Acquisition Program Technical Measurement

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Office of the Director, Defense Research and Engineering

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Outline

- **Background**
  - Weapon Systems Acquisition Reform Act of 2009 (WSARA)
  - Acquisition Program Technical Measurement
- **Program Assessment & Monitoring**
  - Individual Program Support Review (PSR) Stop light
  - Signs of Good Programs
  - Integration of Existing Metrics to Uncover Trends and Relationships
  - Program Insight
- **Preferred End State**
  - Notional Scorecard
  - Integration of DoD Data Repositories
  - Leveraging Industry Best Practices
- **Summary**

Weapon Systems Acquisition Reform Act of 2009

- Establishes Director, Systems Engineering (D, SE) and Director, Developmental Test and Evaluation (D, DT&E) as principal advisors to the SECDEF and the USD(AT&L)
- Mandates documented assessment of technological maturity and integration risk of critical technologies for MDAPs during the Technology Development (TD) phase
- **Establishes D, DT&E and D, SE joint tracking and Congressional reporting on MDAP achievement of measurable performance criteria**
- Mandates competitive prototyping and MDA completion of a formal Post-Preliminary Design Review Assessment for all MDAPs before MS B; additional MDA certification to both at MS B
- Strengthens technical analysis of cost and schedule breaches during the Technology Development (pre-MS B) and the Engineering and Manufacturing Development (post-MS B)

President Barack Obama hands a pen to U.S. Rep. Robert Andrews (D-NJ) as he signs the Weapons Systems Acquisition Reform Act in the Rose Garden at the White House Friday, May 22, 2009. Standing from left are: Andrews, Rep. John McHugh (R-NY), Sen. Carl Levin (D-MI), Rep. Ike Skelton (D-MO) and Rep. Mike Conaway (R-TX). Official White House Photo by Samantha Appleton

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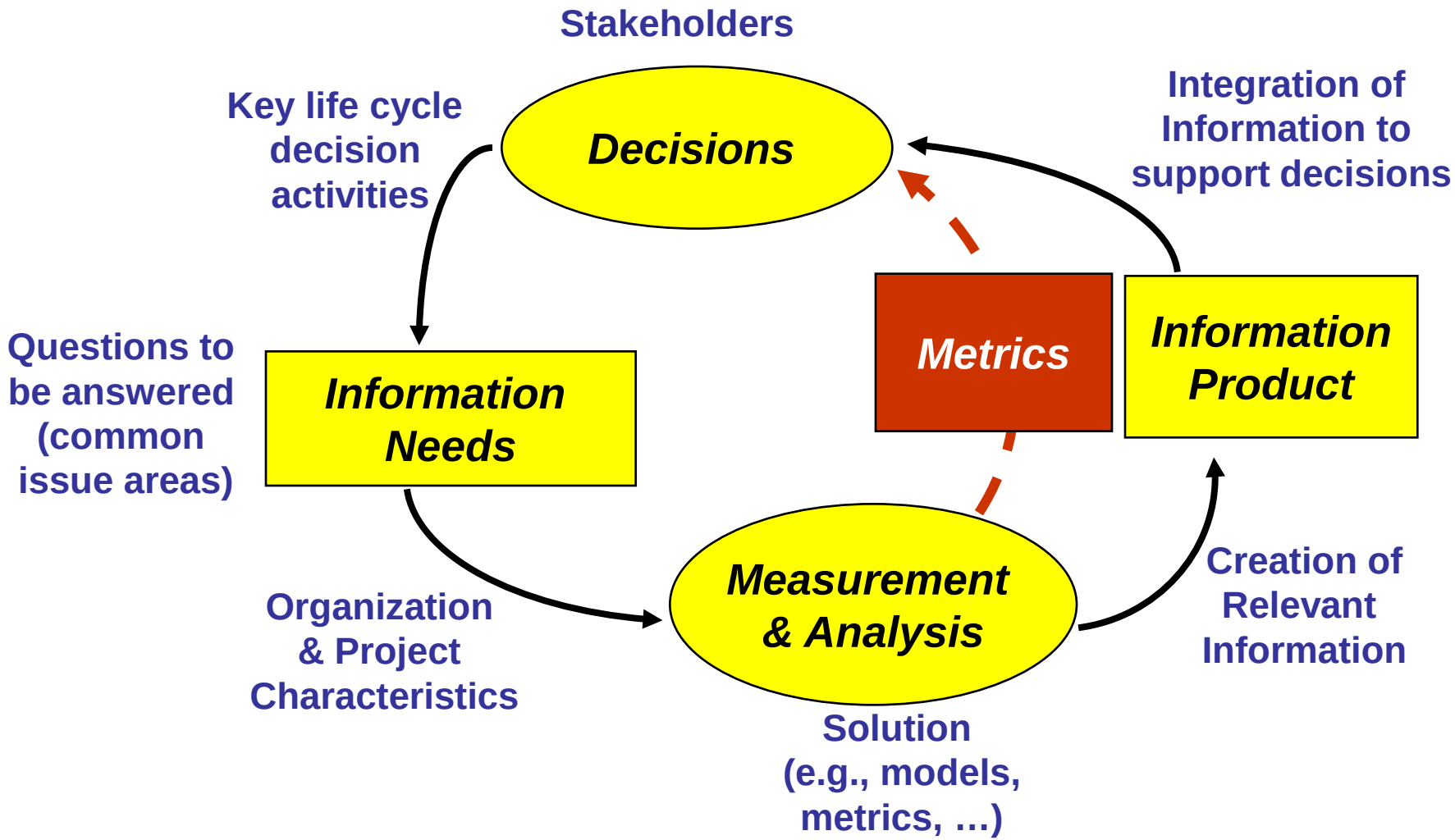
MDAP- Major Defense Acquisition Program (USC 2430)
MDA – Milestone Decision Authority

Acquisition Program Technical Measurement

- **Program performance reporting inadequate to support effective Acquisition decision making**
  - Program-level metrics change as through out the life cycle to address changing information needs (prevents Acquisition organization from obtaining complete data covering the program's full life cycle)
  - Programs develop unique metrics which help them effectively manage their program (prevents Acquisition benchmarking due to dissimilar program data)
- **Our objective is to establish an objective trustworthy Acquisition Program Measurement capability**
  - Fulfilling Statutory requirements of the Weapons Systems Acquisition Reform Act of 2009
  - Maximizing use of existing program reporting requirements and processes
  - Linking Services' and OSD databases to enable DoD Program benchmarking

Enable Objective Information Based Decision Making

Conceptual Information Flow:
(Creating Meaningful Metrics)



(Adapted from: SSCI 2007)

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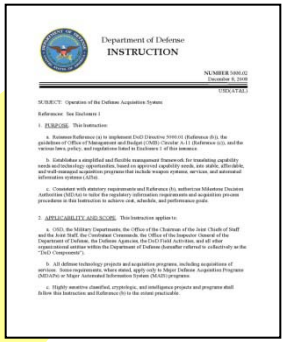
Program Assessment and Monitoring

- **Fall 2002: OSD establishes SE organization to:**
  - Drive SE back into programs
  - Instill credibility in the acquisition process
- **Program Assessments: Element of DoD SE revitalization effort**
  - Help Program Managers identify & mitigate risks
  - Shape technical planning and management
  - Provide insight to OSD stakeholders
  - Identify systemic issues requiring resolution above program


Department of Defense
INSTRUCTION

3.9.6. Program Support Review (PSR). PSRs are a means to inform the MDA, OIPT, and Program Office of the status of technical planning and management processes by identifying cost, schedule, and performance risk and recommendations to mitigate those risks. PSRs shall be conducted by cross-functional and cross-organizational teams appropriate to the program and situation. PSRs for ACAT ID and IAMs shall be planned by the Director, Systems and Software Engineering to support pending OIPT program reviews, at other times as directed by the USD(AT&L), and in response to requests from PMs.

Program Assessments
- Support acquisition decisions & requests
- Address technical issues
- DAPS Methodology provides framework

Program Monitoring
- SE technical reviews, WIPTs, test events
- Program Signature
- Metrics to assess program performance
- Systemic Root Cause Analysis

Continuous Program Engagement Enhances Program Execution

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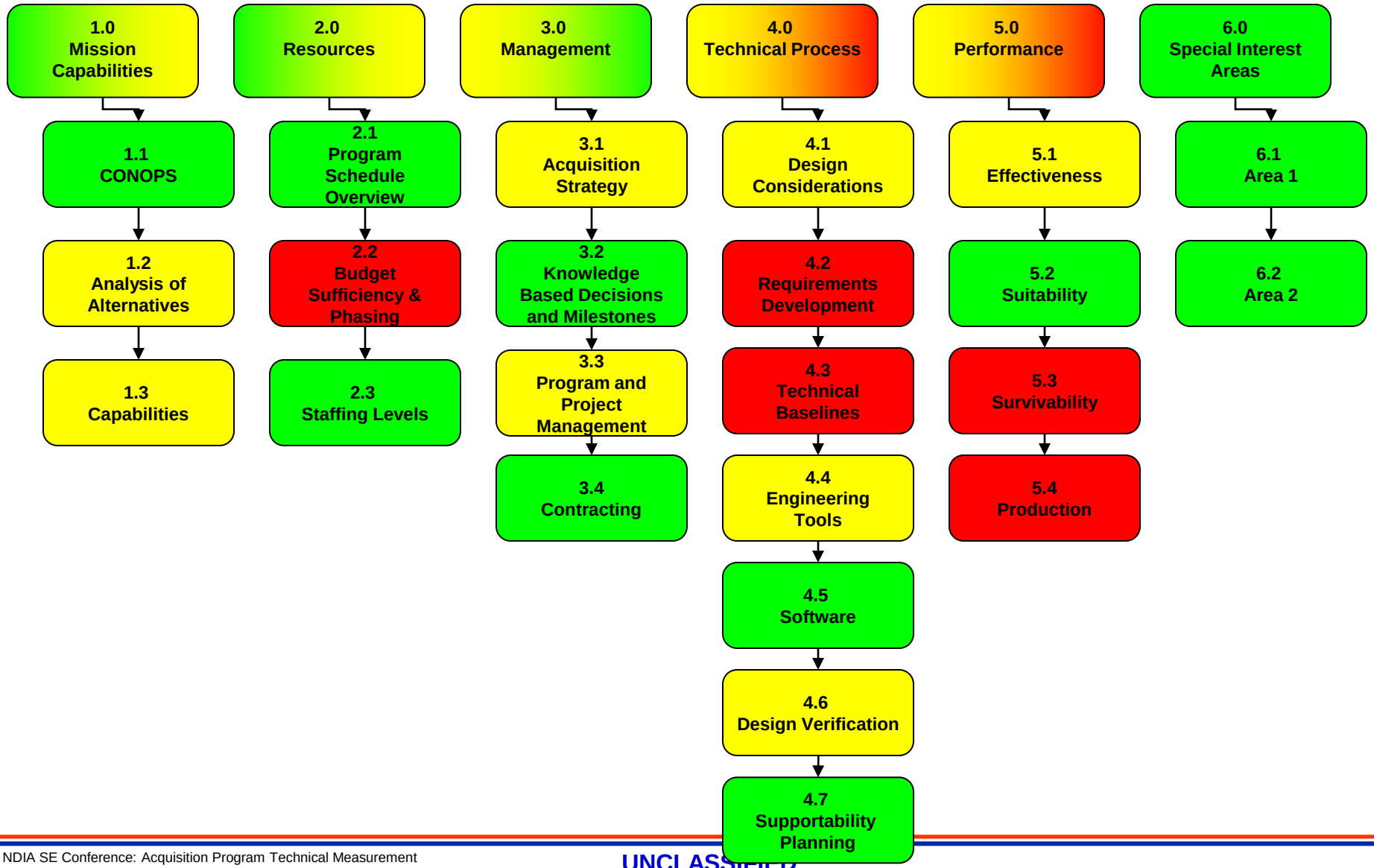
Notional PSR Stop Light



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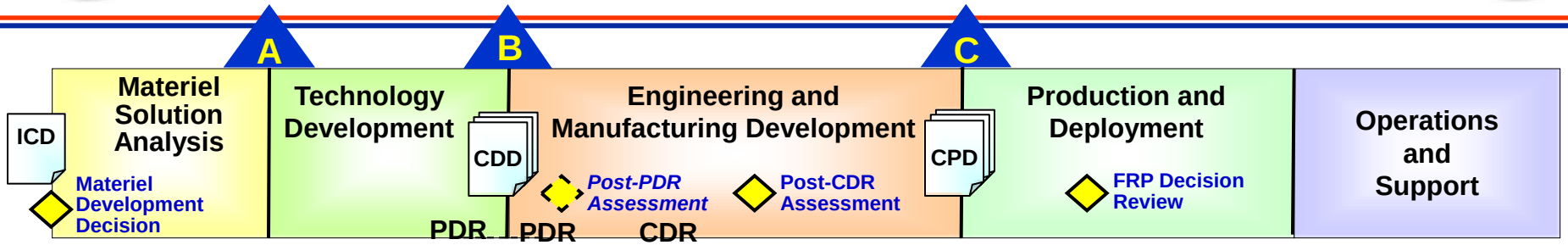
Use Signs and Artifacts of Good Programs to Identify Meaningful Metrics



Technical Excellence
Milestone A

- ✓SEP
  - Risk management planning
- ✓TES
- ✓TDS
- ✓ADM, Phase exit criteria
- ✓Draft RFP

Technical Excellence
Milestone B

- ✓SEP
  - Risk management planning
- ✓TEMP
- ✓Acquisition Strategy
  - Contract Scope
- ✓ADM, Phase exit criteria
- ✓PDR report

Technical Product

- Mature technologies and modular open architecture
- Reliability and maintainability designed-in
- Early focus on production planning
- Realistic software size, productivity, and reuse estimates
- Assessments of manufacturing planning and maturity

Technical Process

- Established SE processes in use
- SEP approved prior to RFP release
- Adequate requirements flow-down/ traceability/ decomposition
- Emphasis on test and verification approach
- Comprehensive contractual verification (section 4 of spec) of meeting requirements (section 3 of spec)

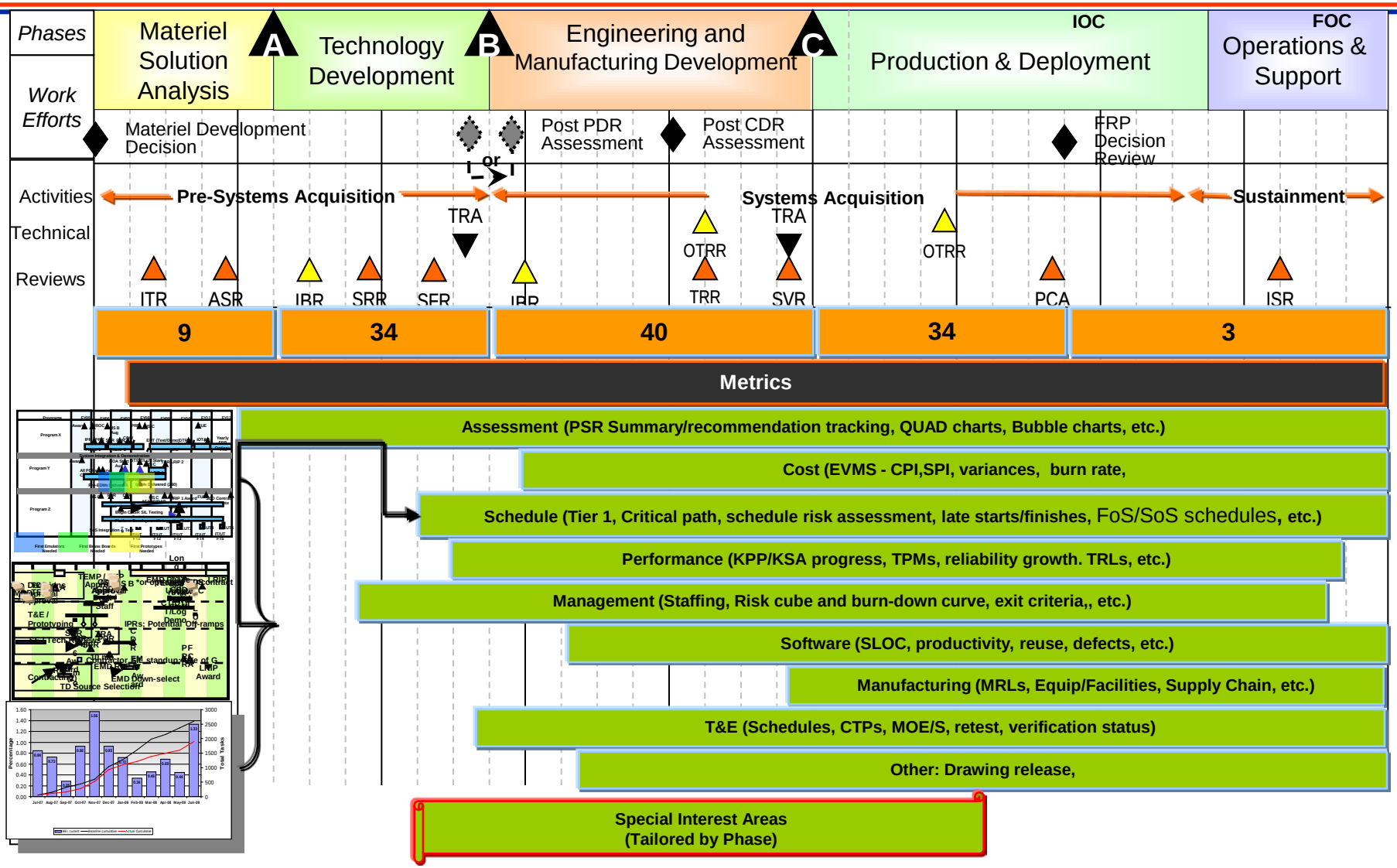
Mission Capabilities/Requirements

- Establish reasonable, measurable and testable CDD/CPD requirements
- Conducts SRR in TD phase with competing contractors
- Uses competitive prototyping
- Establishes PM/User/Contractor advisory group to assess cost/performance trades
- Maintains stable requirements

Resources and Management

- Funding properly phased and adequate to support planned SE activities
- Adequately staffed with qualified personnel
- Adequate management reserve consistent with program risks
- Good communication between user, acquirer, supplier; IPTs
- Manages external interfaces with complementary programs
- Maintains event driven schedules
- Robust risk management process and mitigation activities; Integration with IMS and EVM

Integration of Indicators to Uncover Relationships and Trends



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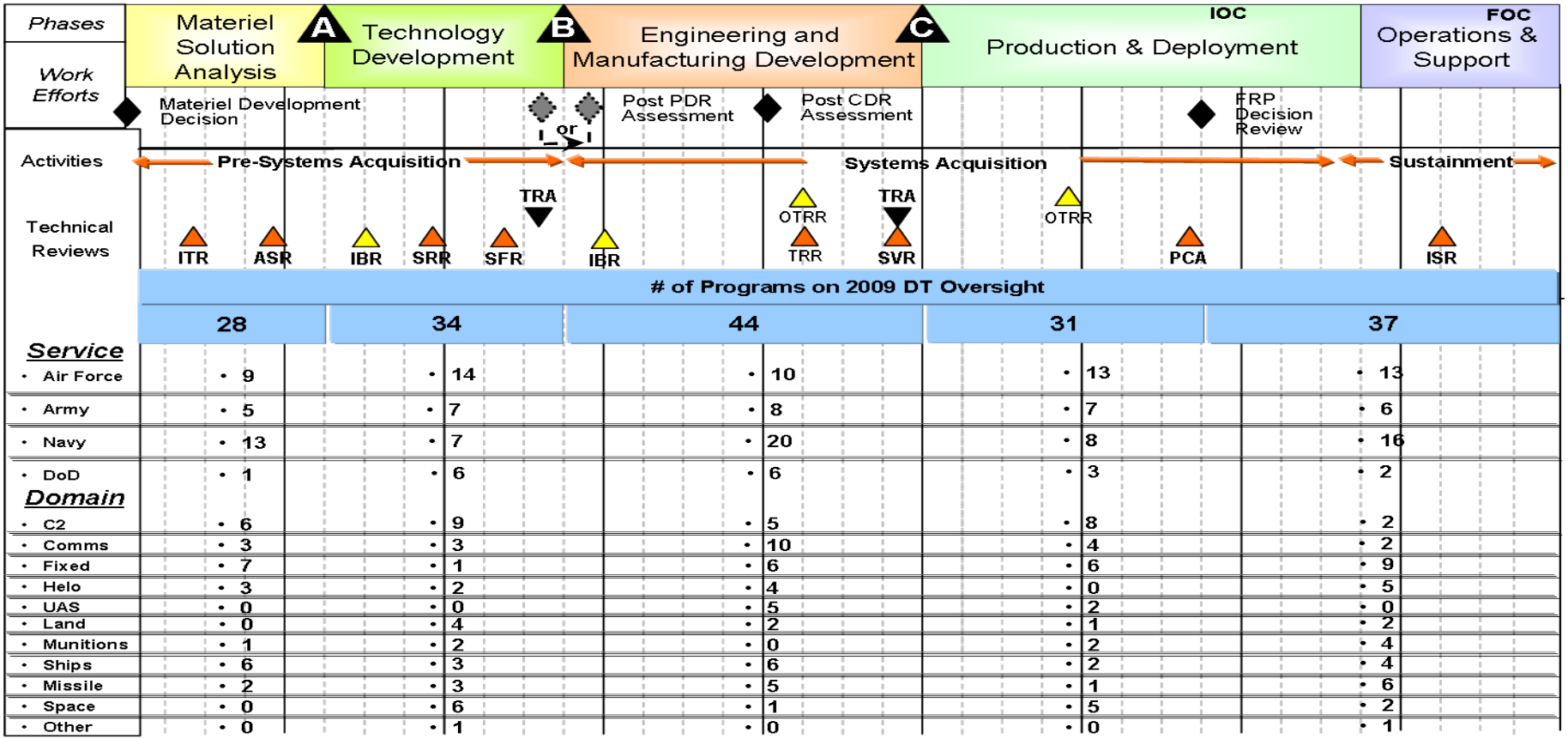
Leverage Existing Data & Metrics

- **Portfolio of MDAP Programs**
- **PSRs provide primary Major Program Support (MPS) touch points to collect data and assess Program Performance**



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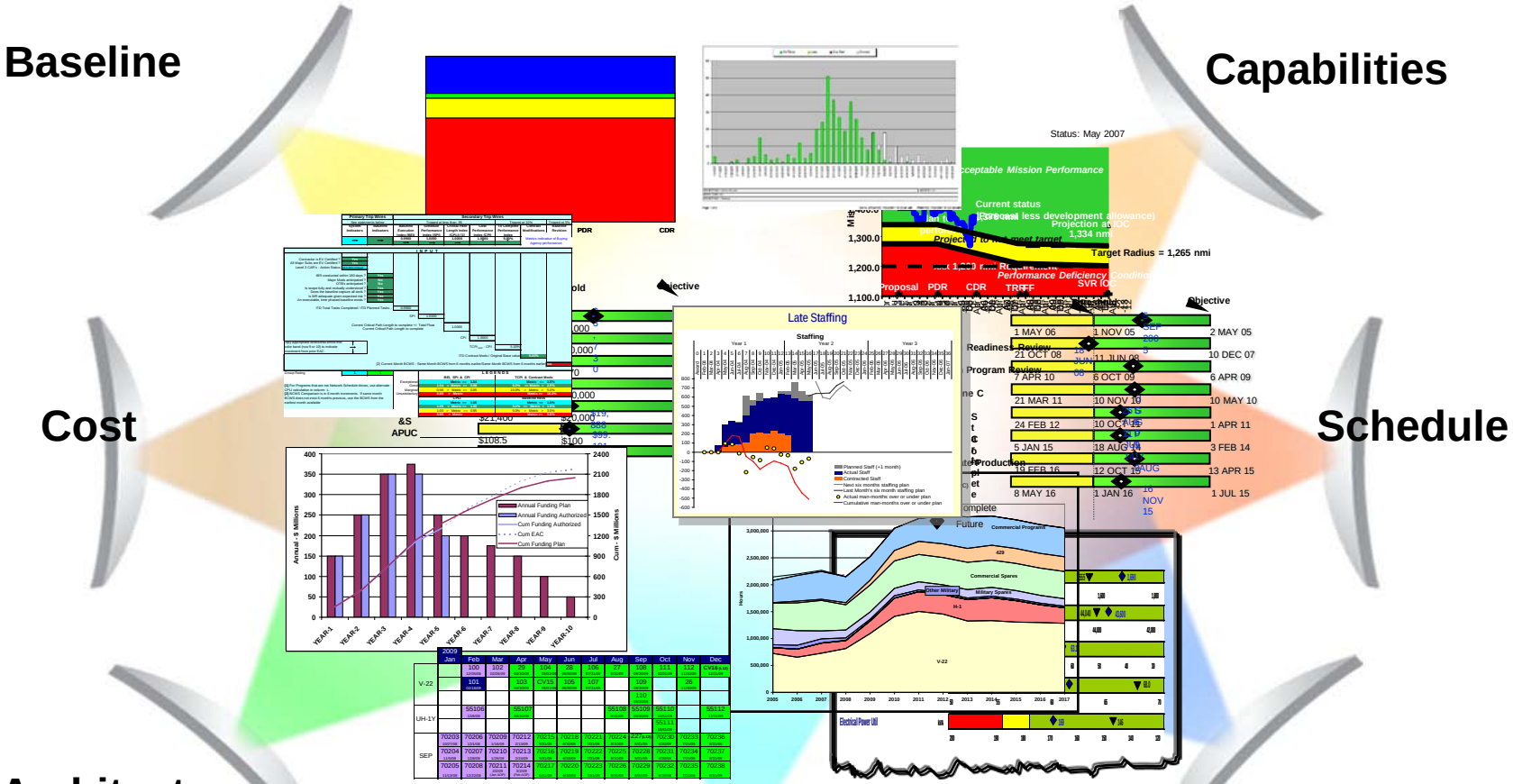
Program Insight



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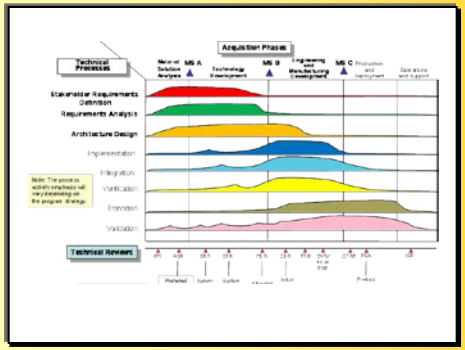
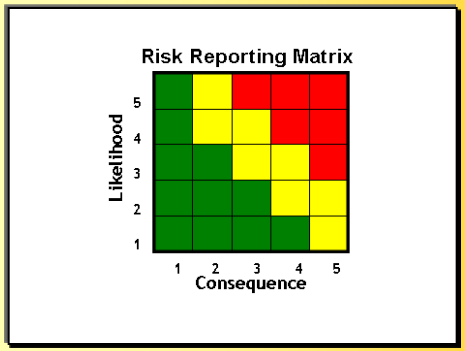
Notional Dashboard

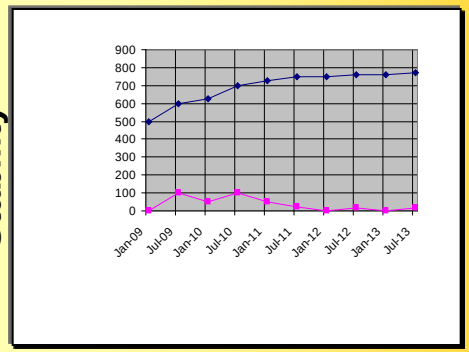
Staffing Plan



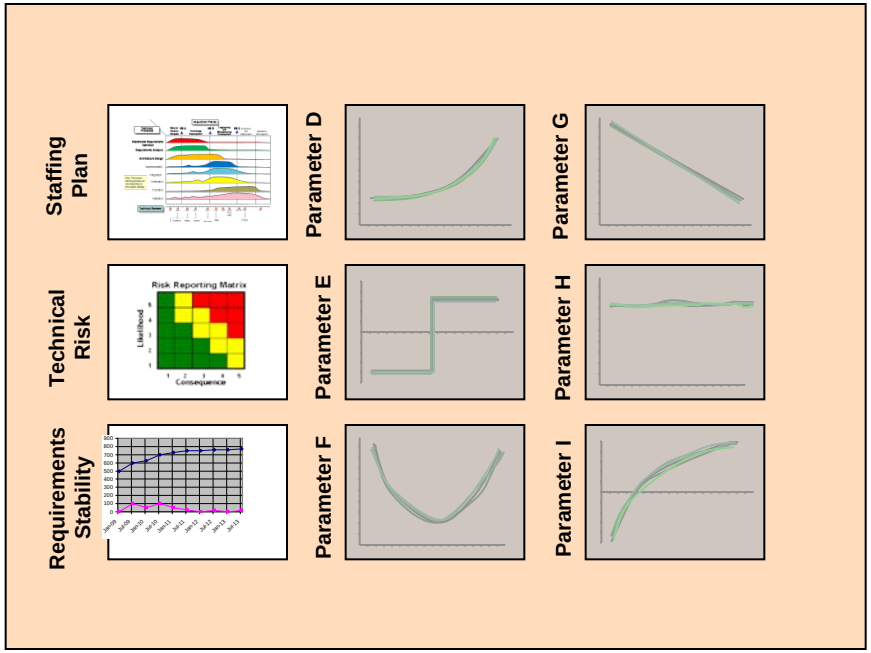
Technical Risk



Requirements Stability



Decision Support Matrix



Inform Milestone decisions by providing assessment against key program factors as well as comparison against past program trends

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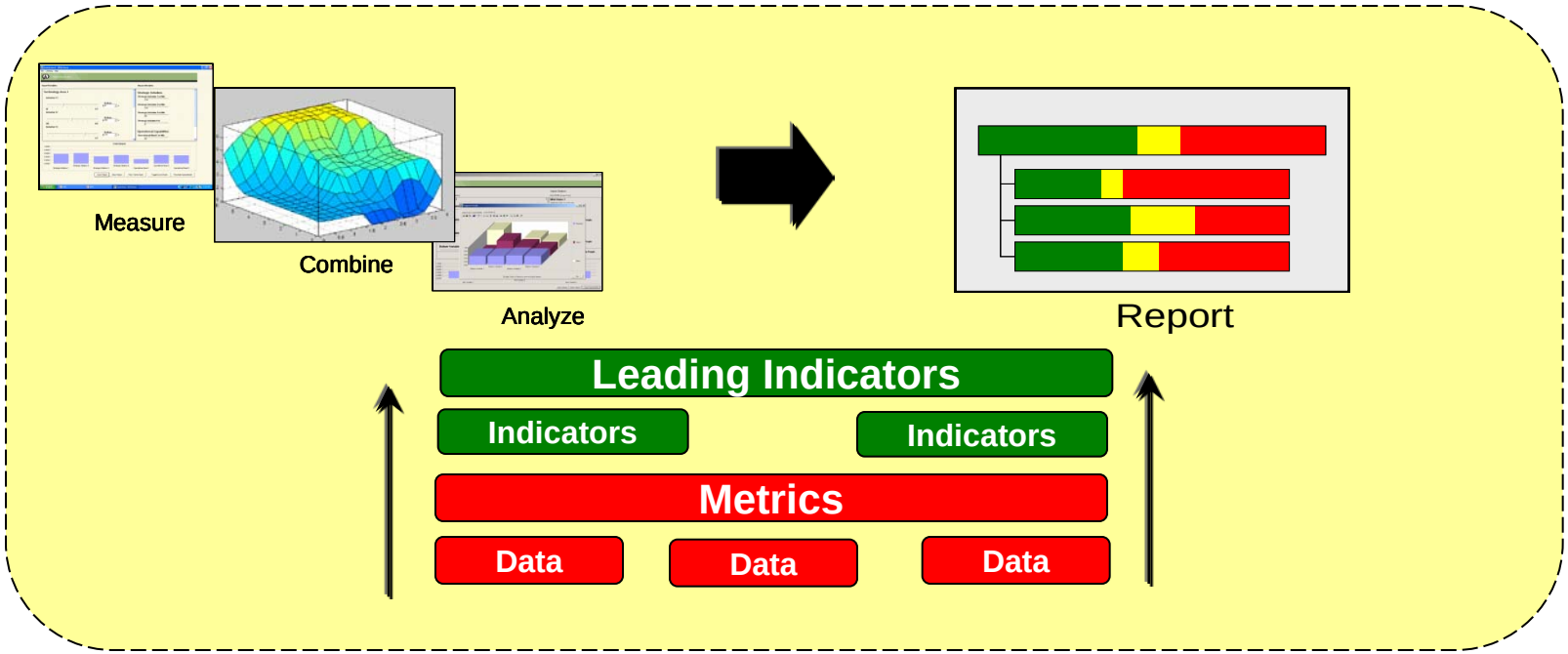
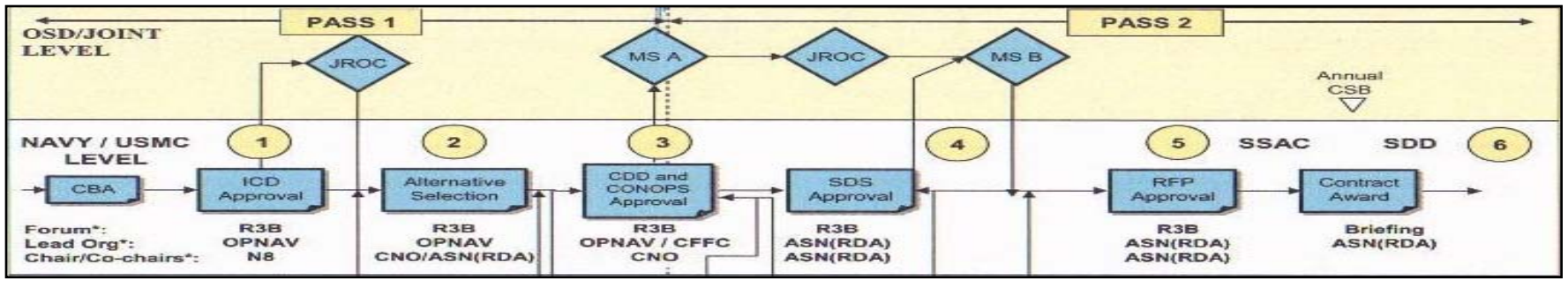
Dashboard Contents based on Existing Indicators





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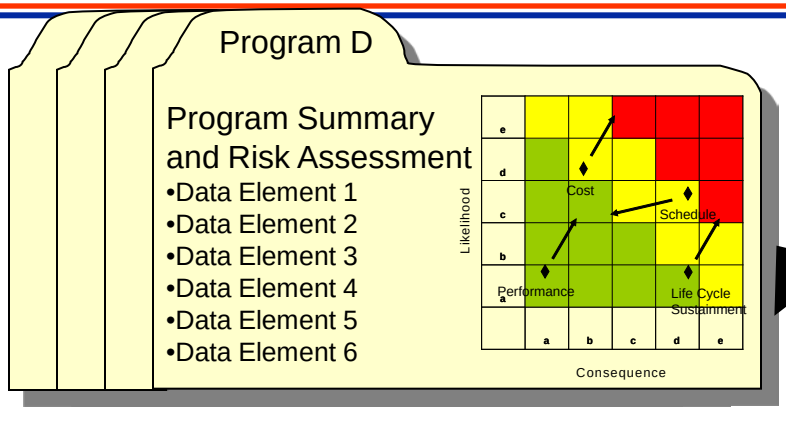
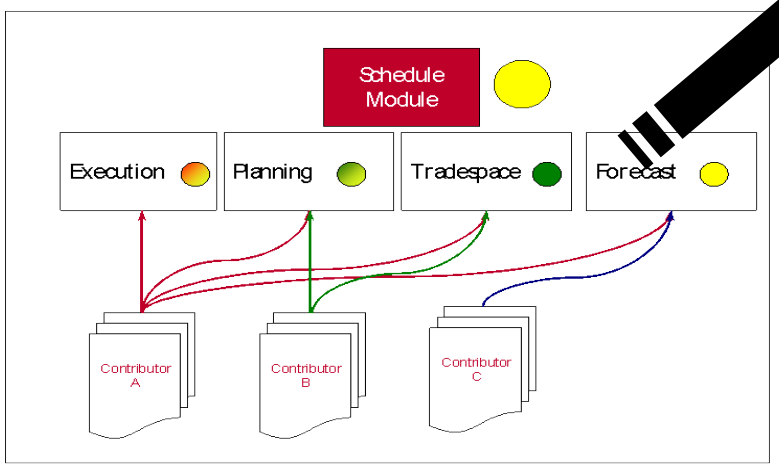
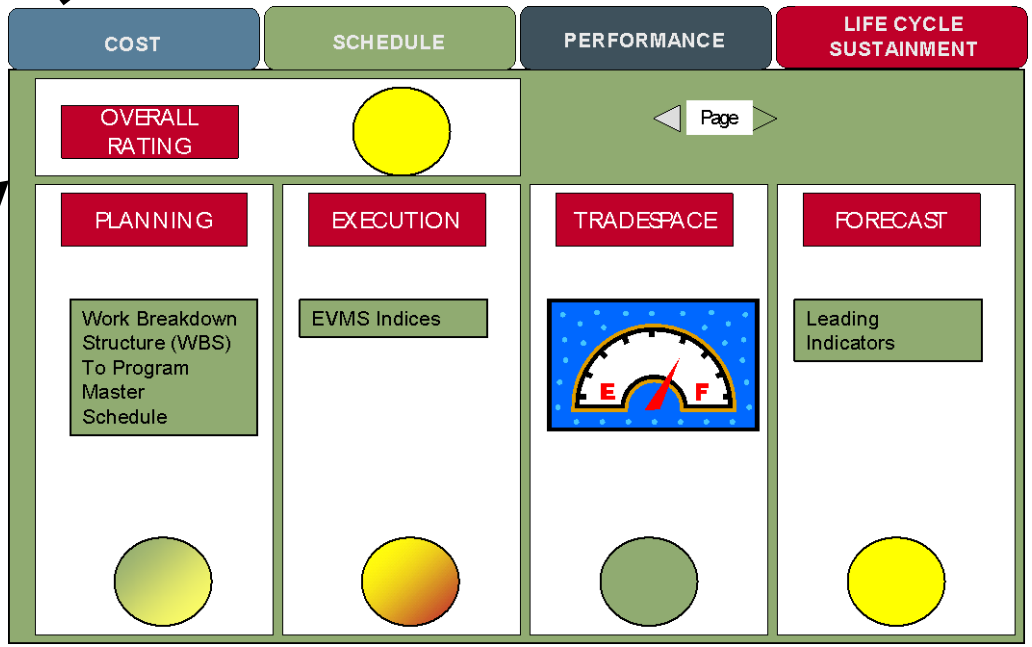
Preferred End State



Program Assessment and Display Level





Aggregation and Integration Level

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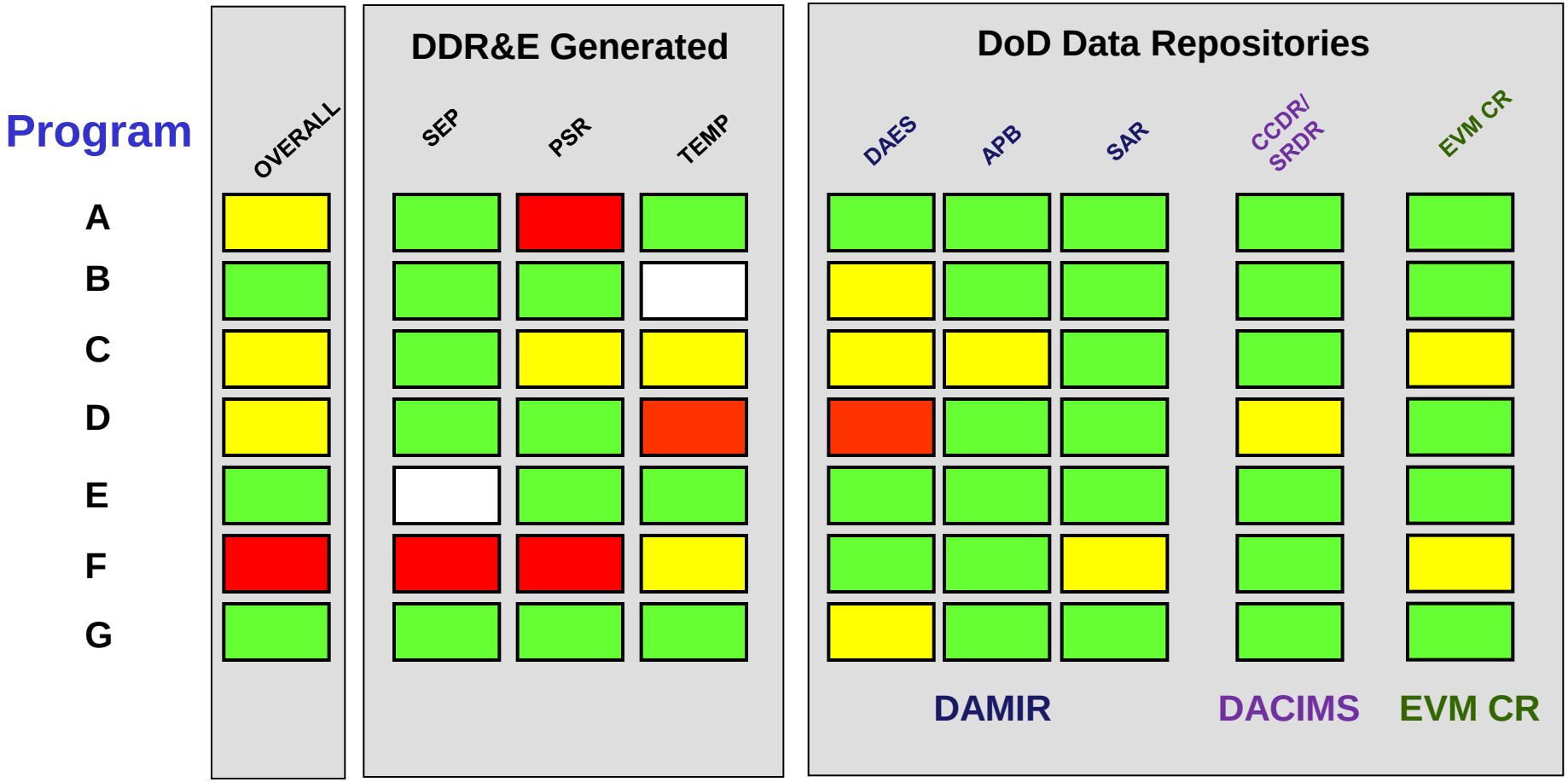
Notional Example for Director of Major Program Support



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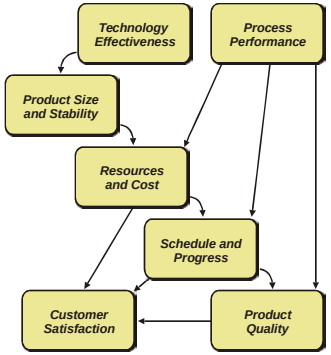
Position DDR&E to Leverage Related Industry Best Practices

LEAN AEROSPACE INITIATIVE

INCOSE
International Council on Systems Engineering

PSM



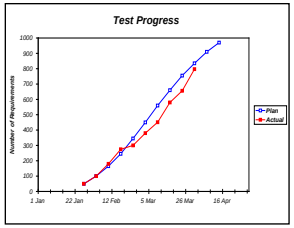
SYSTEMS ENGINEERING LEADING INDICATORS GUIDE

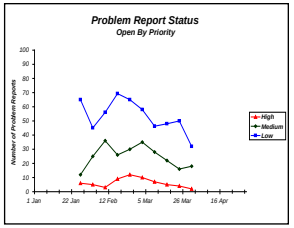
TABLE 1. SYSTEMS ENGINEERING LEADING INDICATORS OVERVIEW

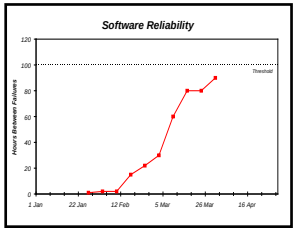
Leading Indicator	Insight Provided	P1	P2	P3	P4	P5
Requirements Trends	Rate of maturity of the system definition against the plan. Additionally, characterizes the stability and completeness of the system requirements which could potentially impact design and production.	•	•	•	•	•
System Definition Change Backlog Trend	Change request backlog which, when excessive, could have adverse impact on the technical, cost and schedule baselines.			•	•	•
Interface Trends	Interface specification closure against plan. Lack of timely closure could pose adverse impact to system architecture, design, implementation and/or V&V any of which could pose technical, cost and schedule impact.	•	•	•	•	•
Requirements Validation Trends	Progress against plan in assuring that the customer requirements are valid and properly understood. Adverse trends would pose impacts to system design activity with corresponding impacts to technical, cost & schedule baselines and customer satisfaction.	•	•	•	•	•
Requirements Verification Trends	Progress against plan in verifying that the design meets the specified requirements. Adverse trends would indicate inadequate design and rework that could impact technical, cost and schedule baselines. Also, potential adverse operational effectiveness of the system.	•	•	•	•	•
Work Product Approval Trends	Adequacy of internal processes for the work being performed and also the adequacy of the document review process, both internal and external to the organization. High reject count would suggest poor quality work or a poor document review process each of which could have adverse cost, schedule and customer satisfaction impact.	•	•	•	•	•
Review Action Closure Trends	Responsiveness of the organization in closing post-review actions. Adverse trends could forecast potential technical, cost and schedule baseline issues.	•	•	•	•	•
Risk Exposure Trends	Effectiveness of risk management process in managing / mitigating technical, cost & schedule risks. An effective risk handing process will lower risk exposure trends.	•	•	•	•	•
Risk Handling Trends	Effectiveness of the SE organization in implementing risk mitigation activities. If the SE organization is not retiring risk in a timely manner, additional resources can be allocated before additional problems are created.	•	•	•	•	•
Technology Maturity Trends	Risk associated with incorporation of new technology or failure to refresh dated technology. Adoption of immature technology could introduce significant risk during development while failure to refresh dates technology could have operational effectiveness/customer satisfaction impact.		•	•	•	•
Technical Measurement Trends	Progress towards meeting the Measures of Effectiveness (MOEs) / Performance (MOPs) / Key Performance Parameters (KPPs) and Technical Performance Measures (TPMs). Lack of timely closure is an indicator of performance deficiencies in the product design and/or project team's performance.			•		
Systems Engineering Staffing & Skills Trends	Ability of SE organization to execute total SE program as defined in the program SEP or SEMP. Includes quantity of SE personnel assigned, the skill and seniority mix and the time phasing of their application throughout the program lifecycle.	•	•	•	•	•
Process Compliance Trends	The quality and consistency of the project defined SE process as documented in the program's SEP / SEMP. Poor/inconsistent SE processes and/or failure to adhere to SEP / SEMP, increase program risk.	•	•	•	•	•

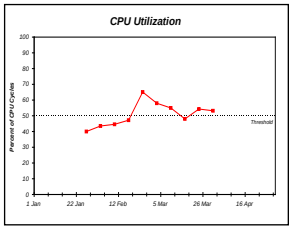
Integrated Analysis Example

Readiness for Delivery









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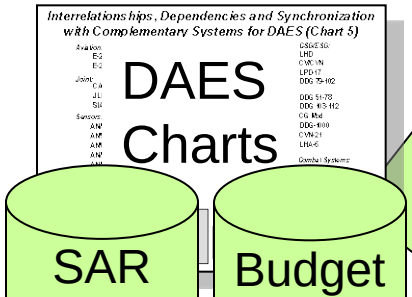
Supporting Future Alignment of Existing DoD Data Sources



SAR (DAMIR)

Budget Exhibits

Data

Consolidated Data Set (MMT)

Independent Variables (Interdependence)

Dependent Variables (cost, schedule)

Data

SAR (DAMIR)

ISP (JCPAT)

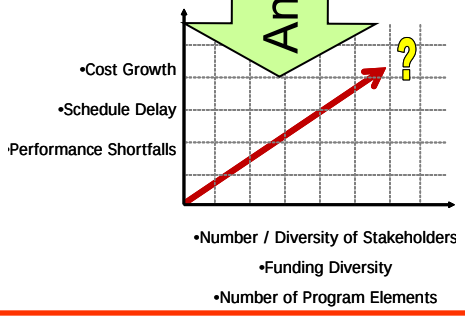
SAR (DAMIR)

Data

SAR (DAMIR)

Analyses

Develop Leading Indicators



Apply to Acquisition

- **Assess program risk**
- **Inform resource req'ts**
- **Etc…**

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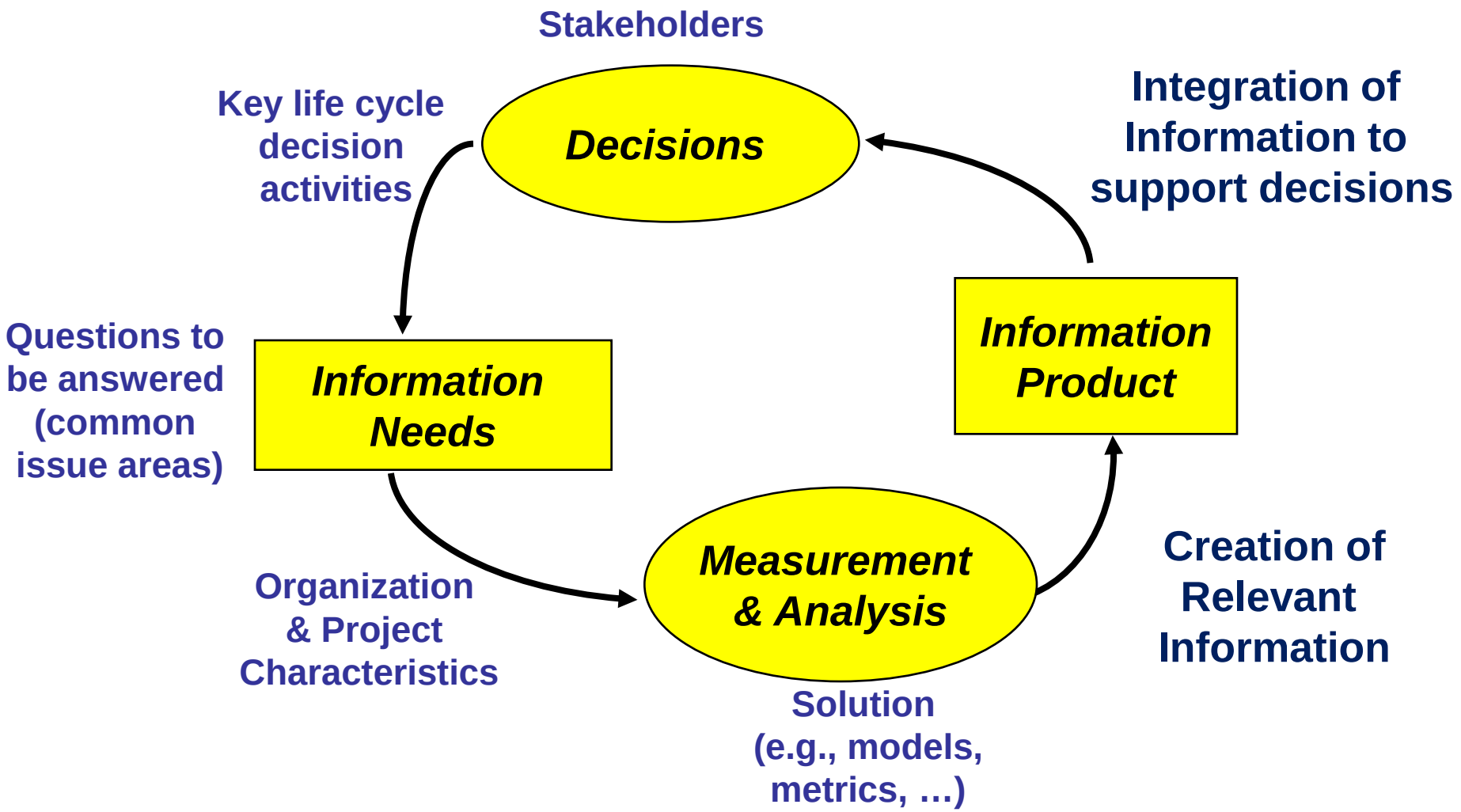
Conceptual Information Flow:
(Creating Meaningful Metrics)



(Adapted from: SSCI 2007)

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Summary

- **Objective is to better insight to Acquisition decision makers**
  - Statutory reporting requirements of the Weapons Systems Acquisition Reform Act of 2009
  - Effective decision making supported by existing program performance reporting as well as increasing the integration of DoD Data repositories
- **Development of useful Acquisition metrics and leading indicators requires integration of existing engineering and management performance data**
  - Minimizing effort associated with data collection and analysis, yet increasing the degree of objective program performance data
- **Focus on creating a set of useful Information products for Acquisition stakeholders, which requires:**
  - Knowledge of data quality (reproducible, unbiased, …)
  - Baselining key decisions and information needs
  - Creating meaningful ways to aggregate and integrate data throughout the Acquisition hierarchy

Questions/Discussion

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