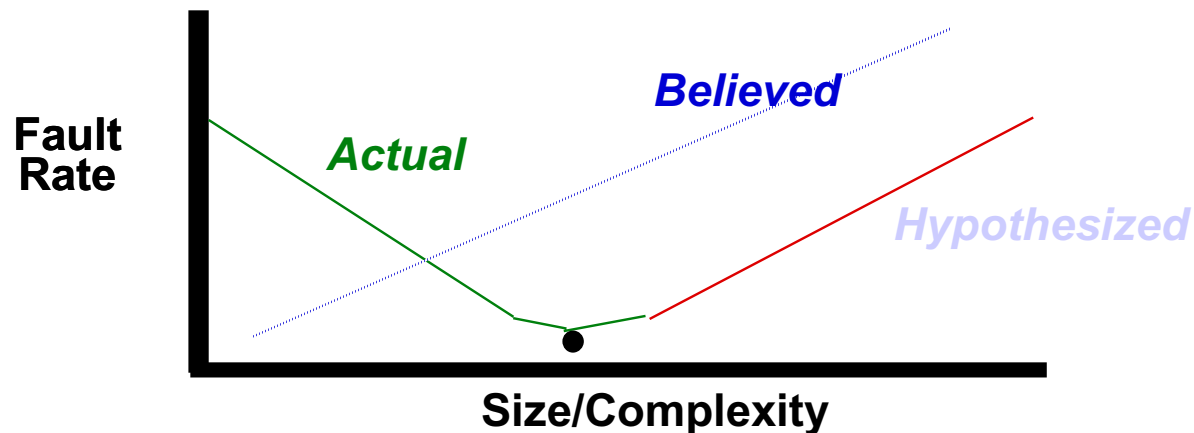
- ## Best Practice: Early detection of defects
  - Initial experience: late detection >100X more expensive
  - New data showed
    - 100X still valid for severe defects
    - However, only 2X more expensive for less severe defects
    - Business model drives acceptance of late costs

The Clearinghouse Vision

- *The* best practice resource for the Department of Defense
- Based on empirical evidence
- Validated practice information provides level of confidence
- Leverages existing best practices and centralizes access to them
- Captures cost, benefits, context, latency
- Supports user-driven selection of relevant practices
- Provides step-wise implementation guidance and expert assistance
- Tracks and measures results

Key Strategies to Overcome Challenges

- **User-focused** access and information infrastructure
- **Empirically based** Information in the repository
- The building block of each practice or set of practices is a **"story"**
- A set of stories are synthesized into a **profile**
- Details of the practice are provided **on demand**
- A type of **color code scheme** provides a quick and easy way of understanding the level at which the practice is well-proven or robust

Delivery Infrastructure Focused on Users

- Easy to use, informative tools for best practices selection and implementation support
  - Practices suggested by goal, risk, phase, program size
  - Implementation ordering for multiple practices
  - Evolution from basic through advanced practices
  - Flexible search mechanisms
- Active community involvement and links to expertise
  - Acquisition Community Connection (nee PM CoP)
- Dissemination of Clearinghouse latest information through widely-used venues: courses, workshops, articles, conference tutorials

Exploiting Sources of Information

- **Identify and utilize what we already know**
  - Mine best practices and lessons learned repositories (from the Services, Agencies, FFRDCs, DAU, Academic Institutions, DACS Gold Practices, Industry, literature, etc.)
  - Cultivate relationships with practice experts and researchers
  - Gather experiences on specific programs
- **Make it readily accessible**
  - One central entry point to organized information
  - Not re-publish what is already there, but provide links
- **Make it easy to use**
  - Extract key information from more detailed sources
  - Provide visual cues and progressively more detailed information
- **Keep it current**
  - E-workshops support practice identification and validation
  - User feedback
  - Ongoing study, conferences, workshops, symposia

Best Practices Vetting Process

A Work In Progress

Each cycle allows more experience to be gathered and processed, leading to better characterization of the practice, improved recommendations, and more dependable implementation guidance.

Practice/packaging maturation cycle

Identification	Characterization	Analysis & Synthesis	Validation	Packaging &Dissemination
Inputs: Leads to practices **Activities:** •Collect •Categorize •Filter •Synthesize •Prioritize **Outputs:** Candidate set of practices	**Inputs:** Set of candidate practices and rationale for consideration **Activities:** •Gather/research characteristics about the practice including context (project, etc.), evidence of use, lessons learned •Complete "story" profile **Outputs:** More detailed set of candidate practices with "stories"	**Inputs:** Detailed set of candidate practices **Activities:** •Aggregate stories, create profile of practice •Populate the repository •Identify/define Interrelationships **Outputs:** Single profile for each best practice, associated artifacts, and confidence levels	**Inputs:** Sets of practice data; validation criteria **Activities:** •Check outputs from previous phases •Color Code practices •Approve practices via panel of experts **Outputs:** Validated practices	**Inputs:** Sets of practice data; validation criteria **Activities:** •Packaging •Publishing •Promoting •Providing user help •Discussions **Outputs:** •Repository update •Papers & conference presentations •Course materials/updates

Proven
Consistent results
Initial validation
Nominated

Possible practice validation coding

Conceptual BP Information

Characteristic data

Experience data

| Case Study # 24	
Best practice	Formal inspections
Source	"Report on the Loss of the Mars Climate Orbiter Mission", [JPL D-18441, JPL Special Review Board, Nov. 11, 1999]
Theory/Expectation	

The use of software inspections will ensure a high level of system quality.

| **Lesson Learned** | |

Attention must be paid that inspections are practiced correctly, with appropriate formality, to ens...
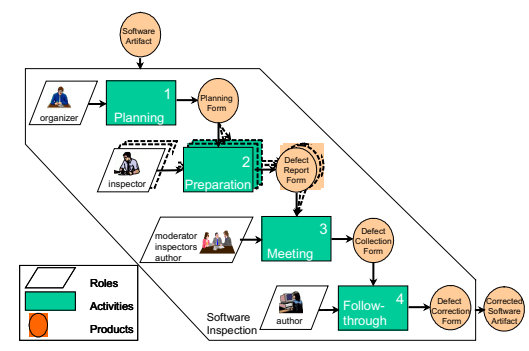
Breakdown in the use of ins...
- Contrary to typical practice...
navigation (end-user) repres...
walkthroughs or the accepta...
- The Sm_forces software p...
critical, which reduced the n...
compared to mission critical...

BP Interrelationships
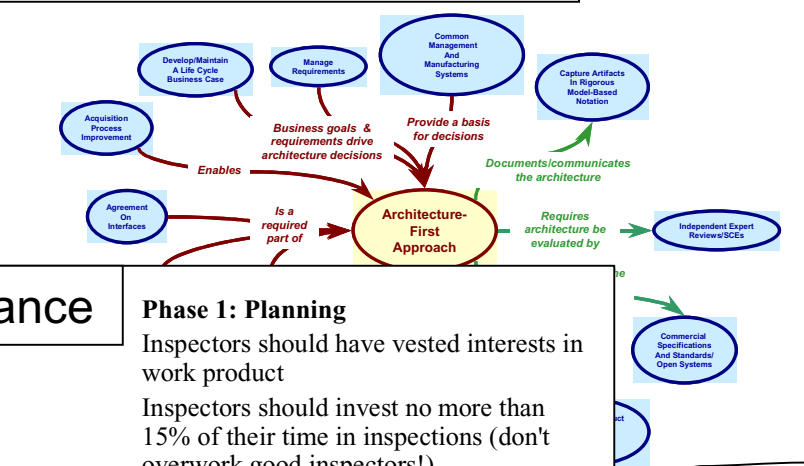
Implementation data/ guidance

Inspection process overview

Phase 1: Planning

Inspectors should have vested interests in work product
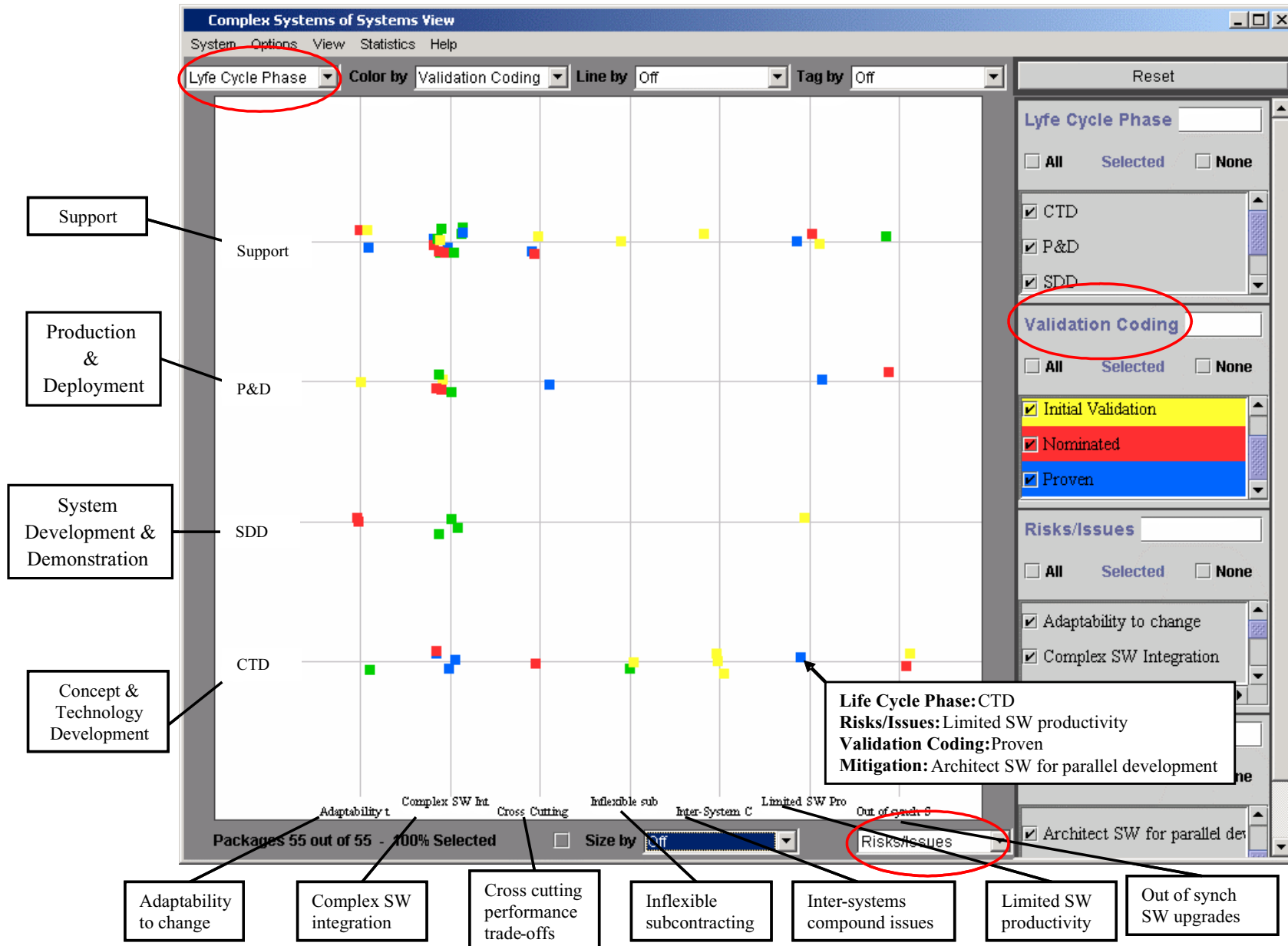
Inspectors should invest no more than 15% of their time in inspections (don't overwork good inspectors!)

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Phase 2: Preparation

Inspectors should spend at least as much time in preparing as is required for the inspection meeting.

Provide adequate lead time for inspectors to perform preparation (3 - 5 work days)

Example Tool for
Practice Selection & Investigation

DACS Gold Practices

- **Initiative began in early-2002, extending previous best practice research**
- **Objectives:**
  - Disseminate consistent, easy-to-understand, value-added best practice information
  - Gather user experience on best practice information
- **35 practices identified; 4 currently described**
- **Relationship to Clearinghouse**
  - Initial information source for Clearinghouse
  - Clearinghouse activities will inform and improve Gold Practice products

How Can You Get Involved?

- Let us know your needs by
  - Identifying your best practices lists and sources of guidance for their use
  - Sharing your experiences & lessons learned in implementing best practices
  - Volunteering to help us define the services and capabilities of the Clearinghouse
  - Participating in surveys, e-workshops and other events - See http://iac.dtic.mil/dacs for more information
- Participate in the next session, "Software Acquisition Best Practices Workshop"

The Best Practices Clearinghouse – In Summary

- Centralized resource
- Lessons learned in application of practices
- Empirically based, Experiences provided
- Acquisition and development practices
- Repository of vetted practices
- Important insight
- Not just another list; Not just a website
- Guidance on selection
- Help provided through multiple services
- Outreach to user community
- Useful information
- Search capabilities
- Easy to use & informative tools

Contact Information

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