

SCRAM: A Method for Assessing Schedule Compliance Risk

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What does SCRAM mean?

- Go away!
- Secure Continuous Remote Alcohol Monitoring
 - As modeled here by Lindsay Lohan
- Schedule Compliance Risk Assessment Methodology



SplashNewsOnline.com/Hollywood.tv

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



Topics

- Three Common Questions Addressed by SCRAM
- Benefits of Using SCRAM
- SCRAM Key Principles
- SCRAM Process
- Future plans for SCRAM



Three Common Questions

- SCRAM addresses three fundamental questions.
 1. Why is schedule slipping?
 - Root cause analysis
 2. Is the schedule credible?
 - Assess risk and identify Issues (including estimated rework)
 - Assess BoEs (Basis of Estimate)
 - Perform schedule “Health Check”
 - Perform Monte Carlo analysis using inputs from other SCRAM areas
 3. How can future slips be prevented?
 - General recommendations based on SCRAM review findings
 - Guidance on “leading indicators” of slippage



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

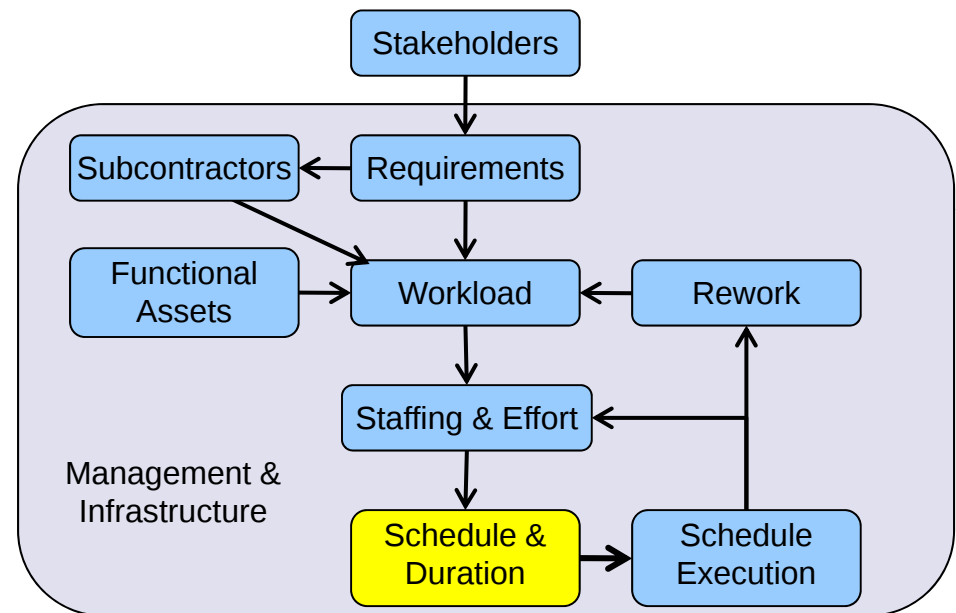
Why is schedule slipping?

- Program managers are flooded with a wealth of data and details
 - Challenge is to organize all of this information
 - Identify cause(s) of slippage
 - Schedule slippage is a symptom of other factors
 - Take effective action to address problems
 - Organizing the information based on SCRAM should:
 - De-clutter the massive amounts of information on a project
 - Relate the different issue areas to each other
 - Highlight missing information
- SCRAM is based on a “Root Cause Analysis of Schedule Slippage - RCASS” model

Root Cause Analysis of Schedule Slippage (RCASS) Model

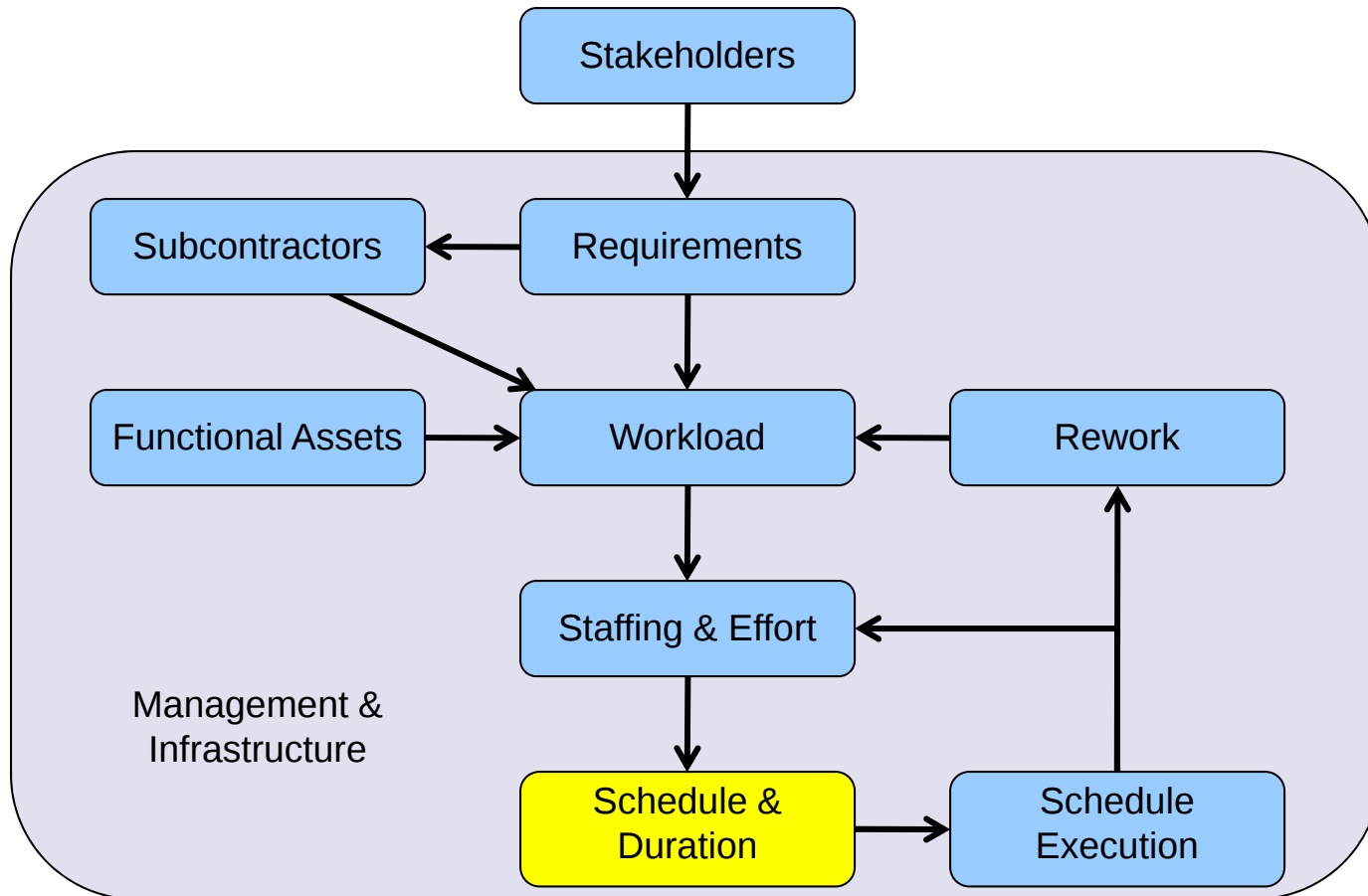
- After many assessments, refined RCASS for guidance in:

- Categorizing the wealth of data and details
- Assessing the causes of slippage
- Recommending a going-forward plan

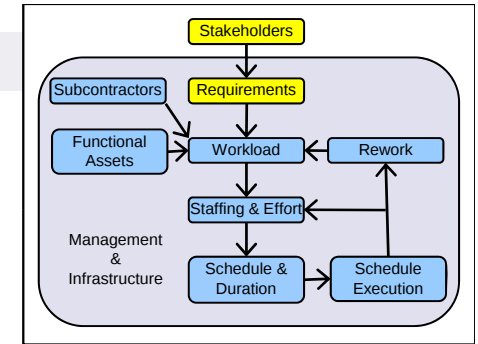


Adapted from Integrated Analysis Model in McGarry et al.,
Practical Software Measurement: Objective Information for Decision Makers

SCRAM-RCASS



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.

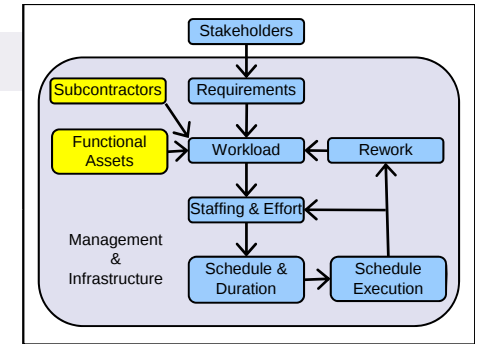
Root Cause Analysis - Examples

■ Subcontractor

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

■ Functional Assets (COTS/MOTS)

- 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

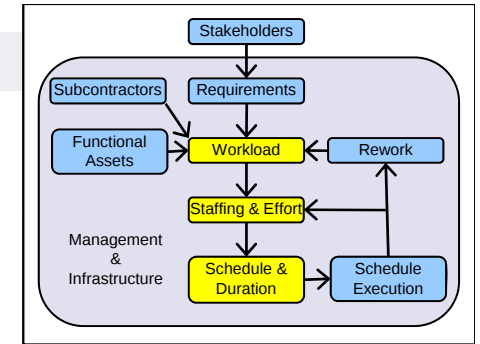
- Source lines of code underestimated
- Contract data deliverables workload often underestimated by both contractor and customer

■ Staffing & Effort

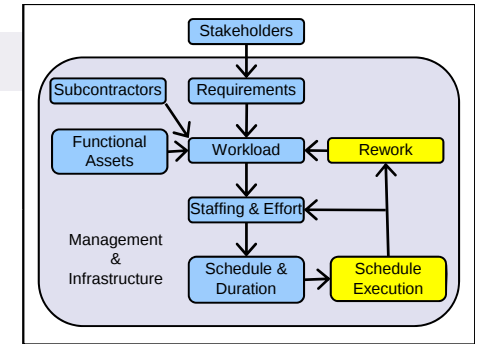
- ### □ High turnover, especially among experienced staff

■ 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)



Three Common Questions

1. Why is schedule slipping?
 - ☐ Root Cause Analysis of Schedule Slippage - RCASS model guides the analysis approach
2. Is the current schedule credible?
 - ☐ Assess the risks and issues
 - ☐ Assess the BoEs (Basis of Estimate)
 - ☐ Perform “Schedule Health Checks”
 - ☐ Perform Monte Carlo analysis
3. How can future slips be prevented?



Assess the Risks and Issues

- Are risks and issues understood and managed?
- What mitigations are in place to address the risks?
- Have the issues been analyzed to determine corrective actions?
 - Are corrective actions being managed through to closure?
- Is there contingency in the schedule if risks are realized?
 - Or is the schedule so tight that nothing can go wrong?



Assess the BoEs

- Technical expertise is essential
- Basis of estimate will vary by phase and activity
 - Requirements
 - Source Lines of Code
 - Test cases/procedures
- Evidence of use of historical data, models

Schedule Health Checks

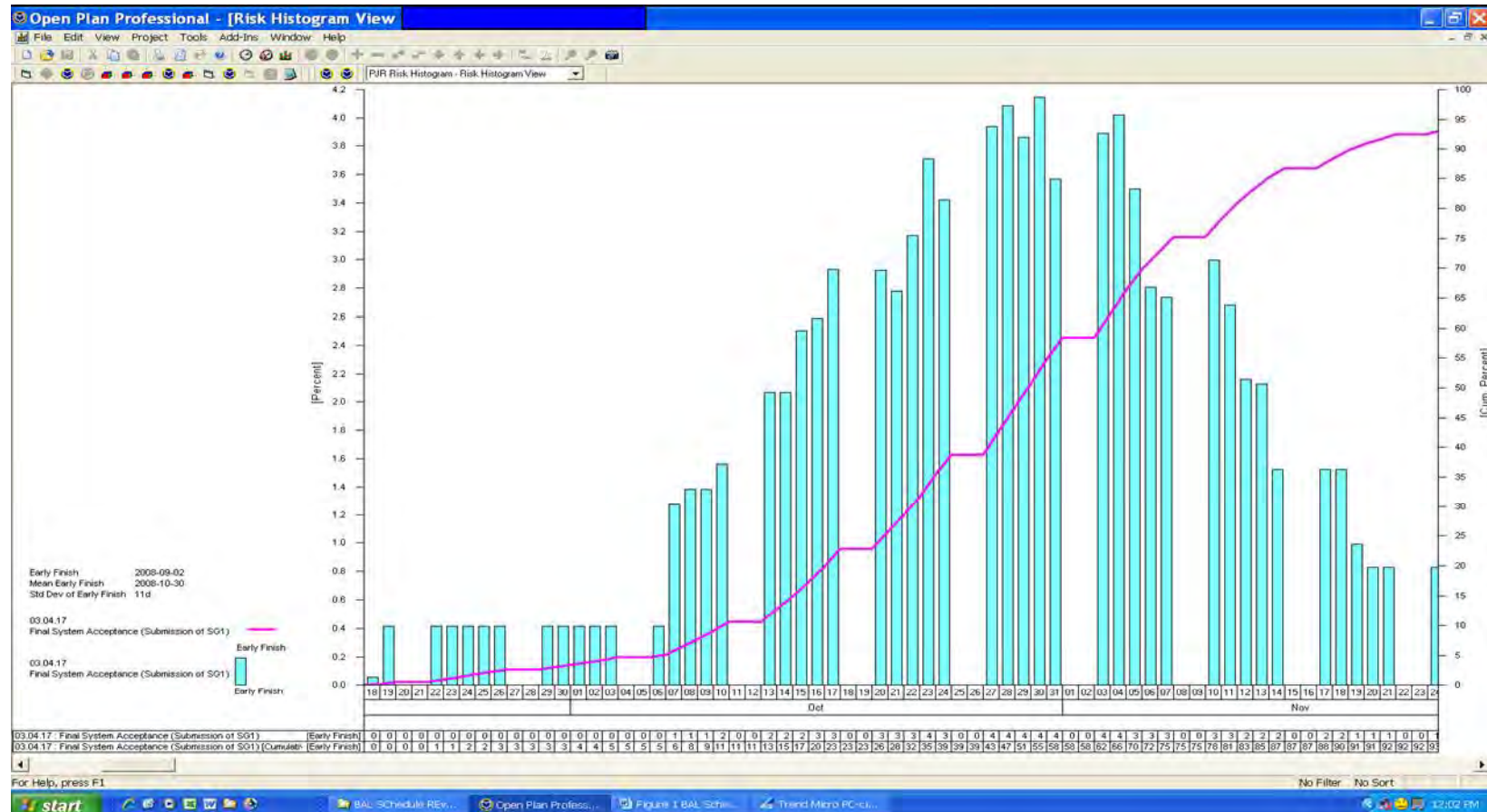
- To evaluate schedule construction and logic
 - Includes analyses of task dependencies, task constraints, and available schedule float
- WBS and Master Schedule are reviewed for alignment
- Government, Prime, and Subcontractor schedule integration / alignment is reviewed
- Ensure external dependencies are included and linked in the schedule
 - Interfaces, resources, facilities, Government Furnished Equipment (GFE), test assets etc.



Schedule Health Checks (cont.)

- Allocate three point estimates to tasks on critical and near-critical path based on identified risk from RCASS
 - optimistic, pessimistic & most likely task duration
- Perform Schedule Risk Simulation (e.g. Monte Carlo)

Monte Carlo Analysis Example





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 - ☐ Perform schedule “health checks”
 - ☐ Perform Monte Carlo analysis
3. How can future slips be prevented?
 - ☐ General recommendations based on SCRAM assessment
 - ☐ Guidance on measurements to serve as “leading indicators” of future slippage

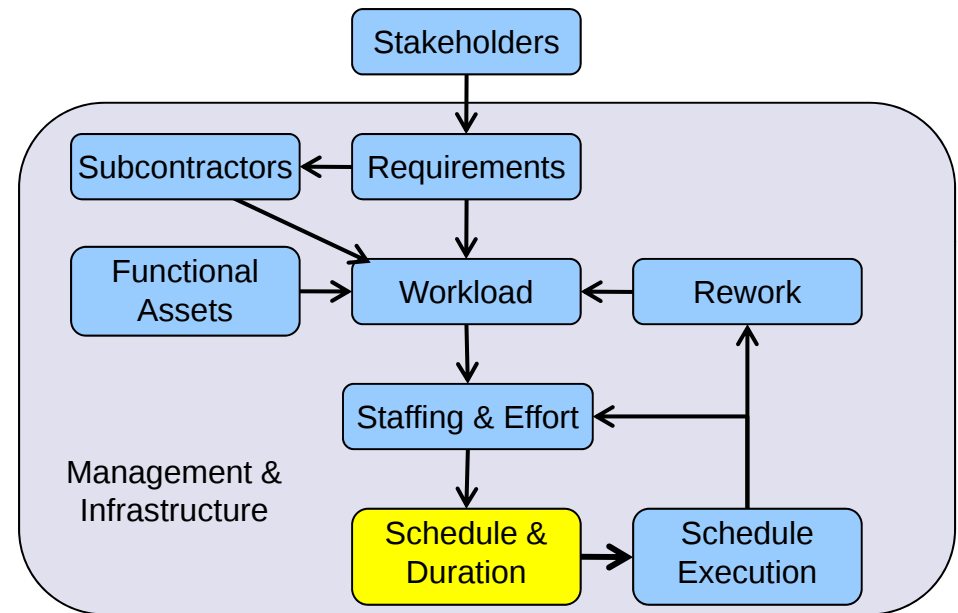


SCRAM Recommendations - Examples

- Clarify the delivery scope (requirements and acceptance criteria)
- Create an Integrated Master Schedule
- Test Procedure development should be more closely tracked and time should be added to the schedule for their review and correction
- Additional time in all test phases should be added for re-running tests that fail or are blocked
- Enhance fidelity of integration lab to improve defect identification

Root Cause Analysis of Schedule Slippage Model

- Provides guidance for collection of measurements
 - For visibility and tracking in those areas where there are risks





Topics

- Three Common Questions Addressed by SCRAM
- Benefits of Using SCRAM
- SCRAM Key Principles
- SCRAM Process Reference / Assessment Model
- Future plans for SCRAM



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



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 ERP application roll out readiness



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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



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

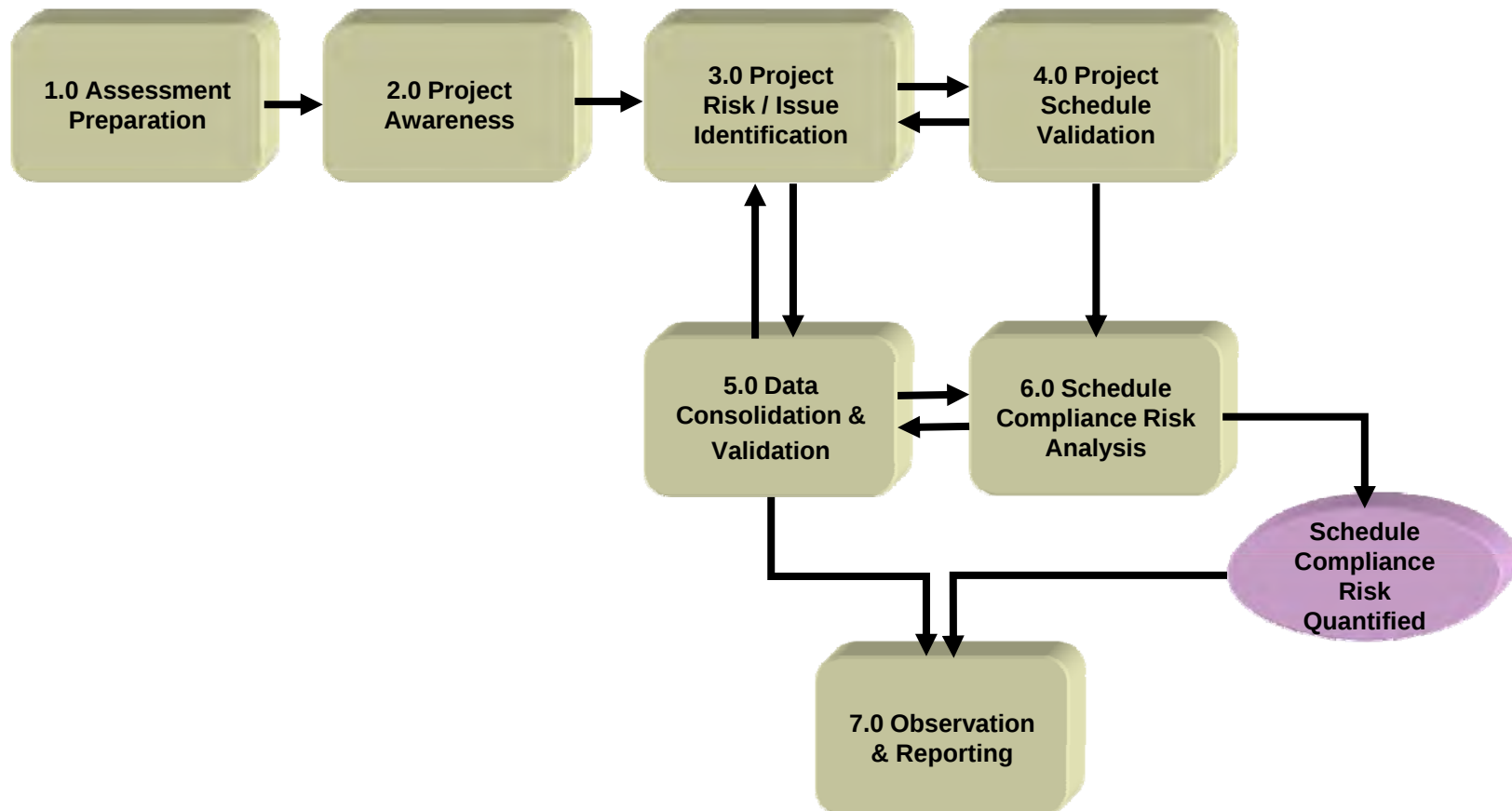
- ☐ One to two weeks spent on-site
- ☐ Executive briefing presented at end of second week



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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>



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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



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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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)