

Tri-Service Assessment Initiative Phase 2 Systemic Analysis Results



***Conference on the Acquisition of Software Intensive Systems
January 28, 2003***

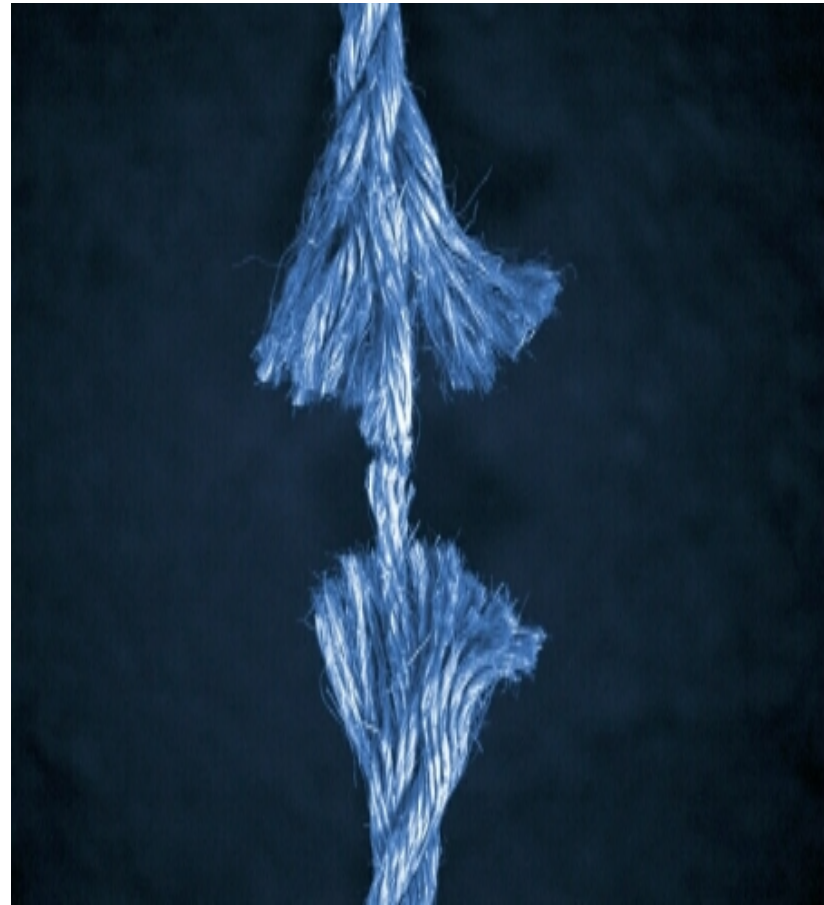
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Presentation Objectives

- ***Convey what we have learned through a systemic “Cross Program” analysis of multiple DoD software intensive programs***
- ***Describe and quantify the recurring issues that impact DoD software intensive program performance***
- ***Characterize the identified DoD program performance issues in terms of cause and effect***
- ***Initiate discussion on potential corrective action strategies***

Phase 2 Overarching Conclusion

The analysis predicts an increasing gap between what is expected and what is capable of being achieved



Summary Findings

- ***Software intensive system development issues are still pervasive across DoD programs***
- ***New emerging issues reflect complex, risk-prone acquisition trends. These include:***
 - ***interoperability / family of systems***
 - ***co-dependent systems development***
 - ***“mission resilient”, evolutionary system development***
 - ***direct funding - Congressional plus-ups***
 - ***expanded contractor acquisition and program management responsibilities***
 - ***acquisition policy easements***

What You Need to Know

- ***The causes of program performance shortfalls are extremely complex - improvement strategies and associated action plans must address this complexity***
- ***As an Enterprise we need to start by re-addressing the performance issues we thought we were already fixing***
- ***The longer we wait - the higher the risk***

Tri Service Assessment Initiative



- **Independent Expert Program Reviews**
- **Single Program Focus**
- **Objective - Improve Program Performance**
- **Program Team Insight**

- **Cross-Program Analysis**
- **Enterprise Focus**
- **Objective - Identify and Characterize Recurring Performance Issues**
- **General and Directed Analyses**
- **Enterprise Manager Insight**

Both Activities are Based on an Integrated Assessment Architecture

Systemic Analysis Phases

Phase 1 - Complete July 2001

- *Top down analysis approach*
- *Initial models - proof of concepts*
- *Assessment architecture integration*
- *Initial data set - 10 assessments*

Phase 2 - Complete December 2002

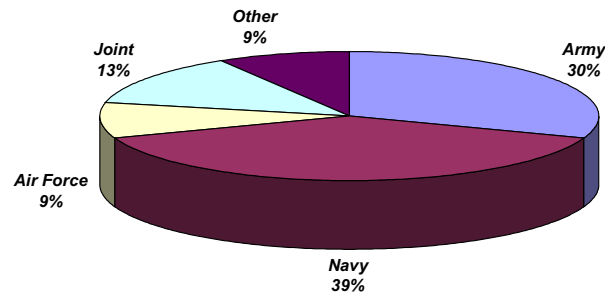
- *Bottom up analysis approach*
- *Based on quantification of recurring issues and sequences*
- *Information driven analysis objectives*
- *Systemic database*
- *Extended data set - 23 assessments*

Phase 3 - Began January 2003

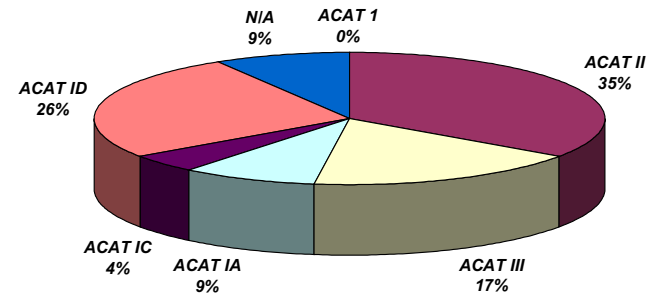
- *Predictive issue pattern analysis*
- *Quantification of projected issue impacts*
- *Architecture and analysis process improvements*
- *Comprehensive transition program*

Tri-Service Assessment Initiative Systemic Analysis™

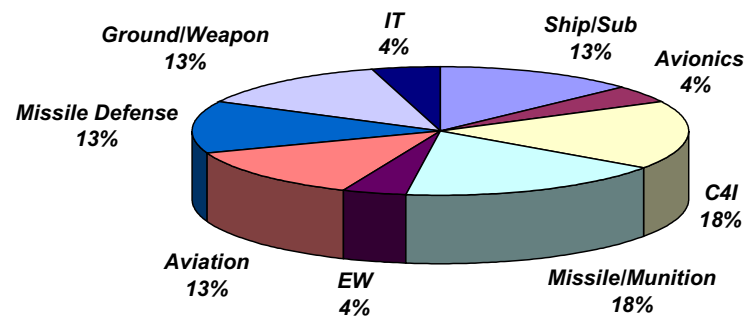
Assessment Distribution



Distribution of Assessments by Service



Distribution of Assessments by ACAT Level



Distribution of Assessments by Domain

Systemic Analysis Process

Program Assessment Results

**Analyze
Assessment Findings**

- *Systemic Peer Review*
- *Assessment Characterization*
- *Issue Identification*
- *Risk Typology Allocations*
- *Initial Cause and Effect Model*

**Basic
Analysis**

- *Issue Frequency of Occurrence Analysis - Data Normalization*
- *Enterprise - Program Issue Responsibility Allocations*
- *Definition of Information Needs*
- *Issue Concurrency Analysis*
- *Issue Sequence Identification and Analysis - Interaction*
- *Issue Characterization - Triggers / Symptoms*

**Directed
Analysis**

- *Executive Data Call*
- *Basic Analysis Review*
- *Definition - Prioritization of Information Needs*
- *Individual Case Analysis*

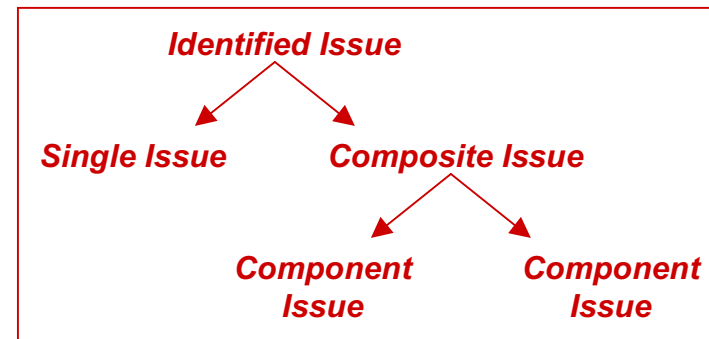
**Integrated
Analysis**

- *Issue Correlation*
- *Risk Analysis*
- *External Correlations*
- *Systemic Analysis Model*
- *Executive Level Conclusions / Summary*

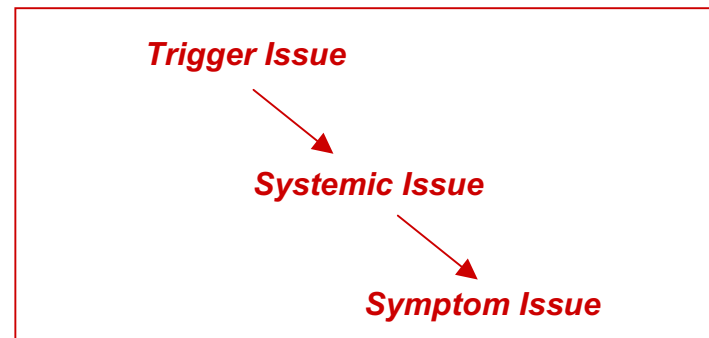
Action Plan

What Was Counted

- **Identified Issues**
 - *single issues*
 - *composite issues*
 - *component issues*
- **Systemic Sequences**
- **Systemic Patterns**
- **Triggers and Symptoms**



Issue Structure



Systemic Issue Pattern

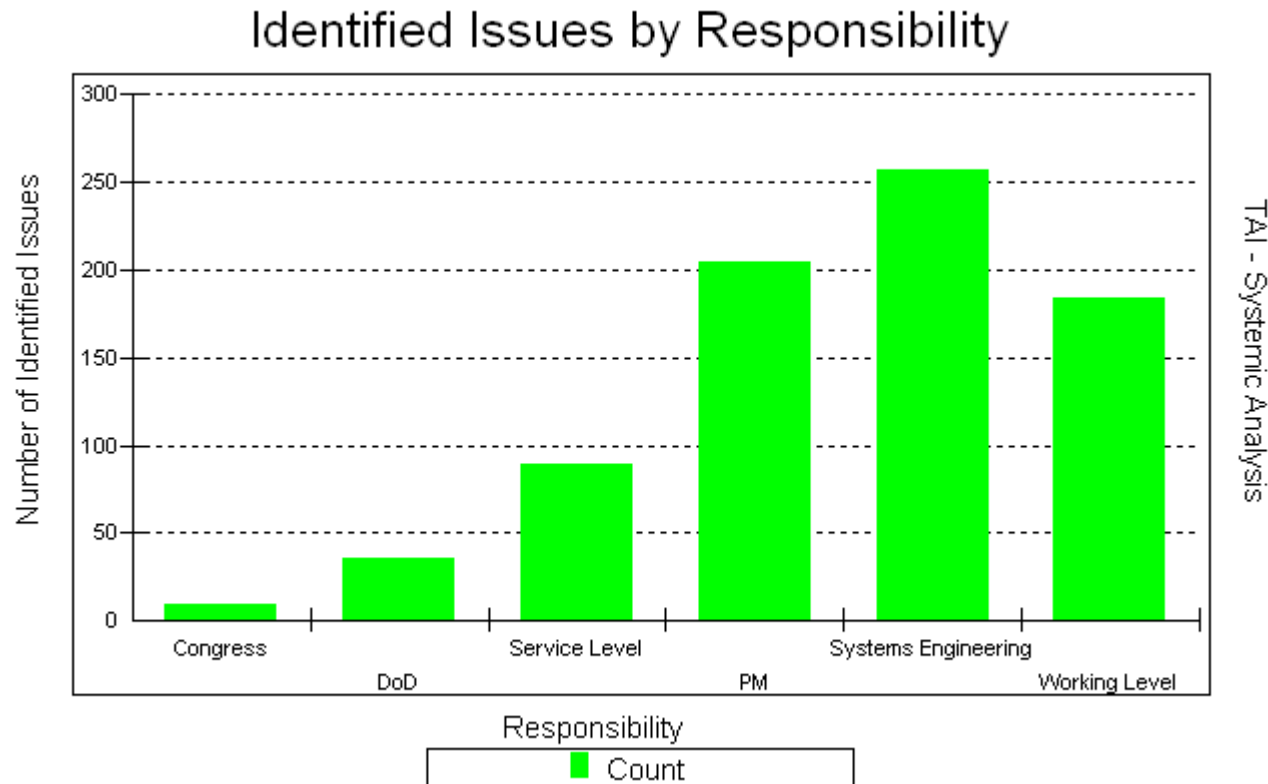
Basic Analysis

Critical program performance problems

<i>Identified Issues</i>	<i>Relative Occurrence</i>
<i>Process Capability</i>	91 %
<i>Organizational Management</i>	87 %
<i>Requirements Management</i>	87 %
<i>Product Testing</i>	83 %
<i>Program Planning</i>	74 %
<i>Product Quality - Rework</i>	70 %
<i>System Engineering</i>	61 %
<i>Process Compliance</i>	52 %
<i>Program Schedule</i>	48 %
<i>Interoperability</i>	43 %
<i>Decision Making</i>	43 %
...	
<i>Configuration Management</i>	26%

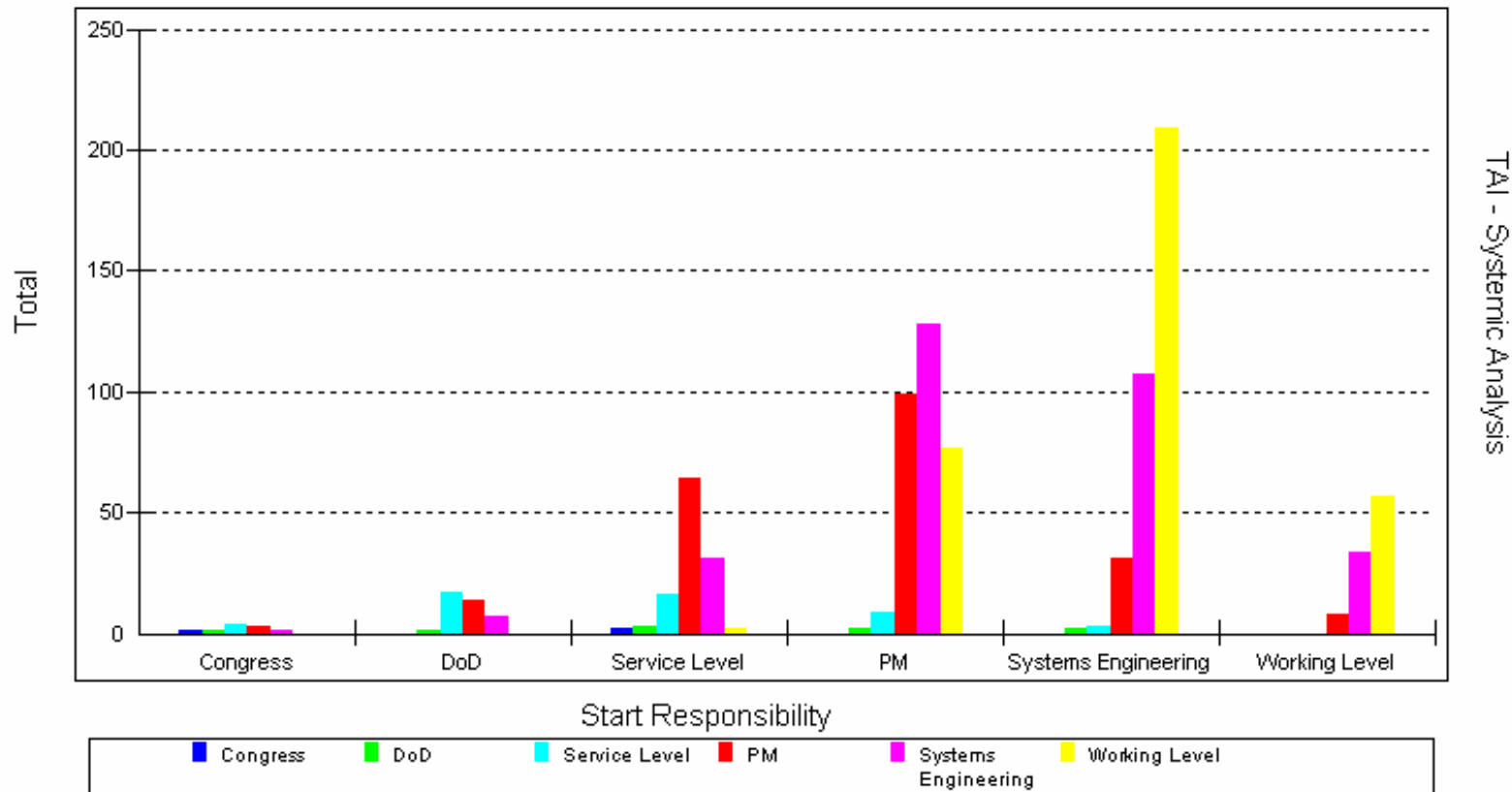
Basic Analysis

Complex issues with multiple interactions across all levels of DoD management



Issue Migration

Sequence Starts - Start Responsibility by Next Responsibility



Basic Analysis

The primary causative performance issues are:

- ***Process capability shortfalls: the inability of the program team to design, integrate, and implement processes that adequately support the needs of the program***
- ***Requirements development and management shortfalls***
- ***Organizational management and communication limitations***
- ***Stakeholder agendas and related program changes***
- ***Product architecture deficiencies***

Cause and Effect Impacts

- **Process Capability** problems result in:
 - **Inadequate Testing**
 - **Poor Change Management**
 - **Poor Product Quality**
 - **Progress Shortfalls**
- **Requirements Management** problems result in:
 - **Poor Product Quality**
 - **Product Rework**
 - **Progress Shortfalls**
- **Organizational and Program Management** problems result in:
 - **Inadequate Program Planning**
 - **Responsibility Conflicts**
 - **Poor Communications**
 - **Product Rework**
 - **Progress Shortfalls**

Basic Analysis

Under pressure, Program Managers make trade-off decisions that impact, in order:

- ***Development progress***
- ***Product technical performance***
- ***Product quality and rework***
- ***System usability***
- ***Cost***

Basic Analysis Summary

- ***The current DoD program issue profile shows little positive impact from past corrective actions, initiatives, and policy***
- ***The Program Manager and the Development Team must address the majority of the program issues, even if they are caused by enterprise level decisions or behaviors***
- ***Causative issues multiply downstream***
- ***The Program Team creates many of their own performance problems***
- ***There are no “single issue” program performance drivers***

Directed Analysis

- ***Software Engineering Process***
- ***Systems Engineering***
- ***Software Testing***
- ***Program Organization and Communication***

Software Engineering Process

Analysis Results

- ***91% of the assessments had process compliance issues (75% triggers)***
- ***52% of the assessments had process capability issues (63% triggers)***
- ***Predominant deficiencies: requirements, risk | measurement, testing, systems engineering, change management***

Implications

- ***The performance problem extends beyond developer software process compliance***
- ***False assumption that organizational process compliance equates to required program process capability***
- ***Compliant organizations still have significant performance shortfalls***
- ***Key process concerns:***
 - a. focus is too narrow in scope***
 - b. impacts of program constraints***
 - c. large program team process incompatibilities***
 - d. program teams just not good enough***

Systems Engineering

Analysis Results

- ***61% of the assessments had systems engineering issues (23% triggers)***
- ***11 of the 16 programs that have requirements issues have SE issues***
- ***43% of the assessments have interoperability issues (50% triggers)***
- ***Predominant deficiencies: Non-existent SE, lack of SE expertise, poor SE implementation, dispersion of SE responsibility and authority, existing SE inadequate for program requirements***

Implications

- ***Cost overruns, schedule slips and rework will continue to plague programs***
- ***The most technically complex systems have the most systems engineering issues***
- ***Interoperability of systems is in doubt***
- ***Rapid exploitation of new/innovative technology is difficult***

Systems Engineering Findings

- ***DoD programs have significant shortfalls with respect to systems engineering yet this is where most of the identified program issues exist***
- ***“Systems engineering by committee” is both common and ineffective***
- ***Programs continuously face unfunded and unplanned mandates related to family of systems management and interoperability***
- ***Trade off decisions are often extremely constrained***

Systems engineering must take a primary and renewed role in today's DoD programs

Software Testing

Analysis Results

- **83% of the assessments had testing related issues (53% triggers)**
- **Predominant deficiencies: lack of test time, facilities, testing cutbacks, poor test procedures**
- **73% of the programs with schedule problems had testing issues**
- **80% of the programs with requirements problems had testing issues**

Implications

- **Overarching testing risk - late discovery of defects (94%)**
- **Most testing issues result in quality shortfalls and rework**
- **Testing of complex systems is an emerging concern**
- **Primary causes of testing shortfalls:**
 - a. requirements (71%)**
 - b. test facilities (71%)**
 - c. test process capability (65%)**
 - d. schedule constraints (41%)**

Program Organization and Communication

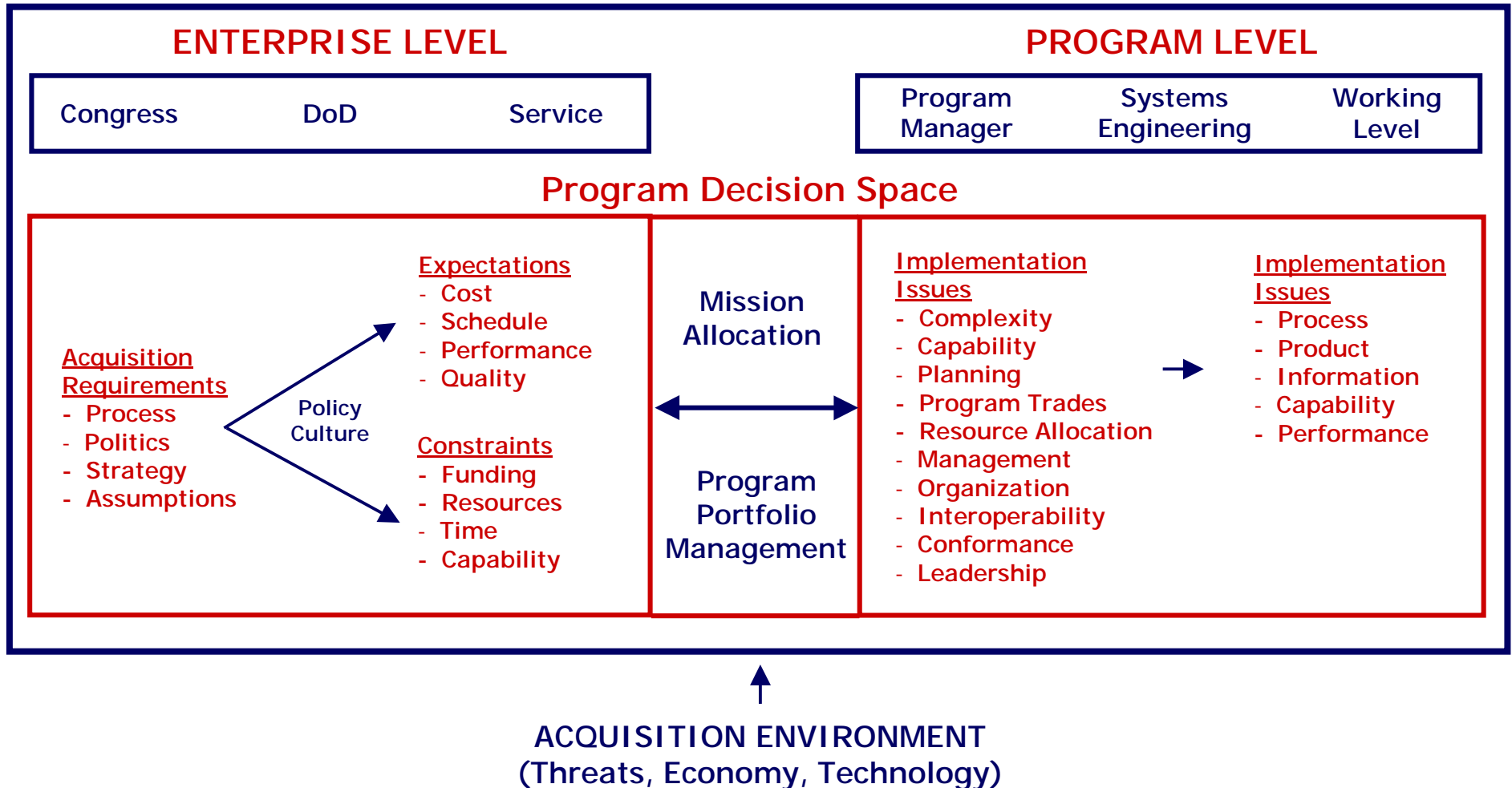
Analysis Results

- ***87% of the assessments had communications issues (65% triggers)***
- ***Every program with IPT related issues had communications issues***
- ***Predominant deficiencies: unclear roles and responsibilities, delayed decision making, conflicting decisions, proprietary information (all exacerbated by widely dispersed organizational teams and complex organizational structures not suited for traditional management approaches)***

Implications

- ***IPTs appear to create more management issues than they resolve***
- ***Poor implementation of IPTs: proliferation, structure, membership, authority and decision responsibility issues***

Systemic Analysis Model



New Solution Strategy Required?

- ***Past DoD acquisition solutions (strategies, policies, and initiatives) have had only limited success in reversing poor performance trends:***
 - ***Single point solutions***
 - ***Poorly evaluated***
 - ***Focused on symptoms not causes***
 - ***Lacking in implementation guidance***
 - ***Conflicting***
 - ***Volatile***
 - ***Lack insight into solution effectiveness***
 - ***Long lasting impacts and residuals***

Key Considerations

- ***Need to establish performance parameters that can be implemented with success across the life of the program***
 - ***Feasible plan***
 - ***Understood constraints***
 - ***Change tolerance***
- ***Need to improve the capabilities of the development teams***
 - ***Real systems engineering***
 - ***Funded management and technical approaches critical to interoperability***
 - ***Foundational processes***

Key Considerations

- ***Need to ensure that all program stakeholders agree on an integrated strategy for attacking the high priority overarching program issues***
 - ***Congress and enterprise***
 - ***Program team***
 - ***Education and technology infrastructures***
- ***Need to augment recent acquisition policy changes with***
 - ***A clear understanding of the complex interactions and constraints that programs are faced with***
 - ***Adequate implementation guidance***
 - ***Directed education***

Assessment & Analysis Essentials

- ***Focus on performance improvement***
- ***Enterprise performance is a composite of project performance***
- ***Use a common architecture for project and systemic evaluation***
- ***Address a wide scope of issues and issue sources***
- ***Risk management and measurement processes are critical***
- ***Flexibility is important – typology not taxonomy***
- ***Relate subjective and quantitative information***
- ***Information needs drive the analysis process***
- ***Frequency of occurrence counts are just the first step***
- ***Data integrity – data integrity – data integrity***
- ***Consistent terminology***

Tri-Service Assessment Initiative Systemic Analysis™

Tri-Service Assessment Initiative™

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