Systemic Analysis of Software Intensive System Issues

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John McGarry
U.S. Army RDECOM-ARDEC

Overarching Questions …

- How are software related problems impacting overall DoD program performance?
- Why do we always seem to be trying to solve the same problems again and again?
- How do we really improve? Do we know where to start?
- Are we focusing on the symptoms or the causes of our performance issues?

Tri-Service Assessment Initiative

- TAI Initiated by OSD in 1998 to address repeated performance shortfalls attributed to software
  - Integrate independent program assessments into standard acquisition practice to help improve program performance
- In May 2000, the Defense Science Board recommended independent assessments for all ACAT I-III programs
- Independent Expert Program Review (IEPR) Policy
  - Initially included in DoD 5000.2
  - Now addressed in FY03 Defense Authorization Act, Section 804 Improvement of Software Acquisition Processes - acquisition evaluation and improvement requirements

Tri-Service Assessment Initiative™

- Independent Expert Program Reviews (IEPR)
- Single Program Focus
- Objective - Improve Program Performance

- Cross-Program Analysis
- Enterprise Focus
- Objective - Identify and Characterize Recurring Performance Factors

TAI Activities are based on an Integrated Assessment Architecture

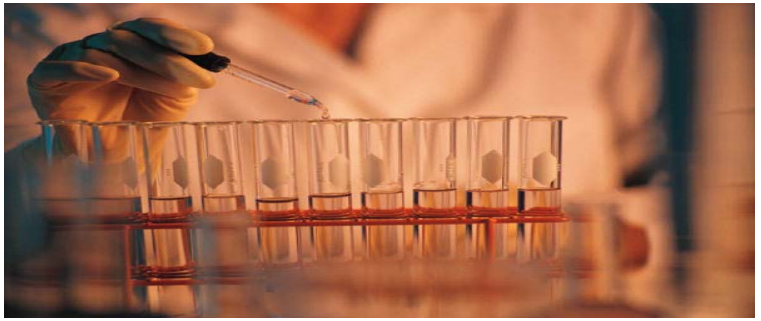
Systemic Analysis

- Identifies recurring program performance issues, risks, and problems
- Quantifies the extent to which these issues are observed
- Determines the cause and effect relationships between identified program performance issues
- Allocates issue responsibility within the DoD acquisition management structure
- Program scope - software focus

TAI SA Process

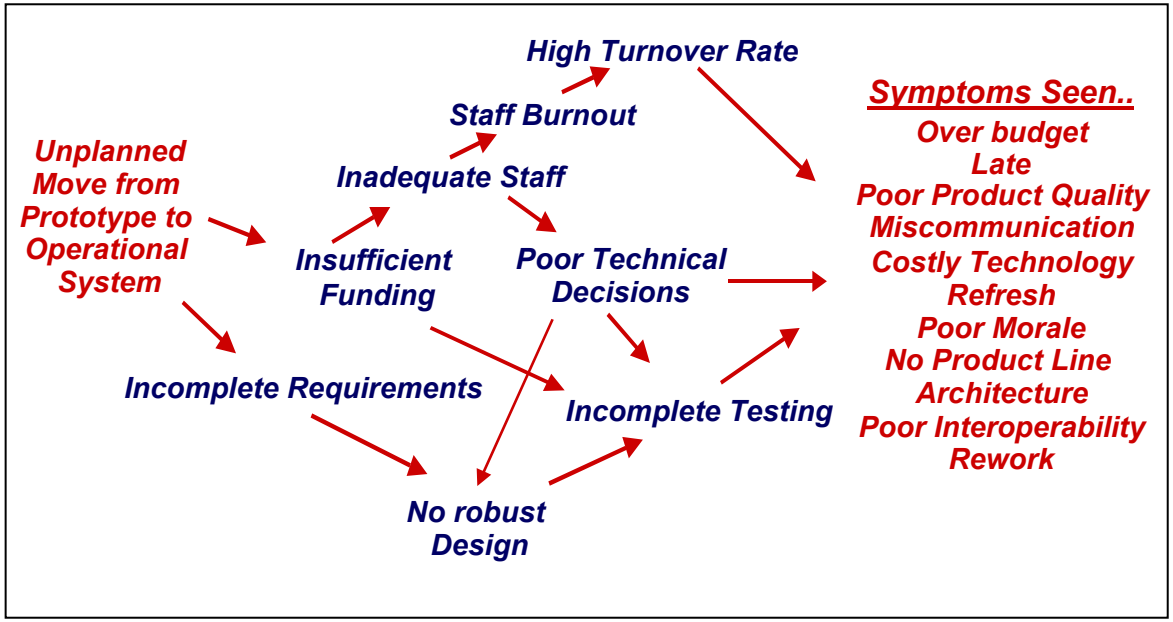
Assessment Products:
Reports, Briefings, CE diagrams

Systemic Analysis

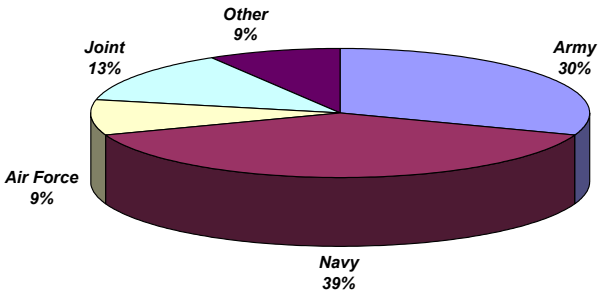


Systemic Analysis "Products"

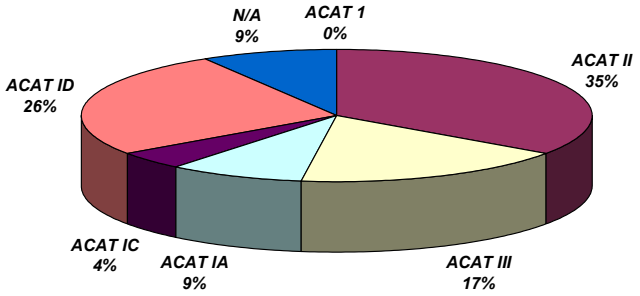
- Triggers/Symptoms
- Systemic Issues
- Responsibilities
- Frequencies
- Patterns



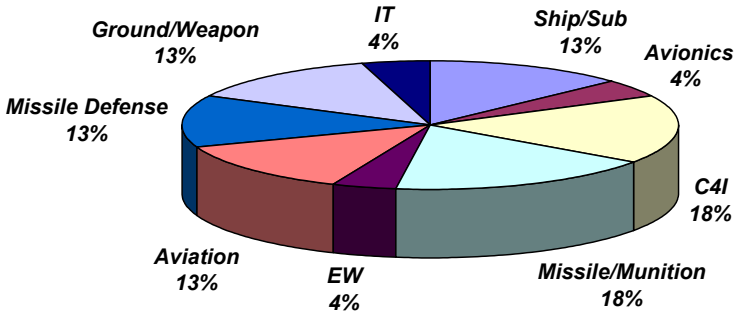
Assessment Distribution



Distribution of Assessments by Service



Distribution of Assessments by ACAT Level



Distribution of Assessments by Domain

Systemic Analysis Executive Summary

- Recurring issues exist across software intensive programs regardless of program characteristics
- They are more prevalent than expected
- Traditional acquisition and development problems have yet to be adequately addressed
- Causative issues produce different performance symptoms in different programs
- Solutions and corrective approaches have been predominantly “stovepiped”

Systemic Analysis Executive Summary

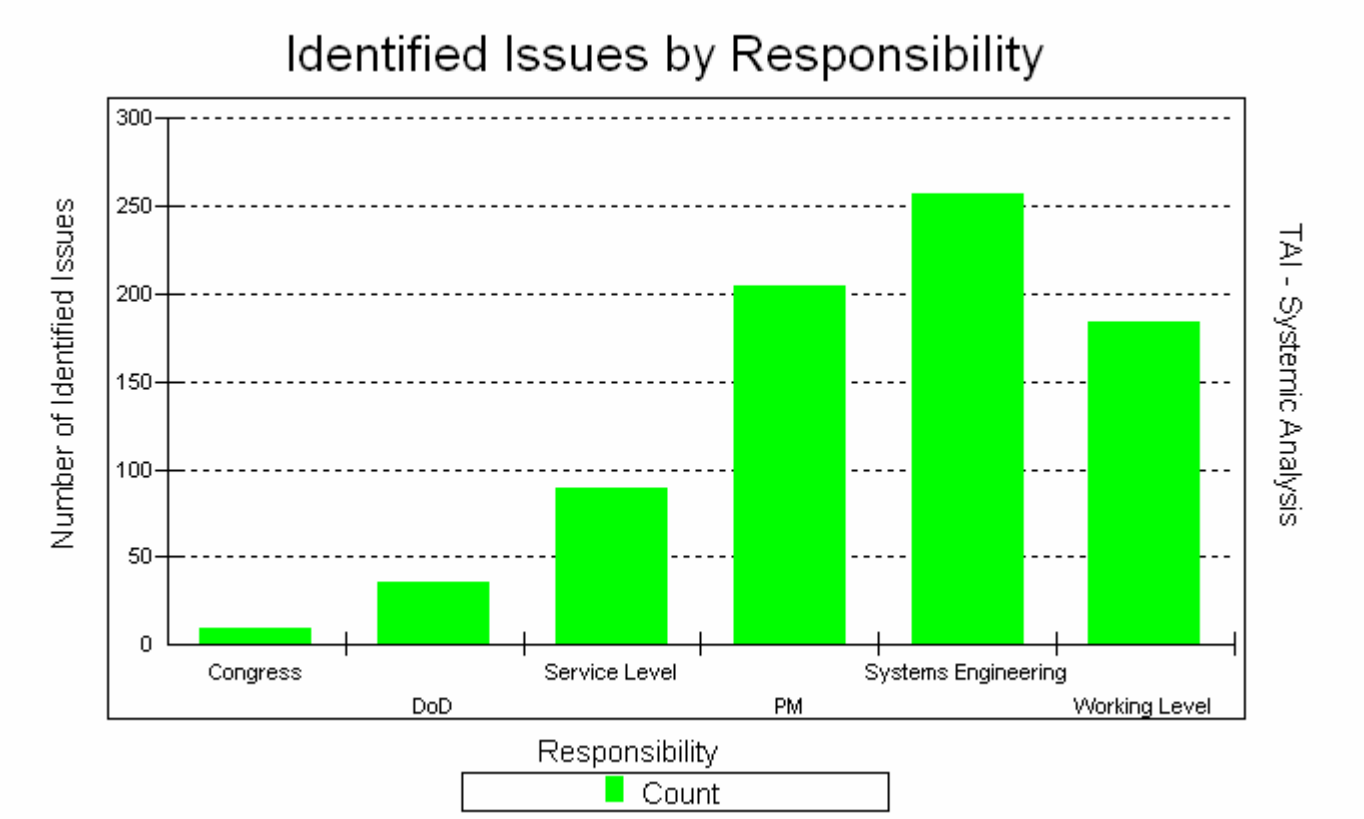
- The gap between "program expectations" and "program performance" is significant across the board
- Many of the causative issues result in inadequate software development performance
- New recurring issues are emerging as DoD acquisition strategies and technologies change
- We continue to focus on fixing the symptoms, not the causes

Critical Program Performance Problems

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

Issue Responsibility Allocations

Complex issues with multiple interactions across all levels of DoD management



Issue Responsibility

Congress - includes Congressional influence as well as program external environmental factors

DoD - includes DoD policy, directives and guidance

Service - includes Service level policy, directives and guidance

Program Manager - includes all program organic PM-level responsibilities, from both the acquirer and supplier (developer) perspectives

Systems Engineering - includes all system engineering-level responsibilities from both the acquirer and supplier perspectives

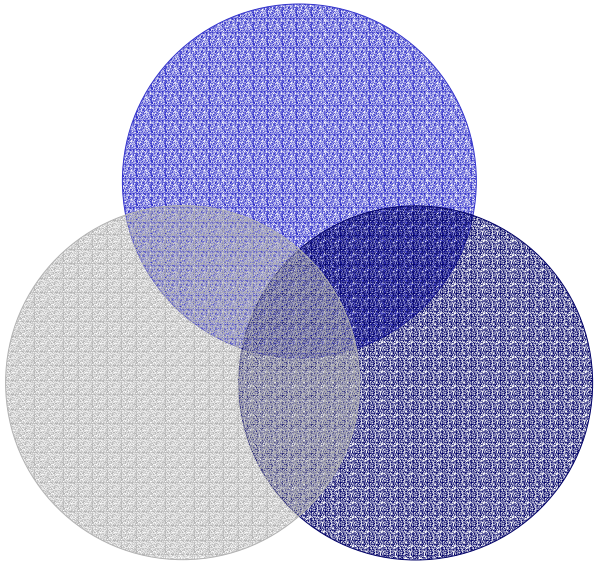
Working Level - includes all the responsibilities of the development staff executing the program-related tasks

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

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

Top Level Issue Categorization

Acquisition / Program Management



Systems Engineering

Technical Processes

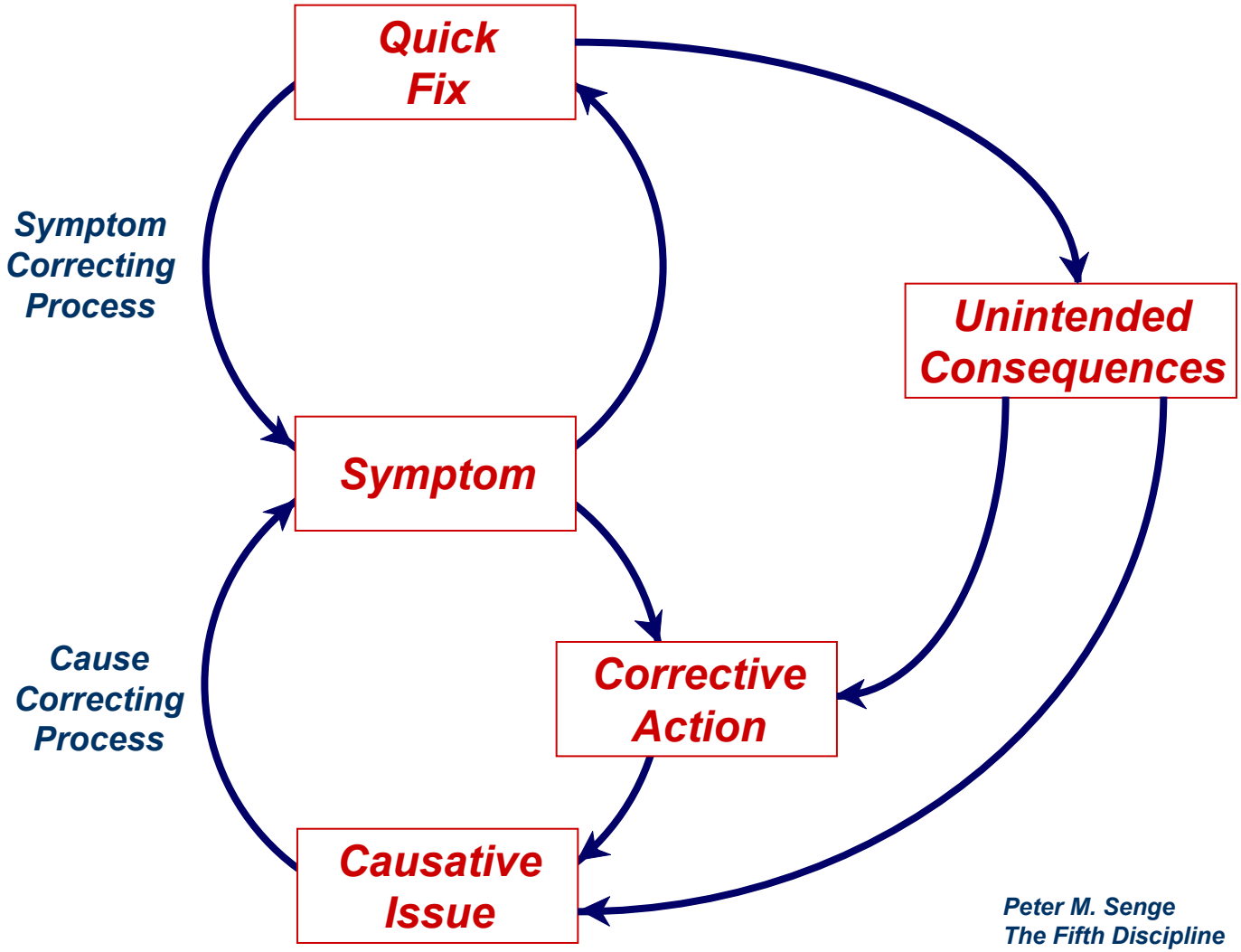
Analysis Summary

- The current DoD program issue profile shows minimal performance 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 or solutions
- Issue interactions are extremely complex

Systemic Findings - Emerging Issues

- Supplier program management and control
- Direct congressional to supplier "plus up" funding
- Massive mission based acquisition and supplier organizations
- Increasing system interoperability and codependency
- Extensive design for mission resiliency
- Fewer and less experienced resources
- Increasing cost consciousness
- Technology integration and update
- CMMI, Evolutionary Spiral, Capability Based Acquisition, Best Practices, others …

Symptom or Cause?



Peter M. Senge
The Fifth Discipline

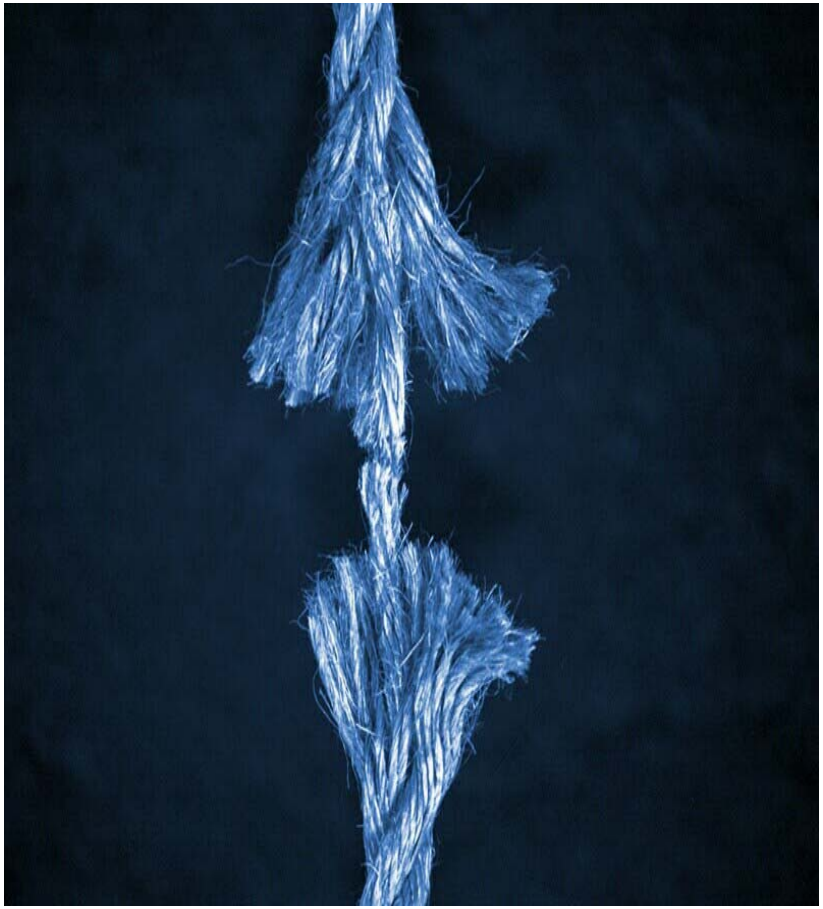
Corrective Actions?

- 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 reinforced
  - Process capability in addition to process adherence

Corrective Actions?

- 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 acquisition policy with:
  - A clear understanding of the complex interactions and constraints that programs are faced with
  - Adequate implementation guidance
  - Directed education

Is there an increasing gap between what is required and what is capable of being achieved?



Contact Information

Kristen Baldwin
OUSD (AT&L) Software Intensive Systems
(703) 602-0851 ext. 109
kristen.baldwin@osd.mil

John McGarry
U.S. Army TACOM - ARDEC
(973) 724-7007
jmcgarry@pica.army.mil