SCRAM: A Method for Assessing Schedule Compliance Risk

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What does SCRAM mean?

- Go away!

- <u>S</u>ecure <u>C</u>ontinuous <u>R</u>emote <u>A</u>lcohol Monitoring
  - ☐ As modeled here by Lindsay Lohan

- <u>S</u>chedule <u>C</u>ompliance <u>R</u>isk <u>A</u>ssessment Methodology

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SCRAM

Schedule Compliance Risk Assessment Methodology

- **Collaborative effort:**
  - Australian Department of Defence - Defence Materiel Organisation
  - Systems and Software Quality Institute, Brisbane, Australia
  - Software Metrics Inc., Haymarket, VA

DMO SCRAM Usage

- **SCRAM has been sponsored by the Australian Defence Materiel Organisation (DMO)**
  - To improve our Project Schedule Performance in response to Government concern as identified by the Australian National Audit Office (ANAO)
    - ANAO is equivalent to the US Government Accountability Office (GAO)

- **DMO equips and sustains the Australian Defence Force (ADF)**
  - Manages 230+ Major Capital Equipment Projects & 100 Minor (<$20M) defence projects

DMO SCRAM Usage (cont.)

- **SCRAM has evolved from our reviews of troubled programs**
  - □ Schedule is almost always the primary concern of program stakeholders (delays to war fighter capability unacceptable)
  - □ SCRAM is a key component of our initiative to identify and remediate (and eliminate) root cause of schedule slippage

bc5   consolidate with 8
                 betsy clark, 7/5/2011

SCRAM Components

- Assessment Process consists of

  - Root Cause Analysis of Schedule Slippage

  - Schedule Health Check

  - Monte Carlo Analysis

What SCRAM is Not

- Not an assessment of technical feasibility

- Not an assessment of process capability
  - However, may be identified and treated as an issue if process performance is identified as contributing to slippage

Topics

- **SCRAM Components**
  - ☐ Root Cause Analysis Model
  - ☐ Schedule Health Checks
  - ☐ Monte Carlo Analysis

- **Benefits of Using SCRAM**

- **SCRAM Key Principles**

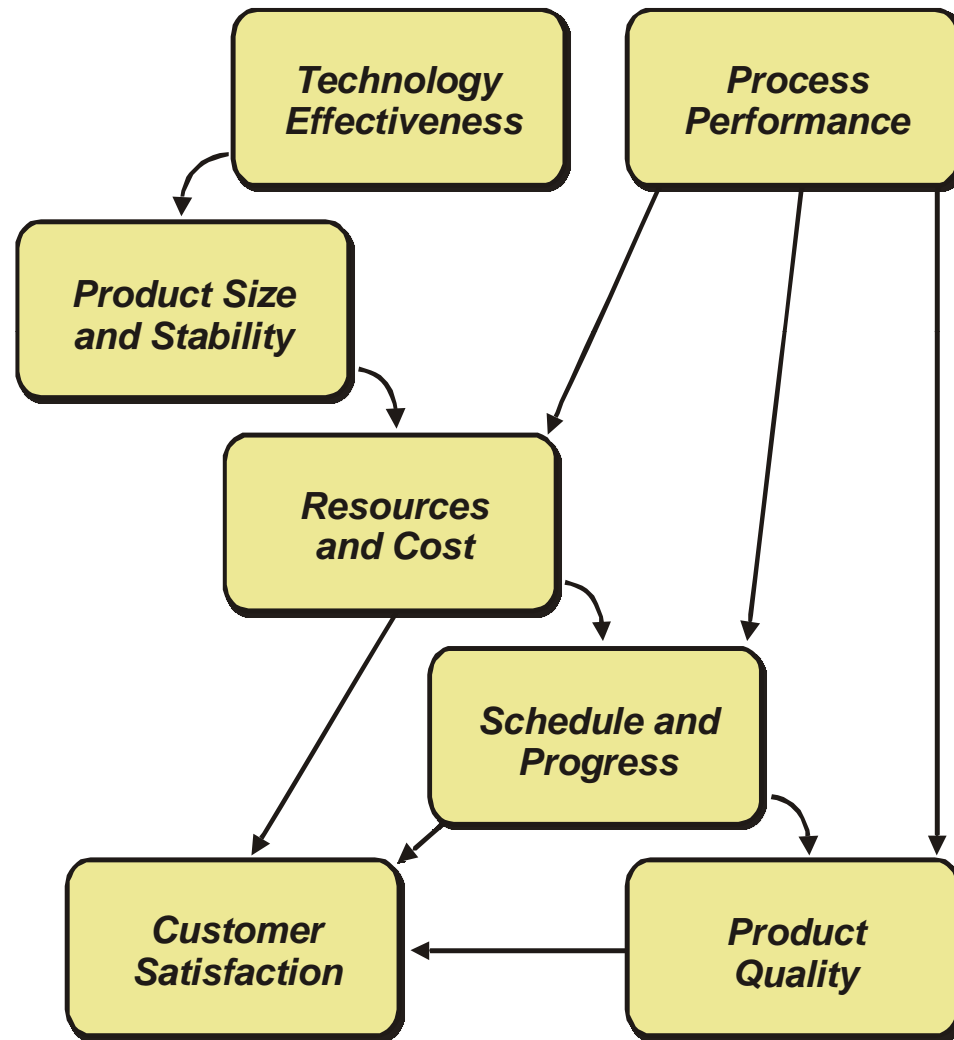- **SCRAM Process Reference / Assessment Model**

- **Future plans for SCRAM**

Slide 8

bc16   Angela takes over here
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PSM Analysis Model

# Root Cause Analysis of Schedule Slippage (RCASS) Model

- Model evolved with experience on SCRAM assessments
- Used as guidance for
  - Asking questions during assessments
  - Categorizing the wealth of data and details
  - Highlighting missing information
  - Assessing the causes of slippage
  - Recommending a going-forward plan
  - Recommending measures to serve as leading indicators
    - For visibility and tracking in those areas where there are risks and problems
    - Similar to the use of the Structured Analysis Model in PSM to guide categorization of issues and risks via issue identification workshops

SCRAM-RCASS
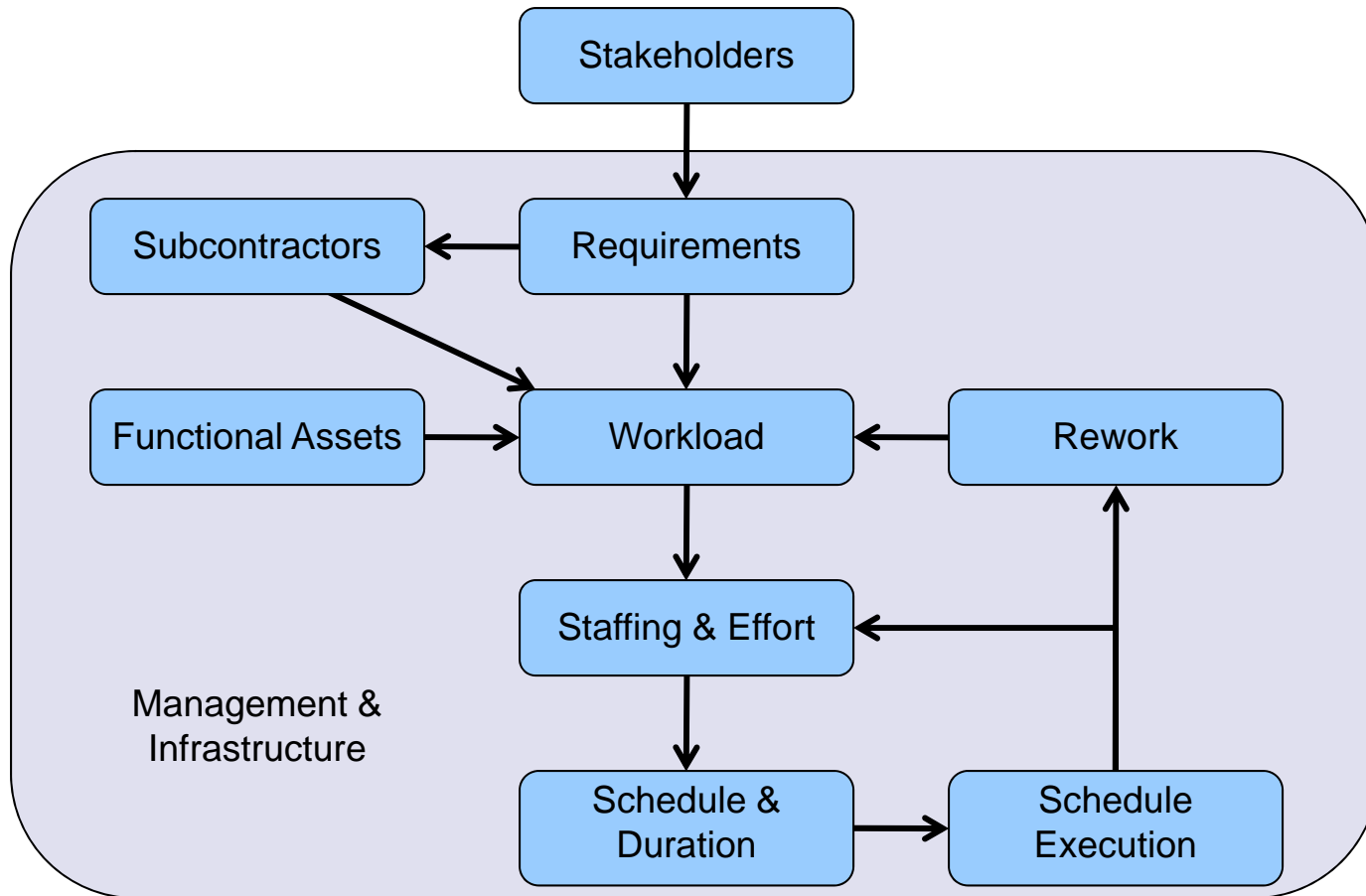
Adapted from Integrated Analysis Model in McGarry et al.,
*Practical Software Measurement: Objective
Information for Decision Makers*

Root Cause Analysis - Examples
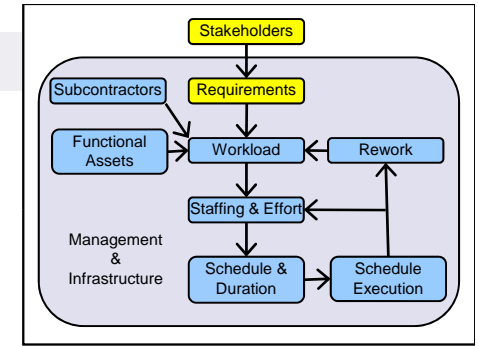
- ## Stakeholders

  - ☐ "Our stakeholders are like a 100-headed hydra – everyone can say 'no' and no one can say 'yes'."

- ## Requirements

  - ☐ Misinterpretation of a communication standard led to an additional 3,000 requirements to implement the standard.
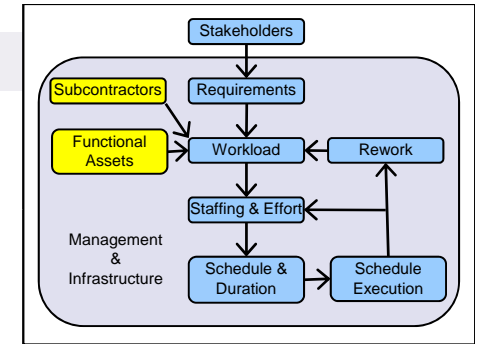
Root Cause Analysis - Examples

Stakeholders

Subcontractors → Requirements

Functional Assets → Workload ← Rework

Staffing & Effort

Management & Infrastructure

Schedule & Duration → Schedule Execution

- **Subcontractor**
  - ☐ Subcontractor omitting processes in order to make delivery deadlines led to integration problems with other system components.

- **Functional Assets (COTS/Reused Code)**
  - ☐ Commercial-off-the-shelf (COTS) products that do not work as advertised, resulting in additional work or replacement with different products.
  - ☐ Underestimating amount of software code that must be written/modified in a legacy system.

Root Cause Analysis - Examples

- **Workload**
  - Optimistic estimates
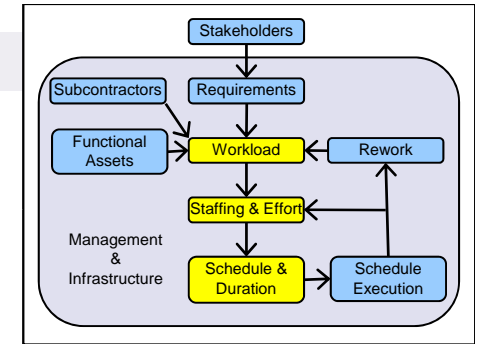   - Source lines of code underestimated
    - Contract data deliverables workload often underestimated by both contractor and customer

- **Staffing & Effort**
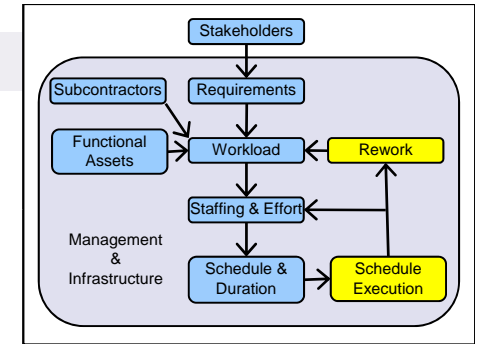 - High turnover, especially among experienced staff

- **Schedule & Duration**
  - Area of primary interest

Root Cause Analysis - Examples

- **Schedule Execution**
  - ☐ Schedule replans are not communicated to program staff or stakeholders
  - ☐ Lack of, or poorly integrated, master schedule
  - ☐ Integrated schedule elements not statused consistently across program. Actual status unknown.
  - ☐ External dependencies not integrated or tracked

- **Rework**
  - ☐ Often underestimated or not planned for (e.g. defect correction)

- **Management & Infrastructure**
  - ☐ Lack of adequate test facilities (in terms of fidelity or capacity)

SCRAM Components

- **Assessment Process consists of**

    □ Root Cause Analysis of Schedule Slippage

    □ Schedule Health Check

    □ Monte Carlo Analysis

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bc14   this doesn't match slide 19
betsy clark, 7/5/2011

bc15   17, 18, 20 & 22 could be reduced to one slide
betsy clark, 7/5/2011

Schedule Health Checks

- **To evaluate schedule construction and logic**
  - ☐ Includes analyses of task dependencies, task constraints, and available schedule float

- **Government, Prime, and Subcontractor schedule integration / alignment is reviewed**

- **Ensure external dependencies are included and linked in the schedule**
  - ☐ Interfaces, resources, facilities, Government Furnished Equipment (GFE), test assets etc.

- **Is there contingency in the schedule if risks are realized?**
  - ☐ Or is the schedule so tight that nothing can go wrong?

Monte Carlo Analysis

- Allocate three point estimates to tasks on critical and near-critical path based on identified risks from RCASS
    - optimistic, pessimistic & most likely task duration

Monte Carlo Analysis Example

Topics

- ## SCRAM Components
  - ☐ Root Cause Analysis Model
  - ☐ Schedule Health Checks
  - ☐ Monte Carlo Analysis

- ## Benefits of Using SCRAM

- ## SCRAM Key Principles

- ## SCRAM Process Reference / Assessment Model

- ## Future plans for SCRAM

bc13   Angela takes over here
betsy clark, 7/5/2011

SCRAM Benefits

- **SCRAM root-cause analysis model (RCASS) useful in communicating the status of programs to all key stakeholders**
    - ☐ Particularly executive management

- **Identifies Root Causes of schedule slippage and permits early remediation action**

- **Provides guidance for collection of measures**
    - ☐ Provides visibility and tracking for those areas where there is risk

- **Provides confidence in the schedule**

bc12   delete except move last bullet to next slide
betsy clark, 7/5/2011

SCRAM - Benefit

- **Validate schedule before execution**

- **Widely applicable**
  - SCRAM can be applied at any point in the program life cycle
  - SCRAM can be applied to any major system engineering activity or phase

- **Examples**
  - Software-Hardware Integration
  - Aircraft Flight Testing
  - Installation/integration of systems on ship
  - Logistics Enterprise Resource Planning (ERP) application roll out readiness

Topics

- **SCRAM Components**
  - ☐ Root Cause Analysis Model
  - ☐ Schedule Health Checks
  - ☐ Monte Carlo Analysis

- **Benefits of Using SCRAM**

- **SCRAM Key Principles**

- **SCRAM Process Reference / Assessment Model**

- **Future plans for SCRAM**

SCRAM Key Principles

- **Minimal Disruption**
  - ☐ Information is collected one person at a time
  - ☐ Interviews typically last an hour

- **Independent**
  - ☐ Review team members are organizationally independent of the program under review

- **Non-advocate**
  - ☐ All significant issues and concerns are considered and reported regardless of origin or source (Customer and/or Contractor).
  - ☐ Some SCRAM reviews have been joint contractor/customer team – facilitates joint commitment to resolve outcomes

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SCRAM Key Principles (cont.)

- **Non-attribution**
  - ☐ Information obtained is not attributed to any individual
  - ☐ Focus is on identifying and mitigating the risk

- **Corroboration of Evidence**
  - ☐ Significant Findings and Observations based on at least two independent sources of corroboration
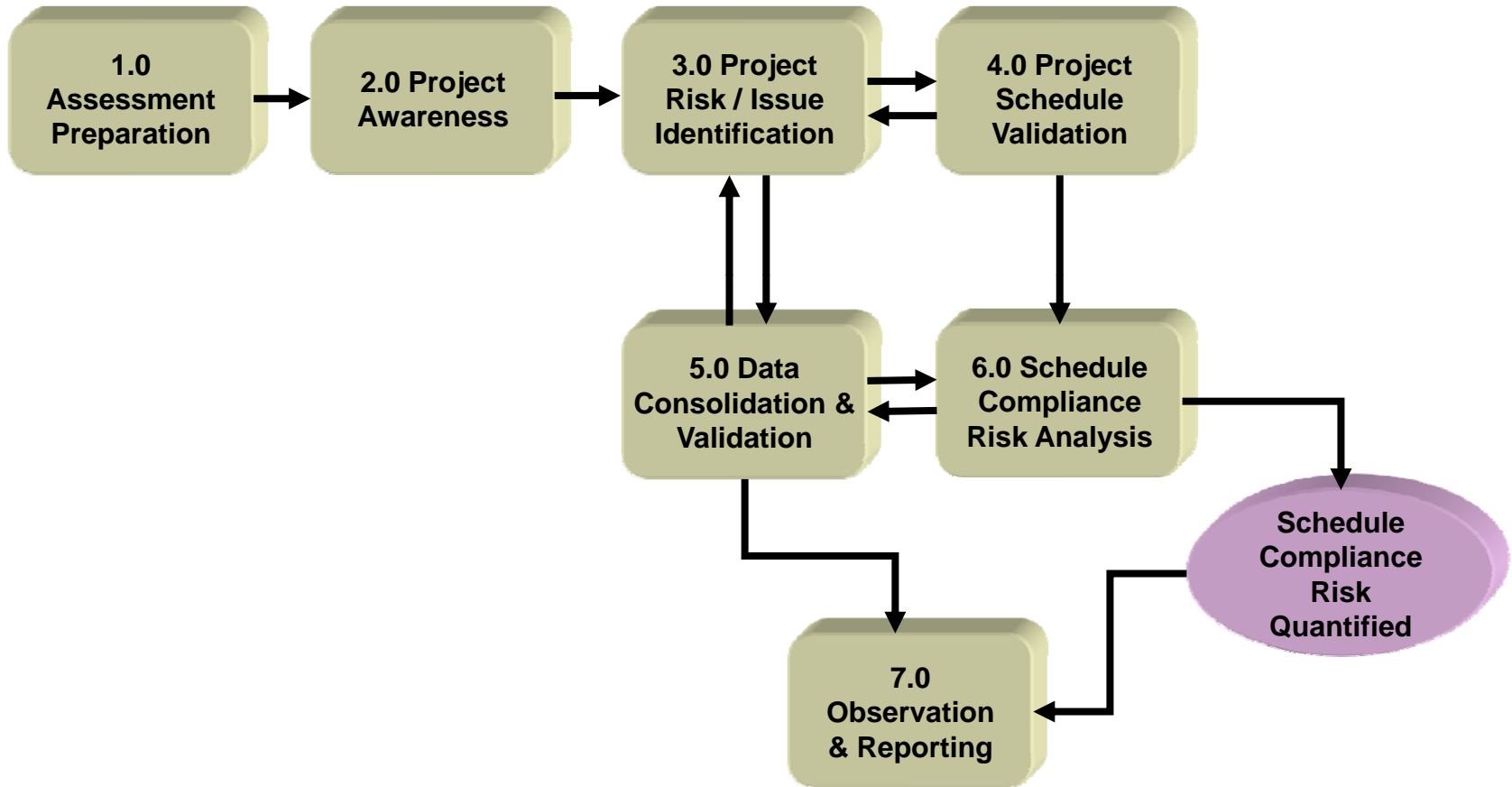
- **Rapid turn-around**
  - ☐ One to two weeks spent on-site
  - ☐ Executive briefing presented at end of second week

Topics

- Three Common Questions Addressed by SCRAM

- Benefits of Using SCRAM

- SCRAM Key Principles

- SCRAM Process

- Future plans for SCRAM

SCRAM Process

SCRAM Team Composition

- Assessment conducted by a small team including:

  - ☐ Engineering Assessors
    - Validate WBS, engineering-related basis of estimates (BoEs), work load estimates, technical risk assessment

  - ☐ Scheduler experienced in the project schedule tool
    - Validates schedule – conducts schedule health checks
    - Performs Monte Carlo risk modelling

  - ☐ Other project domain specialists as needed
    - E.g. Aeronautical Flight Test Engineers

SCRAM Key Steps

- SCRAM Team briefs the Project on the principles, purpose and approach of the SCRAM

- The Project provides the SCRAM team with an initial overview of the current status and project issues

- Project Issues and Risks are confirmed by the SCRAM Team through interviews, reviewing documentation and other project assets

- Schedule health checks and Monte Carlo analysis are performed

SCRAM Key Steps (cont.)

- **Executive out brief is prepared and presented**
  - ☐ Observations, findings and recommendations
  - ☐ Presentation structured using the RCASS model
    - Shows cause and effect linkage
  - ☐ Findings allocated a risk code rating
  - ☐ Presented at the end of the second week

- **The final report is prepared and delivered (an additional two weeks)**

SCRAM Findings - Examples

- **Sample Findings with Risk Code Rating**
  - 🟩 POSITIVE:
    - Functional requirements based-lined and agreed; no evidence was identified of requirements churn or creep

  - 🟦 POTENTIAL RISK:
    - Limited schedule contingency exists for further rework

  - 🟥 HIGH RISK:
    - Lack of an integrated high-level schedule precludes the ability to accurately forecast project milestone achievements
      - ☐ 13 major schedules not integrated at the program level

Process Reference / Assessment Model

- **Developed as an ISO/IEC 15504 conformant Process Reference Model and Process Assessment Model**
  - Funded by the Australian Defence Materiel Organisation (DMO)
  - Developed by
    - Systems and Software Quality Institute and Software Metrics Inc.
  - Delivered June 2010
  - The models are publicly available to download from:

http://www.scramsite.org

Topics

- **Three Common Questions Addressed by SCRAM**

- **Benefits of Using SCRAM**

- **SCRAM Key Principles**

- **SCRAM Process**

- **Future plans for SCRAM**

Future Plans

- **Currently developed Diagnostic SCRAM (D-SCRAM)**
  - Full scale application of the method to evaluate challenged projects or Projects of Concern.
  - Used to assess likelihood of schedule compliance, root cause of schedule slippage and to recommend remediation of project issues

- **Further evolve the SCRAM process for:**
  - Pro-active SCRAM (P-SCRAM)
    - To be conducted prior to Contract or at Integrated Baseline Review (IBR) to ensure common systemic issues are avoided before the Program Schedule is contracted or baselined
  - Monitor SCRAM (M-SCRAM)
    - Reduced version of D-SCRAM that maybe used to monitor project status – project health check performed ad hoc or conducted to support appropriate Gate Reviews

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Future Plans (cont.)

- **SCRAM Training & Assessor Qualifications**

- **SCRAM Process Reference and Assessment Model**
  - ☐ Further revisions
    - Based on feedback from use during SCRAM assessments and
    - Change Requests (Appendix D in the model)

- **SCRAM Assessment Tool**
  - ☐ Prototype has been used
  - ☐ Under development

SCRAM

QUESTIONS

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USA - Brad Clark: brad@software-metrics.com

Acronyms

- ANAO – Australian National Audit Office

- BoE – Basis of Estimate

- COTS/MOTS – Commercial off the Shelf/Modified off the Shelf

- DMO – Defence Materiel Organisation (Australia)

- GAO – Government Accounting Office

- GFE – Government Furnished Equipment

- ISO/IEC – International Organization for Standardization/International Electrotechnical Commission

- ISO/IEC 15504 – Information Technology – Process Assessment

- RCASS – Root Cause Analysis of Schedule Slippage

- SCRAM – Schedule Compliance Risk Assessment Methodology

- SMI – Software Metrics Inc. (United States)

- SSQi – Systems & Software Quality Institute (Australia)