



## Identifying Systemic Program Issues Based on Real Program Findings

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Office of the Deputy Under Secretary of Defense  
for Acquisition and Technology**

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# Systems and Software Engineering...

## What are we all about?



### ***Acquisition Program Excellence through sound systems and software engineering...***

- *Help shape portfolio solutions and promote early corporate planning*
- *Promote the application of sound systems and software engineering, developmental test and evaluation, and related technical disciplines across the Department's acquisition community and programs*
- *Raise awareness of the importance of effective systems and software engineering, and drive the state-of-the-practice into program planning and execution*
- *Establish policy, guidance, best practices, education, and training in collaboration with academia, industry, and government communities*
- *Provide technical insight to the leadership to support effective and efficient decision making*

***Based on USD(AT&L) 2004 Imperative...***

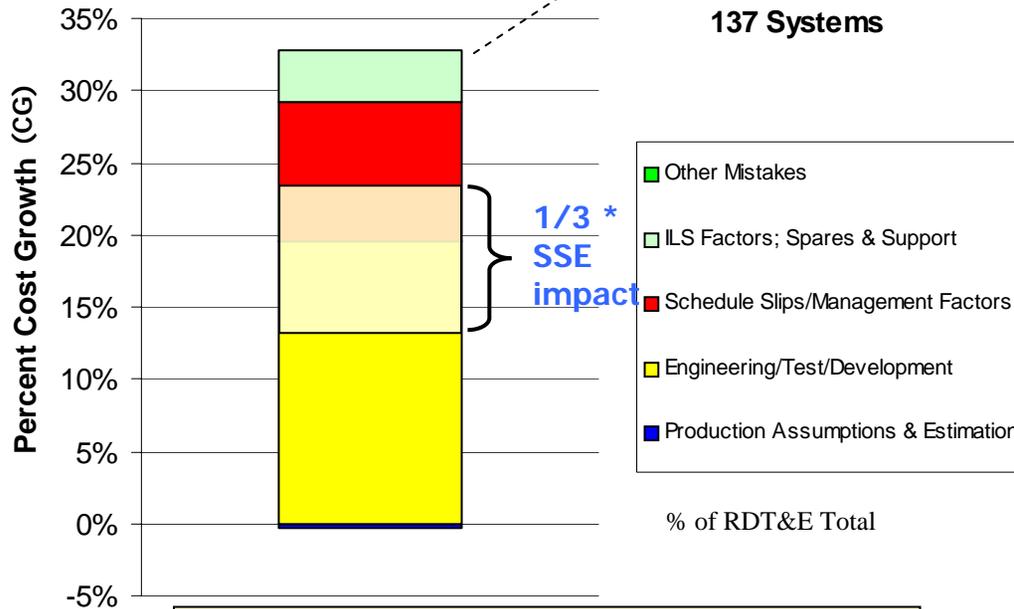
***“Provide context within which I can make decisions about individual programs.”***



# Driving Systems and Software Engineering Back into Programs Reduces Costly Mistakes

## RDT&E Mistakes

Under estimating engineering effort is Major source of error



Source: DoD Cost Avoidance Study (CAIG) 10 year ongoing

33% historical RDT&E Cost Growth

Applied to

\$222.8B RDT&E FYDP\*\*

Yields a Potential

\$73.52B RDT&E Cost Growth FYDP

\* SSE positive impact on just 1/3 of RDT&E mistakes (11%)

Yields a Potential

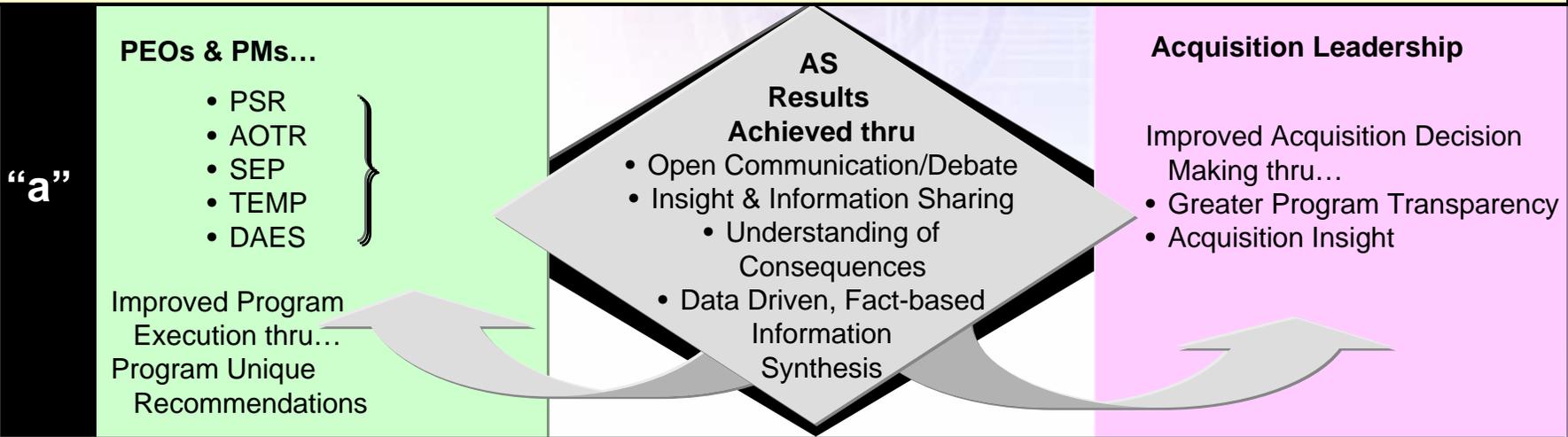
\$24.51B RDT&E Cost Avoidance FYDP

\*\* SAR data for MAIS and MDAP programs under OSD Systems Engineering Oversight

# Providing Value Added Oversight & Support



## • Tactical, Program and Portfolio Management



## • Strategic Management

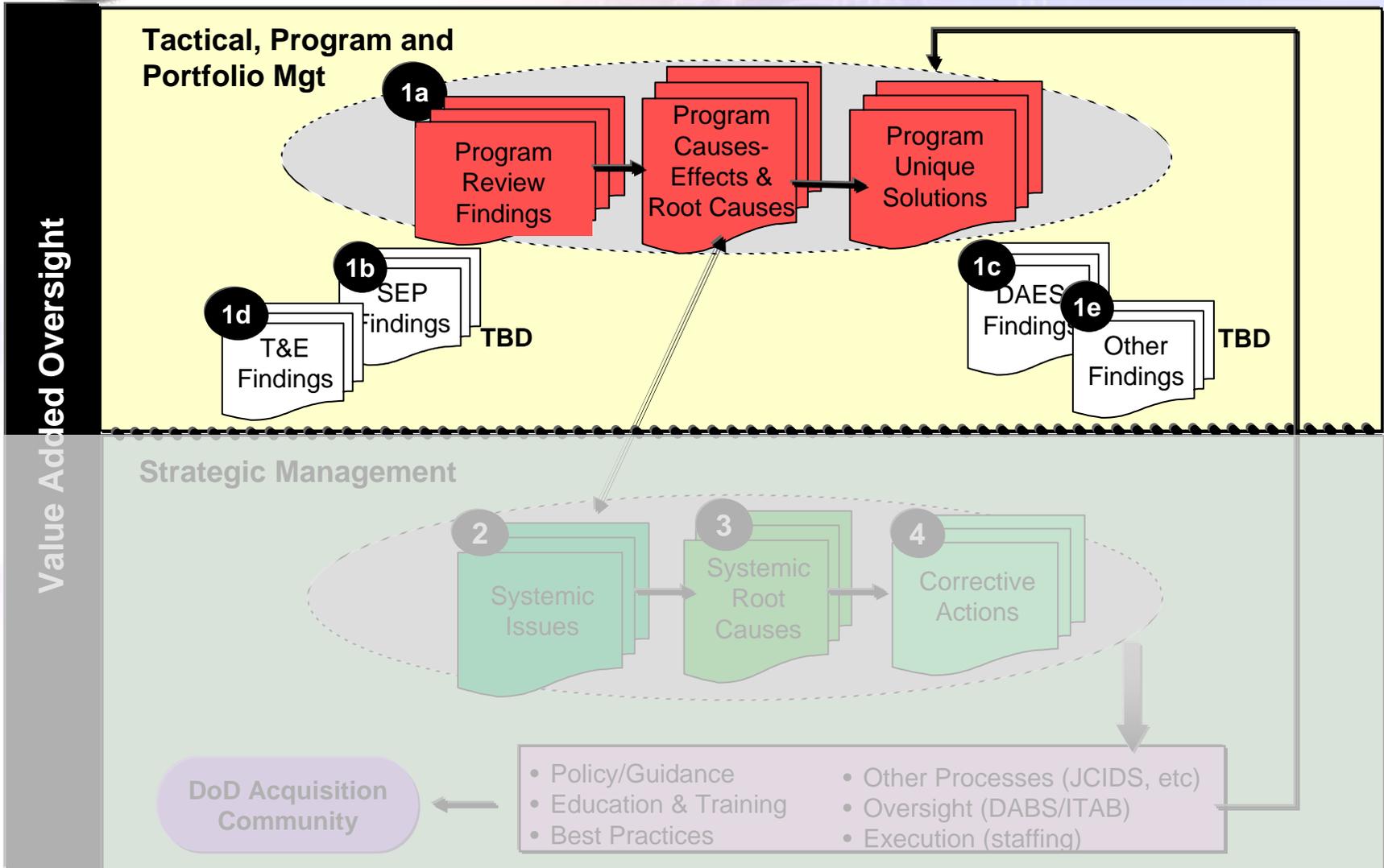


- Policy/Guidance
- Best Practices
- Oversight (DABS/ITAB)
- Education & Training
- Other Processes (JCIDS, etc)
- Execution (staffing)



# Systemic Analysis: Data Model

Steps 1A, 2-4 Underway





# A Tailorable Process Model...

## Pre-MS A (Oct 2004)

Initial Capabilities Documentation (ICD)

Results of system concept studies

Analysis of Alternatives

Technology Development Strategy

Technology Development Planning

Technology Risk Reduction

Systems Engineering planning

## Pre-MS C (May 2004)

Design Baseline status

Status of system demonstration, test, and evaluation

Execution of systems engineering process

Production metrics and process controls

Transition to production planning

Operational test verification

Logistics metrics verification  
(maintenance/training)

## Pre-MS B (Dec 2003)

Results of Technology Development and Maturation

Capabilities Development Documentation (CDD)

Feasibility and stability of requirements

Incorporation of MOSA, Net Centric capability

Acquisition Strategy

Test and Evaluation Strategy

Application of systems engineering process in design, test, and verification

Design producibility and transition to production planning

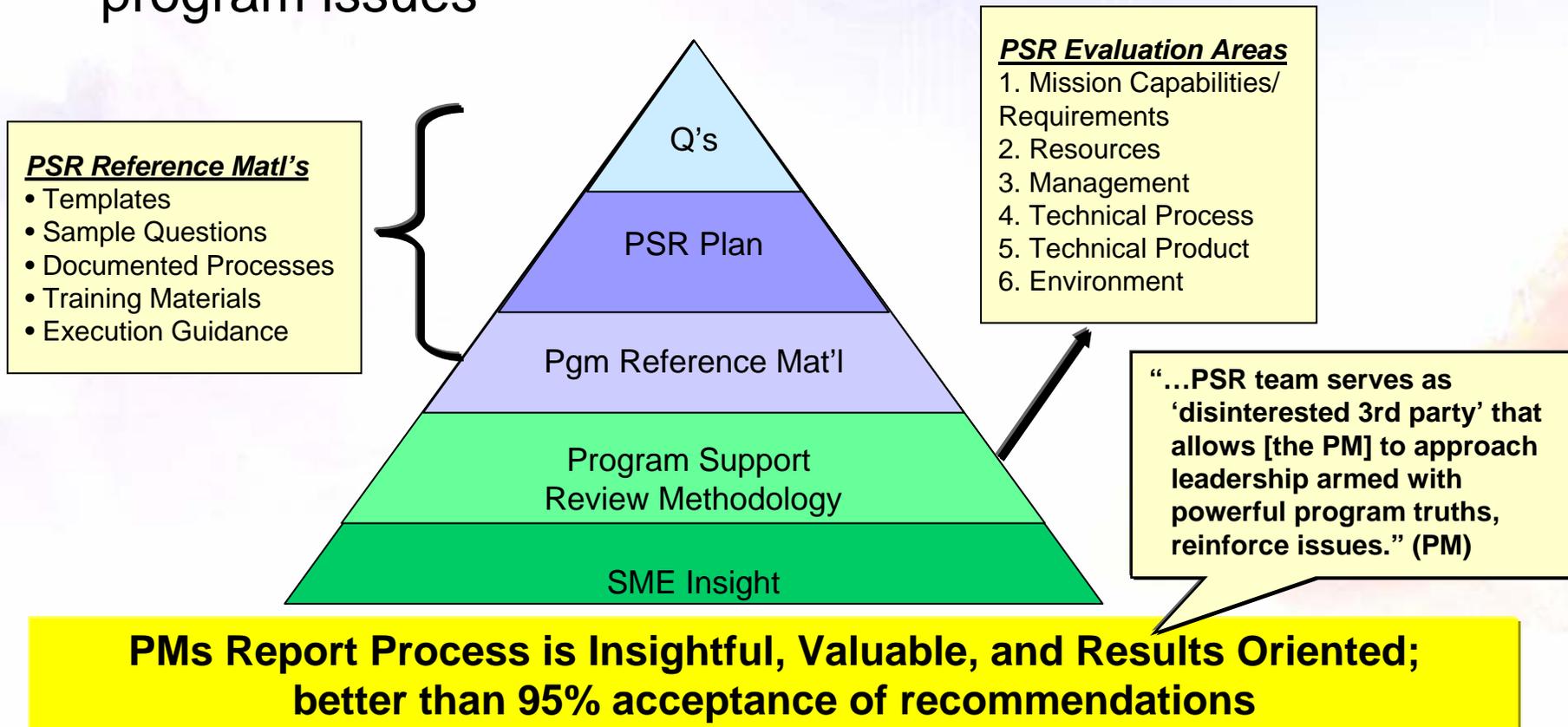
Logistics metrics including supportability, reliability, maintainability

Consolidated Web Version – Oct 2005



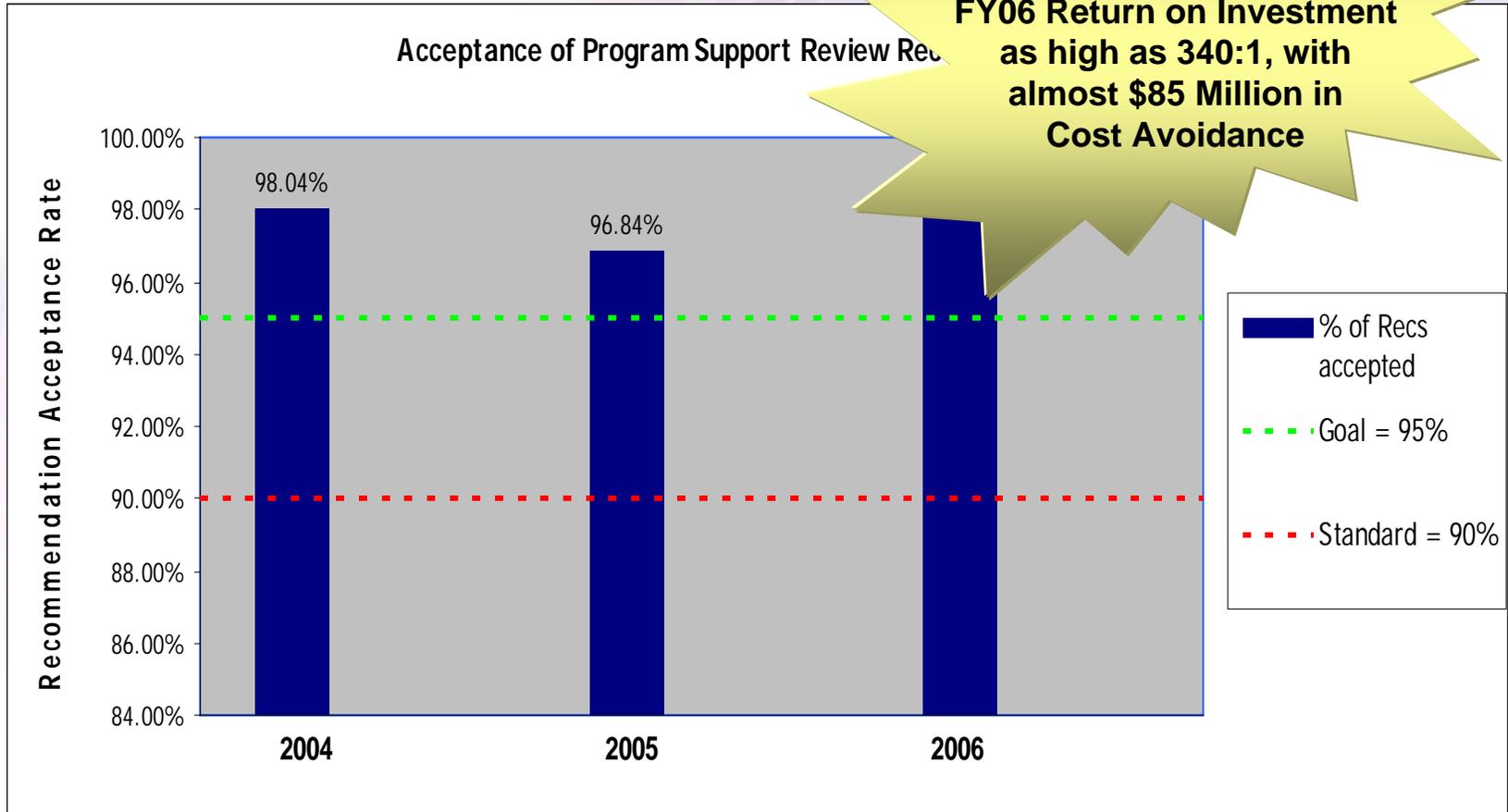
# Program Support Review (PSR)

- Repeatable, tailorable, exportable process
- Trained workforce with in-depth understanding of PMs' program issues





# PSR Effectiveness





# PSR Data Matrix and Coverage Record

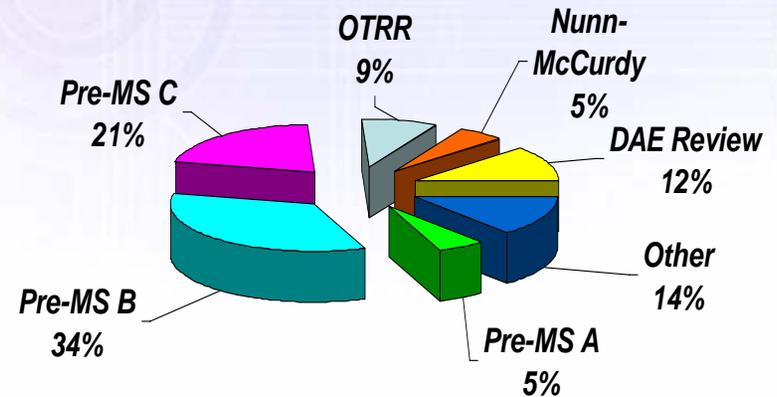
Pre-Milestone B PSR Areas	Doc Rev?		Site Visit Review?		Known Findings (By PMO)							Recs Made?		Unknown Findings (By PMO)					Recs Made?		Syst Issues		Assignment		
	Yes	No	Yes	No	Pos	Neut	Neg	Issue	Risk	Chg	Yes	Rej	Pos	Neg	Issue	Risk	Chg	Yes	Rej	Yes	No				
<b>Totals:</b>	18	35	53	0	20	28	16	11	23	2	36	4	1	15	20	35	1	37	4	55	0				
<b>Grouped Totals:</b>					75									36											
<b>1.0 Mission Capabilities Assessment Area</b>	2	3	5	0	8	2	2	8	6	0	7	0	0	1	4	5	0	4	0	11	0				
<b>Sub-Area 1.1 – Mission Requirements</b>	2	3	5	0	8	2	2	8	6	0	7	0	0	1	4	5	0	4	0	11	0				
<i>Factor 1.1.1 – Reasonableness</i>		x	x		4			1	1		1				1	1		1		2					
<i>Factor 1.1.2 – Stability</i>	x		x		1																				
<i>Factor 1.1.3 – Interfaces</i>		x	x		1			1	1		1									1					
<i>Factor 1.1.4 – Interoperability / Net-readiness</i>	x		x		1	2	2	2			2									2					
<i>Factor 1.1.5 – Testability</i>			x	x	1			4	4		3			1	3	4		3		6					
<b>2.0 Resources Assessment Area</b>	1	8	9	0	5	7	5	1	7	1	10	1	0	1	3	4	0	3	0	10	0				
<b>Sub-Area 2.1 – Program Allocation</b>	1	1	2	0	2	0	2	0	2	0	3	0	0	1	0	1	0	1	0	3	0				
<i>Factor 2.1.1 – Sufficiency</i>	x		x				2		2		3									2					
<i>Factor 2.1.2 – Continuity/Stability</i>		x	x		2								1		1			1		1					
<b>Sub-Area 2.2 – Personnel</b>	0	3	3	0	3	3	1	1	2	0	3	1	0	0	2	2	0	1	0	3	0				
<i>Factor 2.2.1 – Qualifications</i>		x	x		1	1		1	1		1	1								1					
<i>Factor 2.2.2 – Staffing</i>		x	x		1	1	1		1		1				2	2		1		2					
<i>Factor 2.2.3 – Training</i>		x	x		1	1					1														
<b>Sub-Area 2.3 – Facilities</b>	0	2	2	0	0	2	1	0	2	1	2	0	0	0	0	0	0	0	0	2	0				
<i>Factor 2.3.1 – Equipment</i>		x	x		2				1	1	1									1					
<i>Factor 2.3.2 – Infrastructure</i>		x	x				1		1		1									1					
<b>Sub-Area 2.4 – Engineering Tools</b>	0	2	2	0	0	2	1	0	1	0	2	0	0	0	1	1	0	1	0	2	0				
<i>Factor 2.4.1 – Systems Engineering Tools</i>		x	x		2						1														
<i>Factor 2.4.2 – Modeling &amp; Simulation Tools</i>		x	x				1		1		1				1	1		1		2					
<b>3.0 Management Assessment Area</b>	5	11	16	0	2	6	6	1	6	1	10	2	1	4	7	11	0	12	3	15	0				
<b>Sub-Area 3.1 – Acquisition Strategy/Process</b>	1	1	2	0	2	2	2	1	2	0	3	0	0	0	1	1	0	2	0	3	0				
<i>Factor 3.1.1 – Acceptability</i>		x	x		2	2			2		2									2					
<i>Factor 3.1.2 – Feasibility</i>	x		x		2			1			1			1	1			2		1					
<b>Sub-Area 3.2 – Planning</b>	0	3	3	0	0	0	1	0	1	0	1	0	0	1	0	1	0	1	0	2	0				
<i>Factor 3.2.1 – Schedule</i>		x	x				1		1		1									1					
<i>Factor 3.2.2 – Feasibility</i>		x	x																						
<i>Factor 3.2.3 – Suitability</i>		x	x											1		1		1		1					



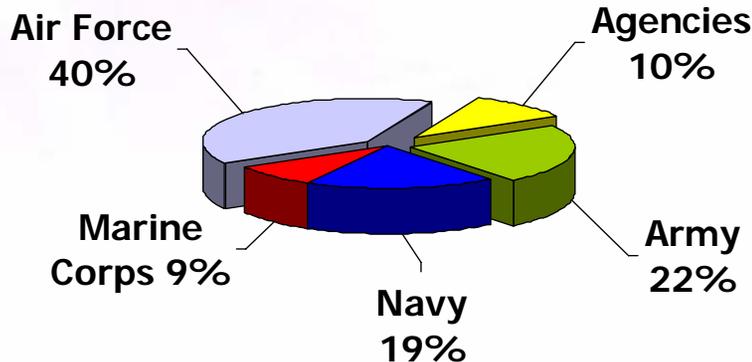
# Program Support Review Activity

- PSRs/NARs completed: 37
- AOTRs completed: 7
- Nunn-McCurdy Certifications: 3
- Support to Service-led reviews: 2
- Technical Reviews: 9

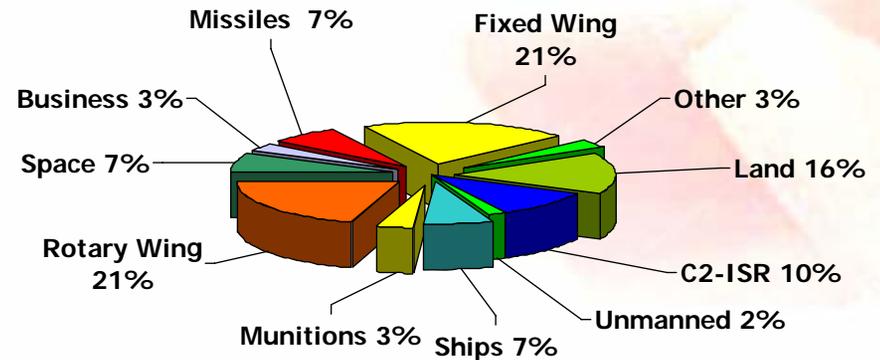
## Decision Support Reviews



## Service-Managed Acquisitions



## Programs by Domain Area





# “Quotable Quotes” from Program Reviews

- Management...
  - “Decisions that should take a week, took a year...”
  - “They were the Romulans, but now we are working with them...”
  - “Often an issue is gone before getting through the process...”
  - “Perfection is the enemy of good enough...”
  - “We tried to co-locate, but it was just too hard...”
  - “Nine women can’t have a baby in one month”
  - “CPI can be gamed...”
  - “EVMS is meaningless...”



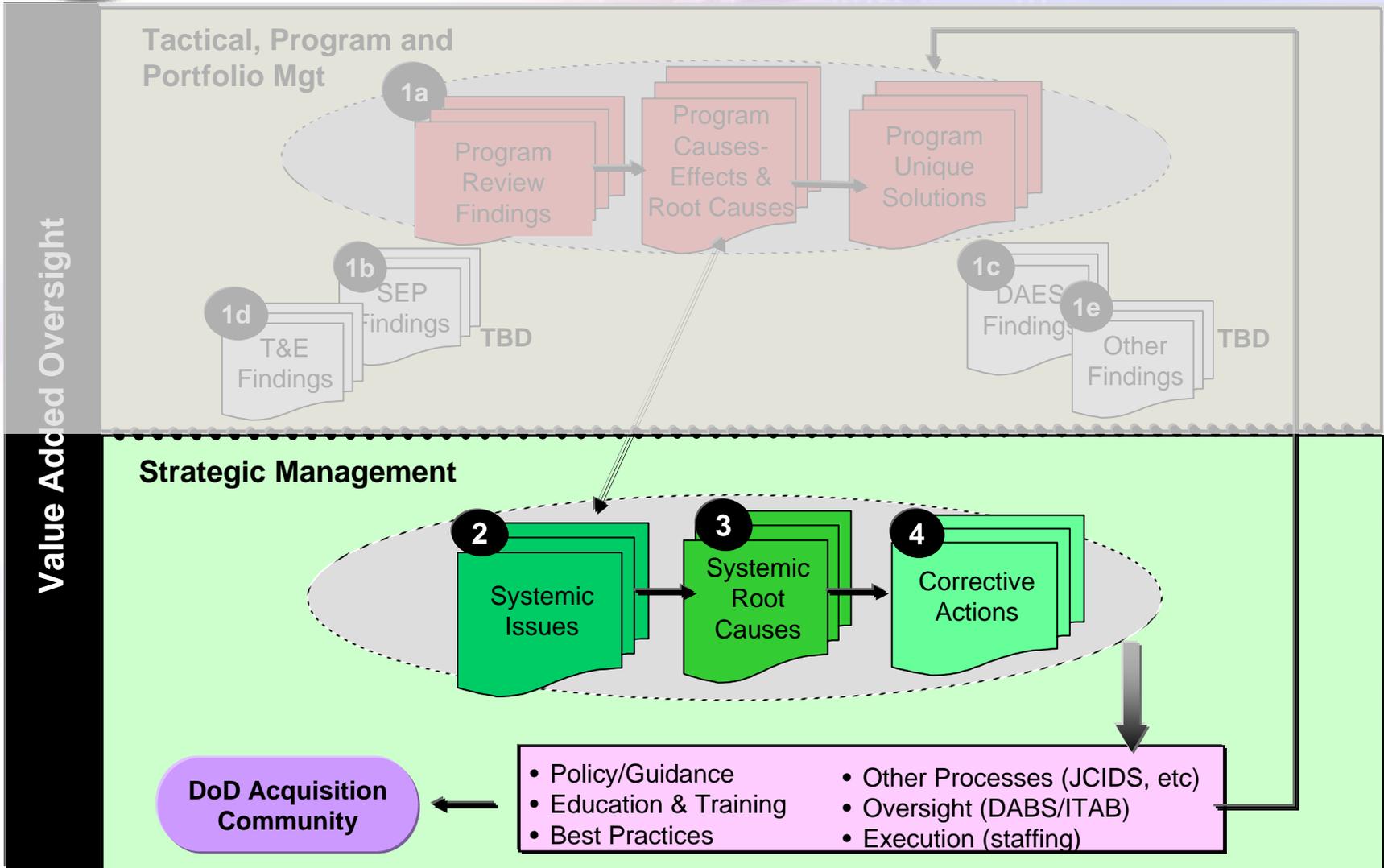
# “Quotable Quotes” from Program Reviews

- Process...
  - “Death by a thousand cuts...”
  - “It’s OK to be different...”
  - “We thought that would be good enough”
  - “I wouldn’t do it this way again...”
  - “...we allow that, but strongly discourage it...”
  - “...we’re not going to tell them about all of our test cases”
  - “That doesn’t mean what you think it means...”
    - » Indigo Montoya, The Princess Bride



# Systemic Analysis: Data Model

Steps 1A, 2-4 Underway



# Systemic Analysis Database



ATS DB - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Mail Print Word Pad Help

Address <https://atstdvp1/sadb/> Go Links

## SYSTEMIC ANALYSIS DATABASE



**Systemic Analysis Database**  
This portal is best viewed  
with IE 4.0 and above

[Click to Start](#)

<b>Browser Name:</b>	Microsoft Internet Explorer
<b>Browser Version:</b>	4.0 (compatible; MSIE 6.0; Windows NT 5.1; SV1; .NET CLR 1.1.4322; .NET CLR 2.0.50727; InfoPath.1)
<b>JavaScript Version:</b>	1.4
<b>Administrator:</b>	<a href="#">Laura Dwinnell (OSD)</a>
<b>Contacts:</b>	<a href="#">Frank F. Huang</a>
	<a href="#">Allan R. MacDonald</a>
	<a href="#">Tony D'Agosto</a>

Local intranet

# SADB Login Page



Systemic Analysis Database (SADB) Login Screen - Microsoft Internet Explorer

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Login

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# Systemic Analysis Database

Systemic Analysis Database (SADB) - Microsoft Internet Explorer provided by Northrop Grumman Corporation

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Back Forward Stop Home Search Favorites

Address <https://atstdvp1.pica.army.mil/sadb/MainMenu.jsp> Go Links

## SYSTEMIC ANALYSIS DATABASE



Welcome Laura Dwinnell

Charts	Findings
Misc	Programs
Reports	Admin

Close

**Sponsored By:**  
**ODUSD (A&T) SSE**  
**Assessments and Support**

Database Developed By:  
RDECOM - ARDEC PICATINNY, NJ  
Fire Control Systems & Technology  
Automated Test Systems Division



Done Internet

Start C:\O\Laura\A&S\Pr... PEO SYSCOM 06 ... Inbox - Microsoft ... Systemic Analy... 99% 1:36 PM



# SADB Structure and Functionality

- Relational, web-enabled, excel output and embedded charts\*
- Data structure architected for incremental expansion
  - Currently two relations: Programs and Findings
  - Currently populated with PSR information
- Required vs. Desired data fields
- Data integrity enforced through -
  - Database rules (Reference Tables) for all required data fields on all input and modification screens
  - Pull down menus limit data selection and prohibit key-in errors
- Data updates to any data element are logged by user, date and time
- Output generated as Excel files for easy use
- User Access Levels (What can a user do and see?)
  - 5 tier structure ensures data integrity and flexibility in web accessibility

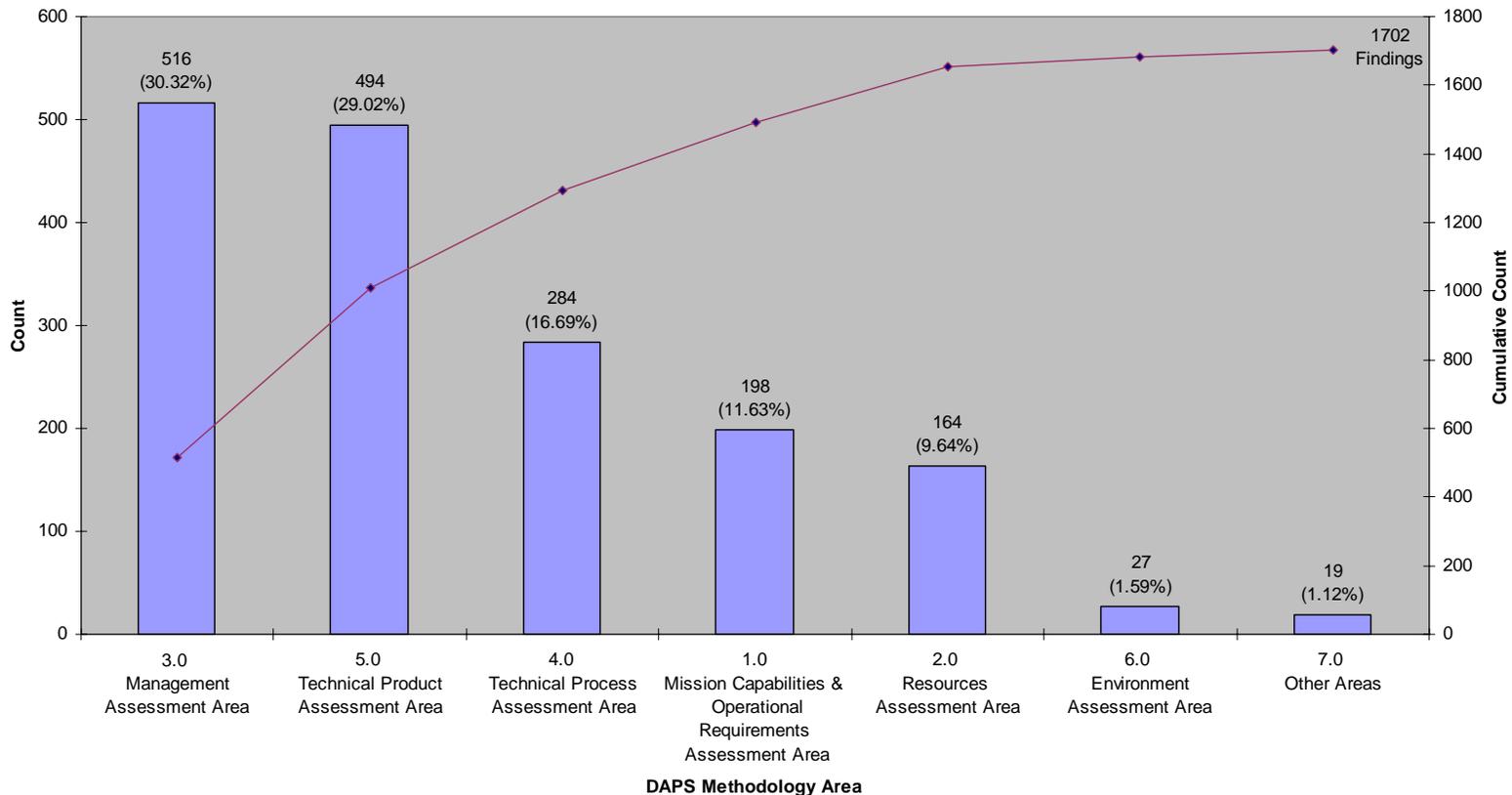
\* Note: Chart feature underway, limited capability at present



# Data Demographics

- Database contains 1701 findings from 29 programs to date
- Reviews conducted between 7/21/03 – 6/27/06

Count & Cumulative Count Of Findings Per DAPS Methodology Area

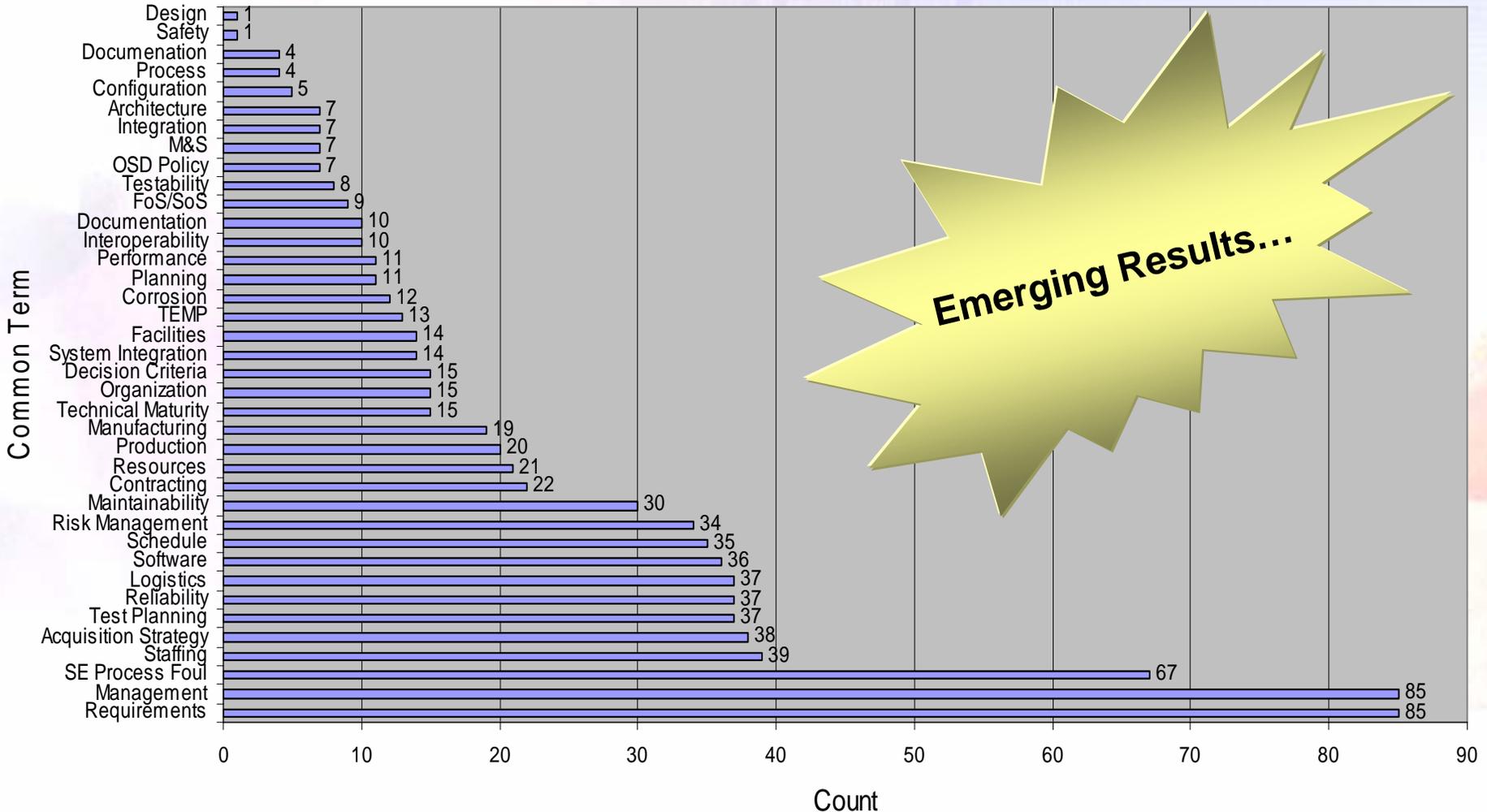




# Categorization of Findings

## Count Of Findings Per "Common Term"

For 842 (49.5%) Of 1701 Findings Specifying A Common Term





# Top 10 Emerging Systemic Issues (1-5)

1.	<b>Management</b>	<ul style="list-style-type: none"><li>• IPT Roles, responsibilities, authority, poor communication</li><li>• Inexperienced staff, ...</li><li>• Lack of adequate communication and information sharing (management and technical) between government and contractor</li></ul>
2.	<b>Requirements</b>	<ul style="list-style-type: none"><li>• Creep/stability</li><li>• Tangible, measurable, testable</li><li>• Lack of ORD thresholds in areas that are key to the program's goals</li></ul>
3.	<b>SE Process Foul</b>	<ul style="list-style-type: none"><li>• Lack of rigorous approach, technical expertise, process compliance</li><li>• SEP contains little mention of subcontractors and key suppliers</li><li>• No plan to perform System Functional Review or PDR during SDD (Planned technical reviews go from SRR to CDR)</li></ul>
4.	<b>Reliability</b>	<ul style="list-style-type: none"><li>• Ambitious growth curves, unrealistic requirements</li><li>• Inadequate "test time" for statistical calculations</li><li>• Demonstrated acceptable levels of reliability and manufacturing process control are not included in SPO and OIPT published criteria</li></ul>
5.	<b>Logistics</b>	<ul style="list-style-type: none"><li>• Sustainment costs not fully considered (short-sighted)</li><li>• Supportability considerations traded</li></ul>



# Top 10 Emerging Systemic Issues (6-10)

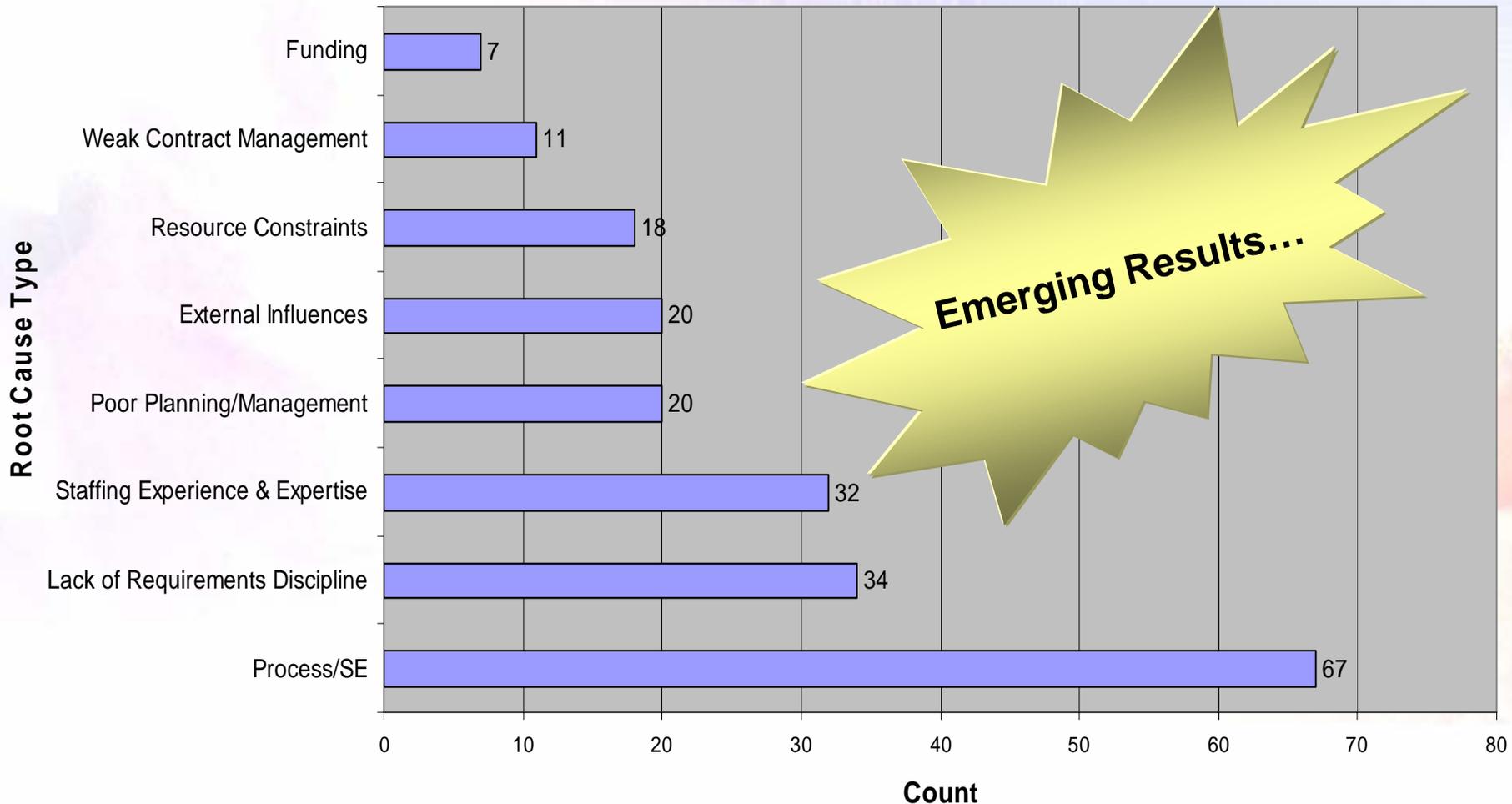
6.	<b>Schedule</b>	<ul style="list-style-type: none"><li>• Supportability considerations traded</li><li>• Realism, compression</li></ul>
7.	<b>Staffing</b>	<ul style="list-style-type: none"><li>• Inadequate Government program office staff to provide oversight and technical review</li><li>• Lack of development acquisition expertise on the project and the staff. No acquisition-certified Program Manager (PM)</li></ul>
8.	<b>Test Planning</b>	<ul style="list-style-type: none"><li>• Breadth, depth of resources</li><li>• Details (hrs, profile, exit criteria, confidence level, OC curve) not sufficiently described in TEMP; Resource details missing in TES</li></ul>
9.	<b>Acquisition Strategy</b>	<ul style="list-style-type: none"><li>• Competing budget priorities, schedule-driven events</li><li>• Contracting issues, poor technical assumptions</li><li>• Functional and physical configuration audits not required by contract (risk to product and operational baseline)</li></ul>
10.	<b>Software</b>	<ul style="list-style-type: none"><li>• Architecture, design/development discipline</li><li>• Staffing/skill levels, organizational competency (process)</li><li>• Lack of insight into contractor's plans for development, integration and validation</li></ul>



# Root Cause Categorization

## Count Of Findings Per Root Cause Type

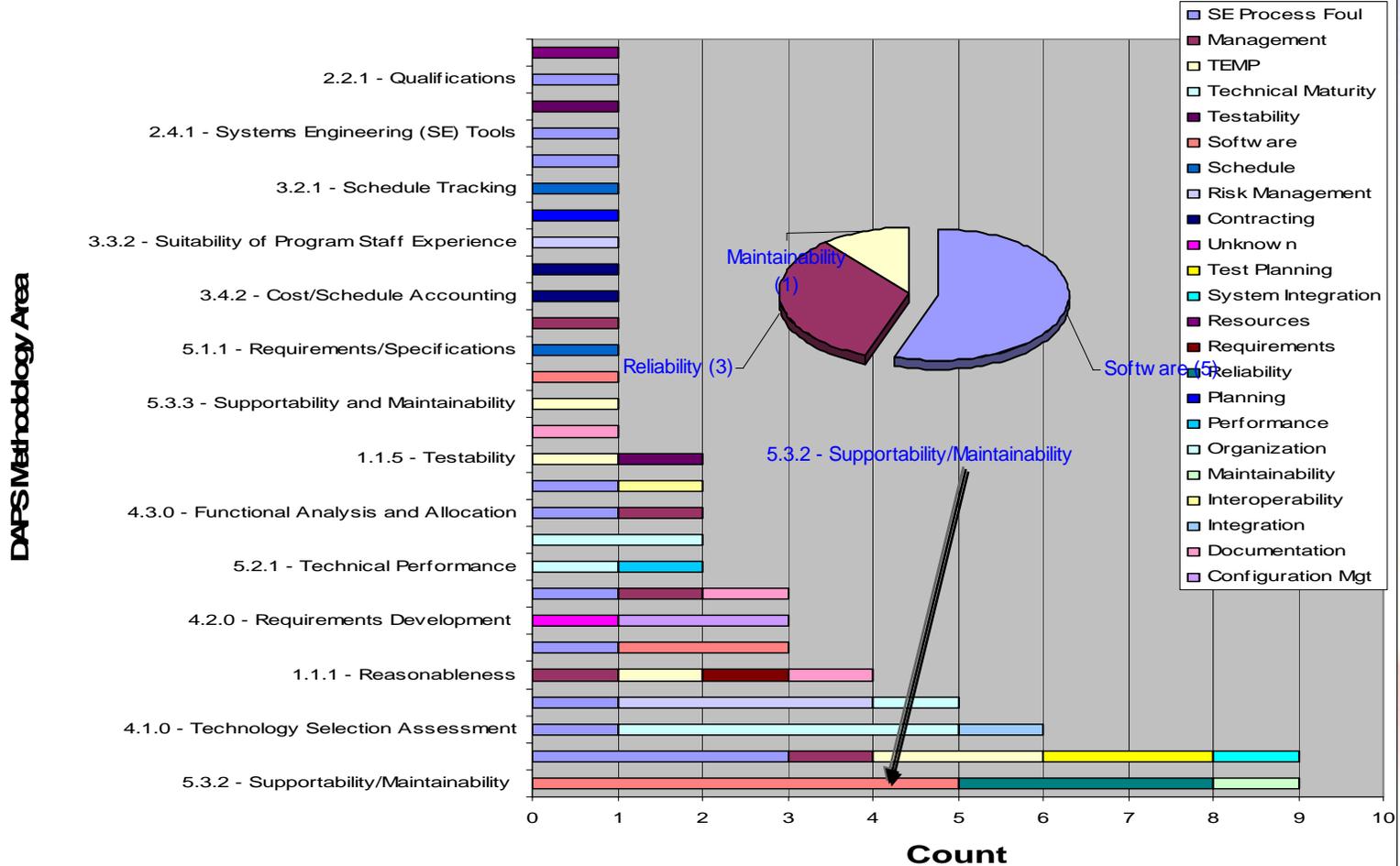
For 209 (12.3%) Of 1701 Findings Specifying A Root Cause Type



# Root Cause Linked to Assessment Terminology

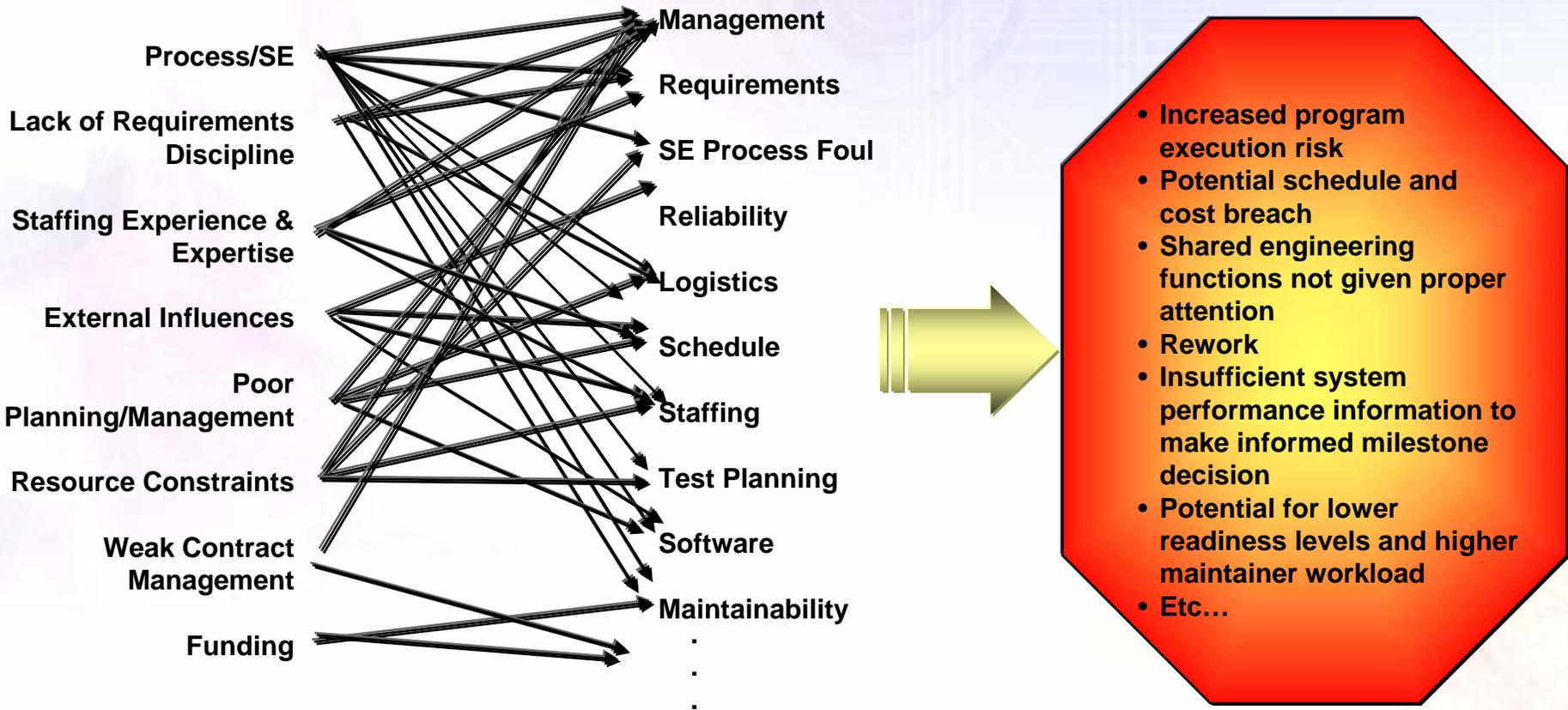


For Root Cause Type "Process/SE"  
Findings By DAPS Methodology Area





# Root Cause Effects



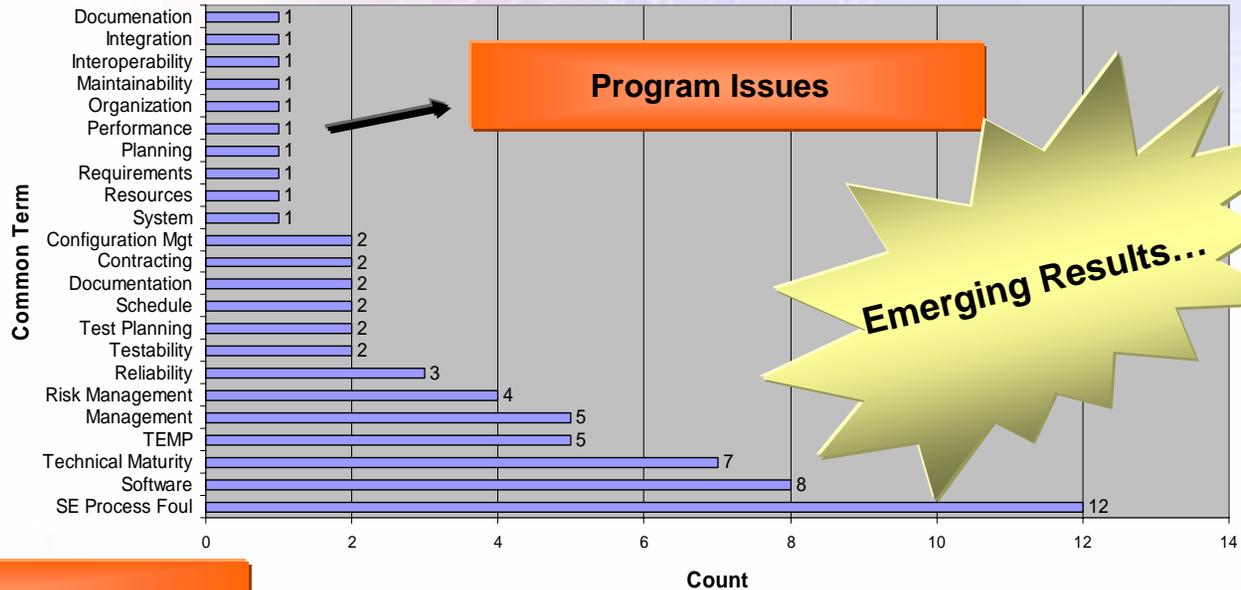
**Root causes impact programs in “shotgun” style**



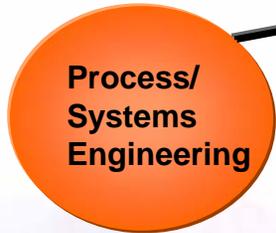
# Root Cause: Process/Systems Engineering

Count Of Findings Per Common Term

For The 66 (98.5%) of 67 Findings Specifying "Process/SE" As The Root Cause Type Where A Common Term Is Also Specified



Root Cause



Process/  
Systems  
Engineering

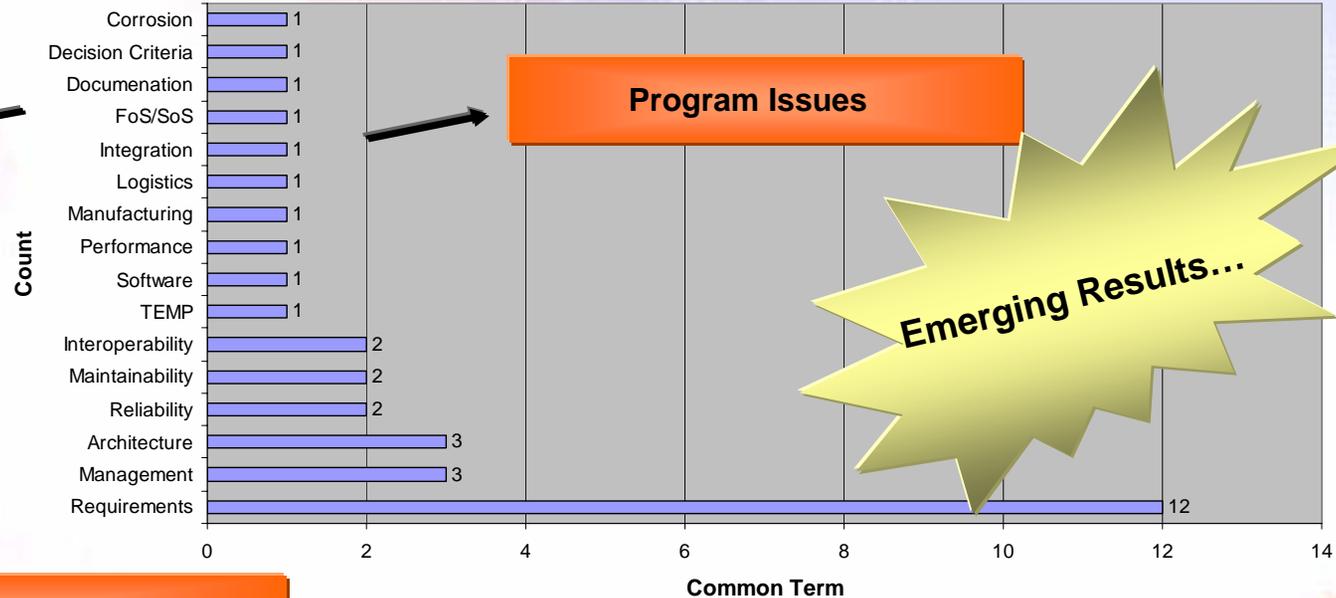
Representative Root Causes

- Lack of a rigorous SE approach
- Lack of emphasis on software architecture when defining software requirements
- Failure to identify and address risk of program dependencies tied to requirements
- Risk management not delegated down to IPTs and sub contractor levels
- Inadequate test environments, program documentation and configuration management



# Root Cause: Requirements Discipline

Count Of Findings By Common Term  
For The 34 (100%) Of 34 Findings Specifying "Lack Of Requirements Discipline" As The Root Cause Type Where A  
Common Term Is Also Specified



Root Cause

Lack of Req'mnts Discipline

Representative Root Causes

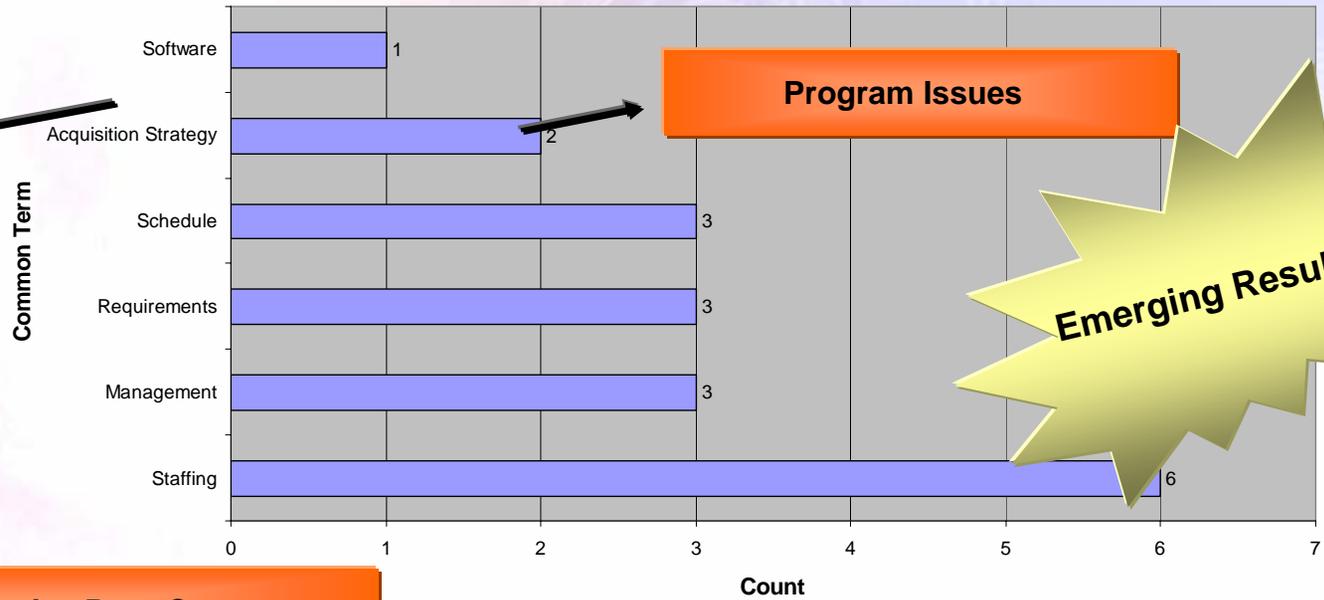
- Changing system interoperability dependencies and external interface requirements
- Evolving, maturing net-ready requirements
- NDI solution may be non-MOSA compliant
- Congressional requirements open to interpretation
- Contract awards are budget vs. effort driven



# Root Cause: Staffing Experience/Expertise

Count Of Findings By Common Term

For The 18 (56.3%) of 32 Findings Specifying "Staffing Experience & Expertise" As The Root Cause Type Where A Common Term Is Also Specified



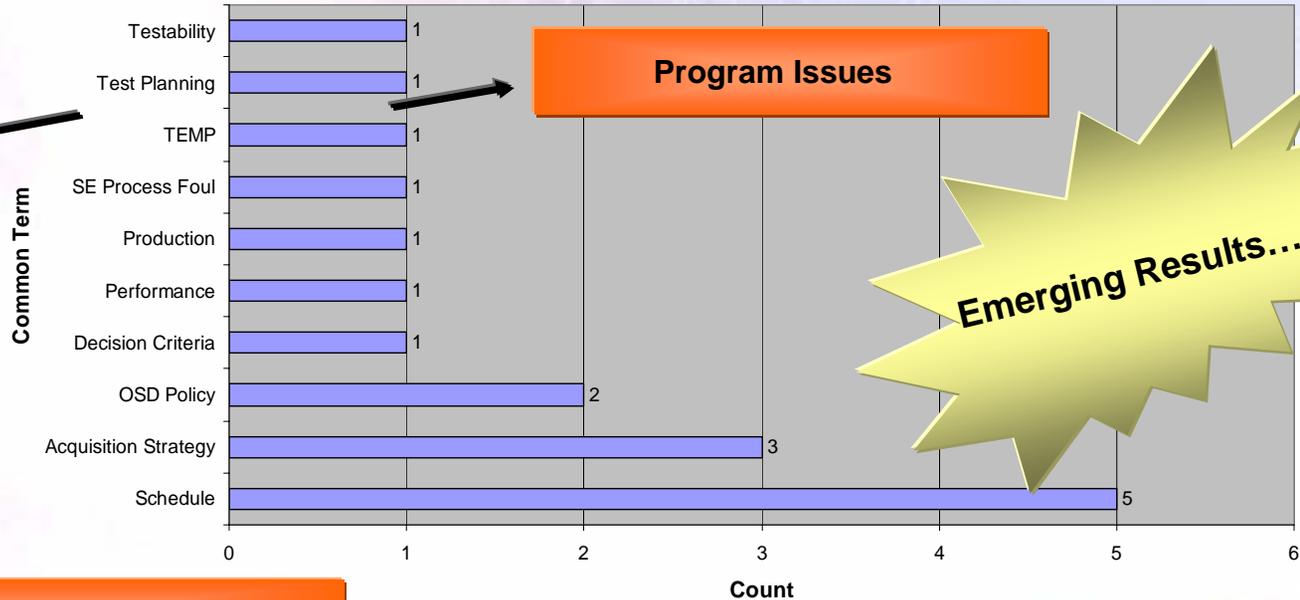
Representative Root Causes

- PEO living within constrained personnel allocation system
- Failure to recognize value of cross-functional IPTs and gov't matrix support
- PM's over-reliance on Industry to define technical solutions, often proprietary/NDI
- Lack of appreciation for, and value added of technical reviews
- Limited staff experience in CONOPS and TTPs; operational ramifications to meet KPPs not fully assessed



# Root Cause: External Influences

Count Of Findings By Common Term  
For The 17 (85%) of 20 Findings Specifying "External Influences" As The Root Cause Type  
Where A Common Term Is Also Specified



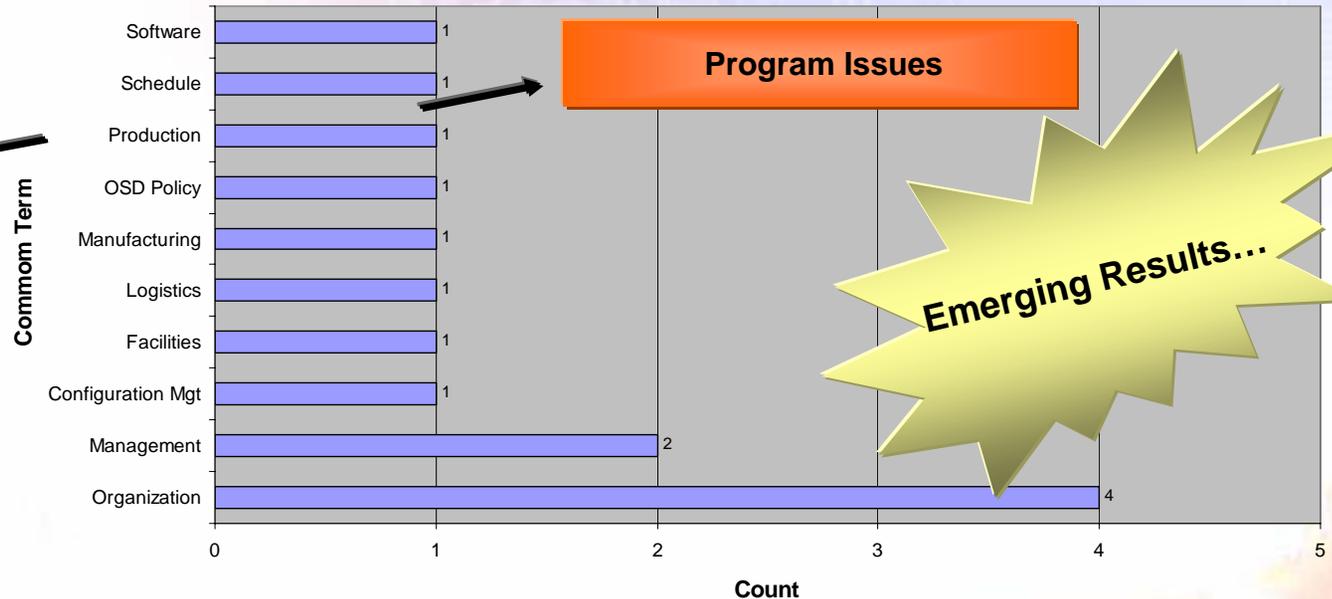
- End date dictated by customer need, driving unrealistic schedules
- Commercial use of “band systems” takes priority over military use due to profitability
- Urgency to replace aging equipment by procuring short-term NDI solution at expense of long-term requirements



# Root Cause: Poor Planning/Management

Count Of Findings By Common Term

For The 14 (70%) of 20 Findings Specifying "Poor Planning/Management" As The Root Cause Type Where A Common Term Is Also Specified



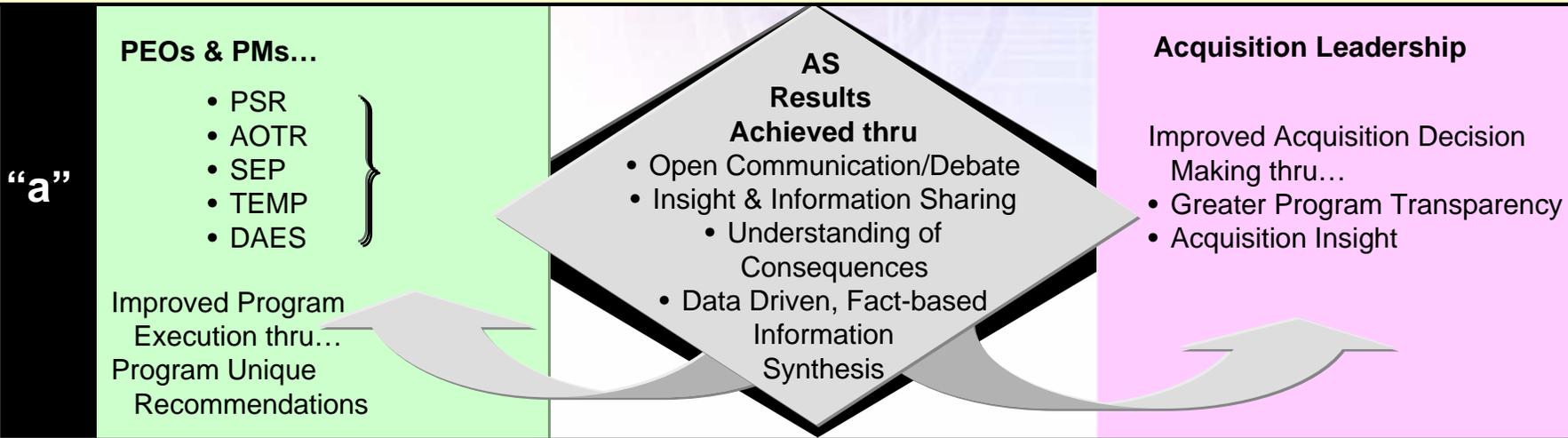
Representative Root Causes

- Absence of critical path analysis
- Erroneous assumption that prime would do pre-award integration
- IPT Charters are low priority due to staffing and time constraints
- Lack of trust, collaboration and communication: unwillingness to share information
- Contractor proprietary info

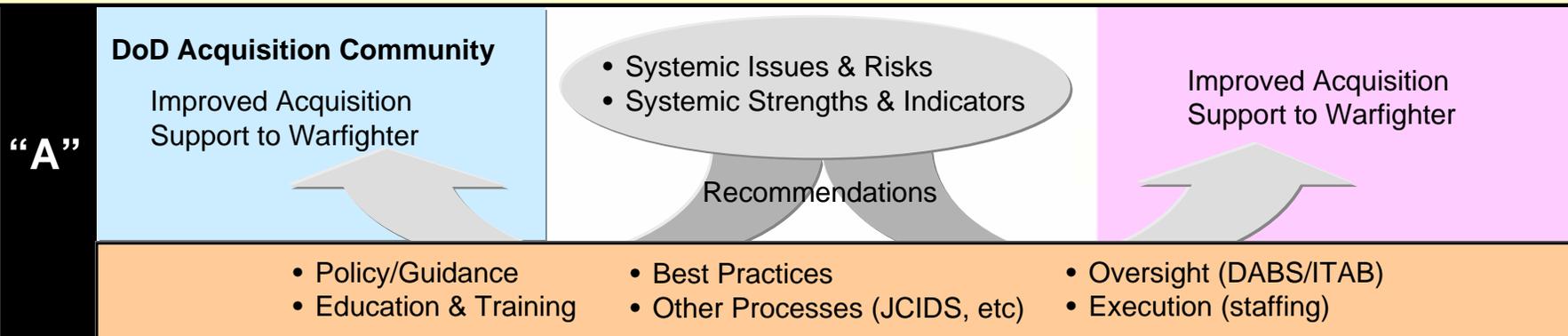
# Providing Value Added Oversight & Support



## • Tactical, Program and Portfolio Management

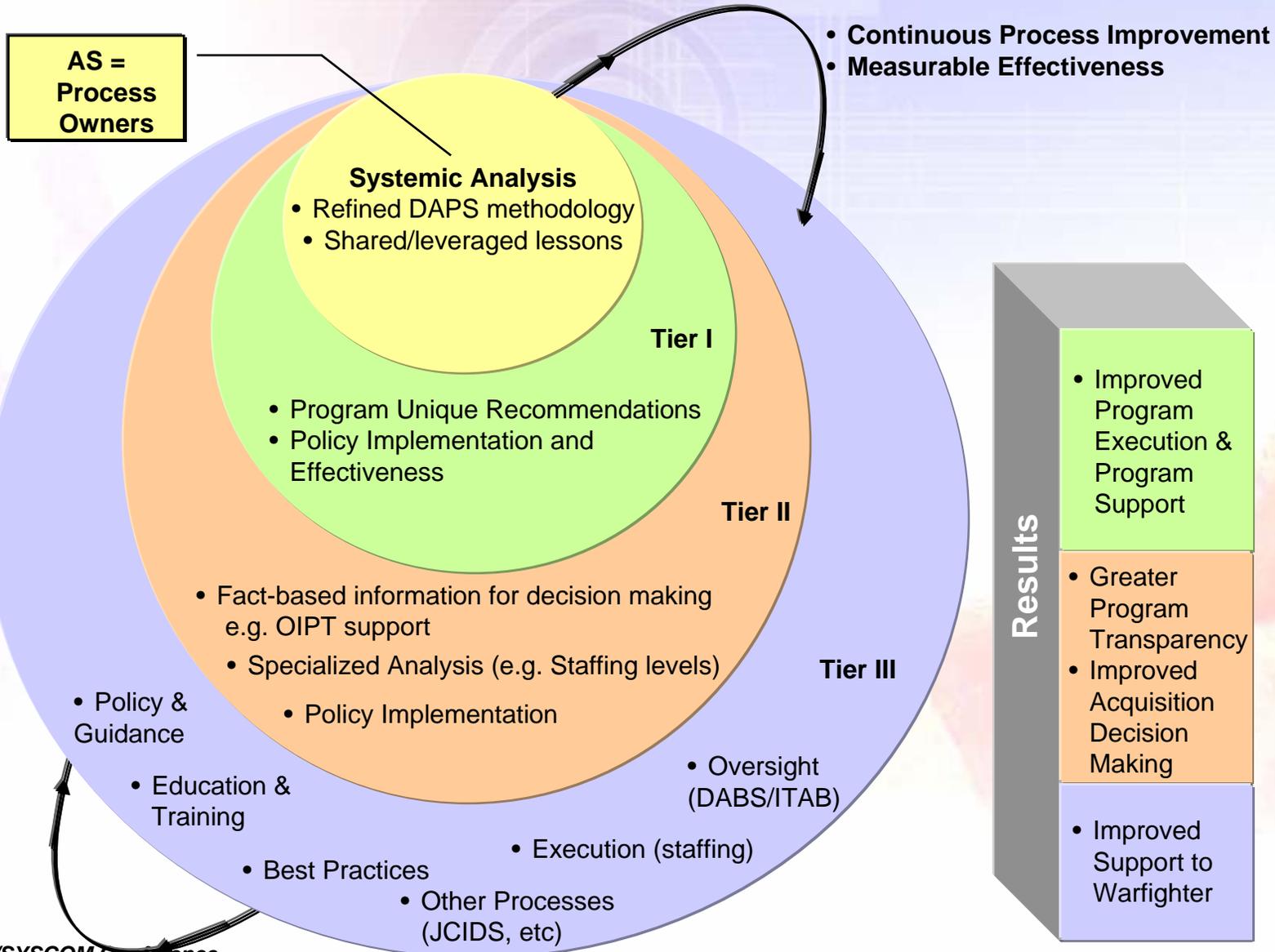


## • Strategic Management





# Systemic Analysis – Customer Model





# Emerging Customer Products...

## Assessments & Support

### Internal

- Independent study results: "Views on PSRs"

- 24% - Very positive
- 41% - Positive
- Knowledgeable professional team
- Timing relative to other program events a concern
- Duplicative roles
- Perceived as "got"

Continuous Improvement  
&  
Measurable Effectiveness

- Improved DAPS Methodology
- Earlier support to programs
- Metrics and performance tracking
- Lean/Six Sigma application
- Customer feedback
  - PM Survey
  - % Recommendations Accepted

### External

**Tier III:**  
Acq  
Communi-  
ty

- Risk Management Guide
- CLM on Tech Reviews
- Contracting for SE Guid
- Mandatory M...n...sions

...flow down to  
...ACAT IC and below  
...r Force...st to pilot

**Tier I:**  
SSE,  
PMs &  
PEOs

- Actionable and useful program execution recommendations for PMs
- Working with SE WIPTS to develop better SEP Guidance and Templates
- Facilitate SEP approval

**Work In Progress**

# Questions/Discussion



## Contact Information:

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