Improving Systems Engineering Execution and Knowledge Management

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Objective

- Refocus programs back to basic objectives of Systems Engineering execution including oversight of product developmental life cycle
  - Requirements, design, implementation, test, delivery, product feedback and sustainment
- Identify methods of simplifying and presenting key domain knowledge (need to know) to the engineer
  - Processes, procedures, and technical
- Provide simplified approaches to improve communication and better manage products and teams
  - Use of web, database tools and improvement focusals
- Provide ability to better understand and manage products in an age of sometimes overwhelming conditions
  - Reduce the apparent bottleneck caused by engineering teams interpreting the overlapping requirements and mandates
Traditional Systems Engineering

Traditional Systems Engineering Activities

- **Fundamental Systems Engineering Activities**
  - Requirements Analysis
  - Functional Analysis and Allocation
  - Design Synthesis

- **All balanced by techniques and tools called System Analysis and Control**
  - Track Decisions and Requirements
  - Manage Interfaces
  - Manage Risks
  - Track Cost and Schedule
  - Track Technical Performance
  - Verify Requirements
  - Review and audit progress
Can we improve Systems Engineering?

- **Processes, Procedures and Technical Information**
  - Decrease excess of supporting documentation including variations of same?
    - SEI CMM®, SEI CMMI®, corporate, program, team, etc
  - Legacy programs struggle?
    - Baseline to one set, then an “improved” set is flowed down (sometimes before the initial baseline is completed)
  - Identify specific information related to engineering role?
    - Easy to get lost and confused

- **Systems Engineering Oversight**
  - Provide oversight during code/build to decrease chances of major rework down the road?
  - Evaluate metrics at developmental stages and post delivery?
    - Build upon successful program practices and lessons learned
    - Continuous improvement
  - Utilize Improvement Councils with dedicated focals?
Previous Assessment Findings

**Quick Assessment Guidelines**
- Begin with quick assessment of group developmental status
- Identify common and unique enterprise software tools
- Identify artifacts, processes, procedures and supporting documentation
- Identify all change boards and other review boards
- Identify methods for group communication and status

**Results of Evaluation**
- Determined that many processes, procedures, and documentation were already in use accessible via program only
- Programs were collecting some information (give credit where credit is due)
- Included common and unique tools such as Finance/Budgeting, Earned Value System, Risk Tracking, Quality and Selloff documentation, Requirements tracking, Change Process/CCB, and some levels of metrics
- Big picture of program not always apparent to team members
Focus on Following Standard Work Flow

- Engineering development should follow a basic work flow
- Problems occur when basic development steps are marginalized, minimized, or omitted
Provides the stakeholders with complete color coded work flow of both new products and sustainment of existing products.

Visually enhances ability of the stakeholders to better understand dynamics of how to improve systems engineering execution and business discipline knowledge management.
Legend provides color coded element identifiers

Standard tools - lists web-based methods for maintaining same information gathering throughout the organization

**Legend**

- Start
- Systems Engineering
- Customer Support
- SW / HW Development
- 4 Ps Improvement Council

**Standard Tools**

- Web Portal
- eGuidance
- Standard Meeting Agenda
- Status Roll Up
- Peer Review
- Support Center
Start for new development Section
– Entry point for new business
Sustainment support and capturing product upgrades
- Represents methodology for acquiring follow-on business
- Section addresses support center, problem disposition and upgrade funding

**Legend**

- Web Portal
- eGuidance
- Standard Meeting Agenda
- Status Roll Up
- Peer Review
- Support Center

**Standard Tools**
Section for Change Board activity
Design Synthesis - code/build oversight

- Work Flow Visualization (cont)

Legend

- Web Portal
- eGuidance
- Standard Meeting Agenda
- Status Roll Up
- Peer Review
- Support Center
Testing, verification and release
Work Flow Visualization (cont)

- Configuration Management, delivery and continuous improvement
- Improvement Council

Legend
- Staff
- Systems Engineering
- Customer Support
- Software Development
- Improvement Council

Standard Tools
- Web Portal
- eGuidance
- Standard Meeting Agenda
- Status Roll Up
- Peer Review
- Support Center

System Engineering

Continuous Improvement
People, Processes, Procedures, Performance

Lessons Learned
Metrics – Root Cause Process Defects Rework

Improvement Council
Staff
Team Lead Managers

Delivery

Notify Customer

Configuration Management Audit (QA)
Work Flow Visualization Benefits

- **Identifies major steps in development that will remain during organizational process change activity**
  - Engineer better informed as to what his or her role is for product development
  - Influence to product delivery

- **Associated processes may change, but work flow stays consistent**
  - Minor adjustments made for that role for that task

- **Communication across specialties improved**
  - Work flow task

- **Importance of work flow task provides increased importance on work product artifact, at that stage**
  - Improve peer review effectiveness
  - Decreases chance of out of phase defects
  - Increases chance of in phase defects found
Knowledge Management

- Linking and sharing of related information between business disciplines
  - Improves systems engineering influence and maturity
  - Improves oversight of quality
  - Increases timeliness of applicable decision making processes
  - Directs engineer to key “need to know” information
  - Protects engineer from overwhelming sensation of “nice to know” information
  - Reduces bottleneck
Knowledge Management (cont)

- **Electronic guidance or eGuidance**
- **Key “need to know” information provided by a web based tool**
  - Procedures, Processes, and tools required to do the job
  - E-Guidance is a tool designed to provide an employee relevant reference information regarding his/her role and responsibilities within the organization and current assignment
  - Intent of e-Guidance is for the employee focus learning of necessary tools, procedures, and product documents in an expeditious manner
Standard Tools to Consider

- Common Web Portal
  - Meeting Agenda
  - Meeting Minutes
  - Status with applicable roll up to various levels of leadership
  - eGuidance
  - Peer Review
  - Support Center
Summary

**Challenge**
- Implement an effective method of improving systems engineering execution and knowledge management across specialties
- Maintain control of chaotic situations that impact baseline work flow
- Insure communication of activities are readily available up and down the organizational chain

**Solution**
- Build on past studies and lessons learned for continuous improvement
- Develop visualizations of major business work flow elements
- Map the employee role to the documentation that is needed
- Develop standard meeting agendas that represent full process compliance
- Utilize the latest technology to lessen the bottleneck affect of key domain technical documentation of the team and specific roles

**Future Benefits**
- More robust program managers
- Knowledge builds upon knowledge