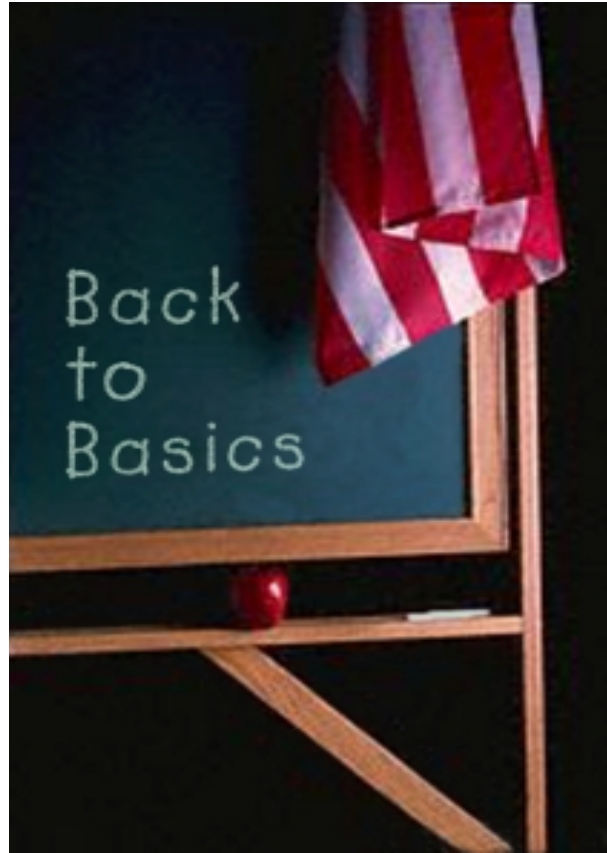


# Software Intensive System Acquisition - Best Practices



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**30 January 2003**

# Problem

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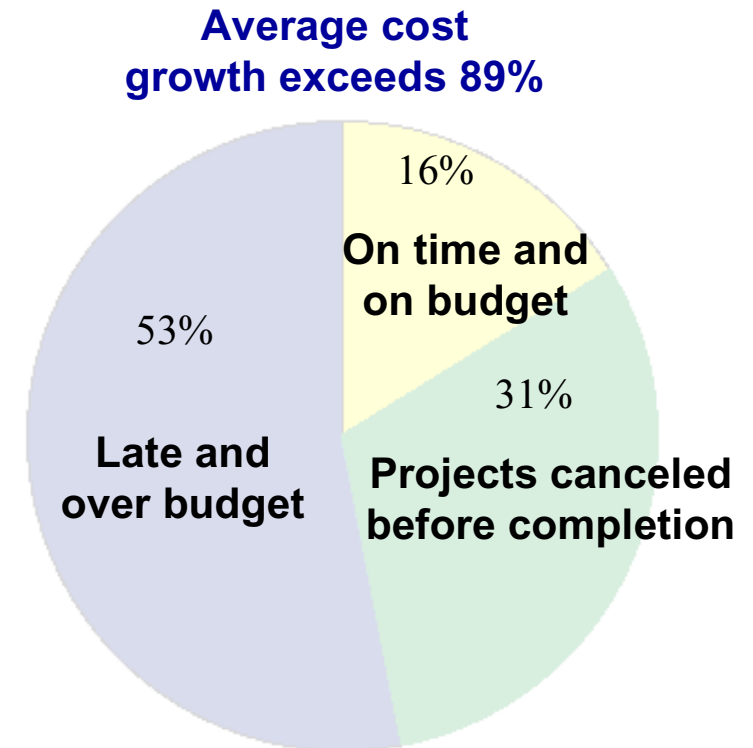
- **Defense development and acquisition programs continue to experience “software problems” resulting in significant cost overruns, schedule slips and performance difficulties**
- **ESC made significant progress to reform software acquisition processes in the early 90’s and was seen as an enlightened leader**
- **New environment emphasizes evolutionary spiral acquisition models**
- **Are we using the best software acquisition practices for this new environment?**

# Software Program Findings

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Programs with software difficulties exhibit *fundamental* problems:

- Requirements are too complex or too rigid
- Developer lacks software skills and experience
- Poor software management practices
- Lack of effort up front on system architecture
- Lack of system engineering trading hardware/software
- Adherence to policy & directives at expense of system performance & functionality
- No real financial incentives
- Program management does not anticipate or cannot fix the problems



**Average final product contains 61% of originally specified features**

Ref: CHAOS Study, Standish Group  
Summer 1999

# Project Work Plan

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- **FY03**

- **Develop a framework for assessing projects**
- **Baseline ESC's**
  - = **software acquisition status**
  - = **software acquisition best practices**
  - = **software acquisition concerns**

- **FY04**

- **Examine options for software acquisition process improvements**
- **Develop plan to implement reengineering**
- **Pilot programs**

# Project Assessment

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- **Goal: to leverage existing materials in this area**
  - **Capability Maturity Model (CMM)**
  - **Capability Maturity Model Integration (CMMI)**
  - **Tri-Service Assessment Initiative**
  - **MITRE Program Assessment Toolkit**
  - **OSD Equivalency Core Criteria and Questions**
  - **Airlie nine practices**
  - **Software Program Managers Network 16 Critical Software Practices™**
  - **Defense Science Board (DSB) reports**
- **Selection: Software Program Managers Network 16 Critical Software Practices™ supplemented by findings of Defense Science Board Report on Defense Software (Nov 2000)**
  - **Triage (rather than in-depth)**
  - **Based on proven industry practice**

# Assessment Framework

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## Project Management

- Adopt a Program Risk Management Process
- Estimate Cost and Schedule Empirically
- Use Metrics to Manage
- Track Earned Value
- Track Defects against Quality Targets
- Treat People as the Most Important Resource
- Improve Software Skills of Acquisition Managers
- Adopt Effective Contract Incentives
- Stress Past Performance and Process Maturity
- Exploit Independent Expert Reviews

## Product Construction

- Adopt Life Cycle Configuration Management
- Manage and Trace Requirements
- Use Systems Based Software Design
- Ensure Data and Database Interoperability
- Define and Control Interfaces
- Design Twice, Code Once
- Assess Reuse Risks and Costs
- Use Executable Architectures
- Employ Iterative Design/Development Cycles
- Maintain a Strong Technology Base

## Product Stability & Integrity

- Inspect Requirements and Design
- Manage Testing as a Continuous Process
- Compile and Smoke Test Frequently

### Source:

Software Program Managers Network 16 Critical Software Practices™

DSB Report on Defense Software (Nov 2000)

# Example

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## 4. Track earned value

Top level question:

Do you use earned value to track progress on your program?

a) Yes

b) No

If no – skip to Practice 5

If yes – continue

Who on your staff understands the entry and exit criteria for each task the contractor has defined?

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How is earned value credit given?

a) Binary with zero percent given before task completion and 100% when completion is validated

b) Partial credit allowed

How often is earned value reported, collected and reviewed?

a) Less frequently than once a month

b) Between once a month and every two weeks

c) Every two weeks or more frequently

Does the cost reporting system segregate the software effort from the non-software related tasks?

a) Yes

b) No

## **Related Efforts**

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- **A Study of Best Practice Adoption by Defense Acquisition Programs (CrossTalk May 2002)**
  - **Dr. Richard Turner, The George Washington University**
  - **Measured best practice adoption in defense acquisitions**
  - **Found widespread awareness (85%) but little actual implementation (avg 25%)**
- **Software Process Improvement at SPAWAR PMW 163 (May 99)**
  - **Frank Doherty (<http://www.spmn.com/Pmw163/>)**
  - **Developed a variant of the SPMN 16 Point Plan™ for all program managers to implement**
  - **Provided manuals, training**
  - **Baseline assessment 388 questions, all weighted, answers rated on a 5 point scale**
  - **Goal was to have an effectiveness score of 4 out of 5 in 12 of the 16 areas within 8 months**
  - **Results unpublished**



# Process

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- **Develop a short list of questions that can be used to evaluate the health and performance of a software development project / program office**
  - **More detailed questions for identified problem areas**
- **Conduct the survey for all of the programs under a PEO**
  - **Interview format allows observations to be captured**
  - **Also capture what is working**
- **Provide each SPO with a confidential report of results for her/his project**
  - **Results most useful to those in position to best correct deficiencies**
- **Provide the PEO with a report showing aggregate data**
  - **Support identification of overall trends**
  - **Support setting of performance goals**
- **Repeat periodically (every 6 months) to evaluate process improvement**

# Next Steps

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## ● FY03

- Complete baseline survey
- Analyze results
  - Look for trends: by acquisition phase, by program type (e.g. networking, radar), by software challenge (e.g. COTS integration, real-time), etc.
- Update assessment framework
- Provide reports to program managers, PEO

## ● FY04

- Identify process improvement options with most “bang for the buck”
- Create/Refine software Tactics, Techniques and Procedures (TTPs) for selected options
- Develop plan to implement reengineering
- Identify candidate programs
- Pilot selected TTPs on candidate programs

# Impact

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- **Baseline of PEO program software acquisition practice**
- **Identification of best practices in evolutionary, spiral acquisition environment**
- **Specification of software acquisition Tactics, Techniques and Procedures (TTPs)**
- **Pilot experience with TTPs**
- **Recommendations for integration within ESC business practices**