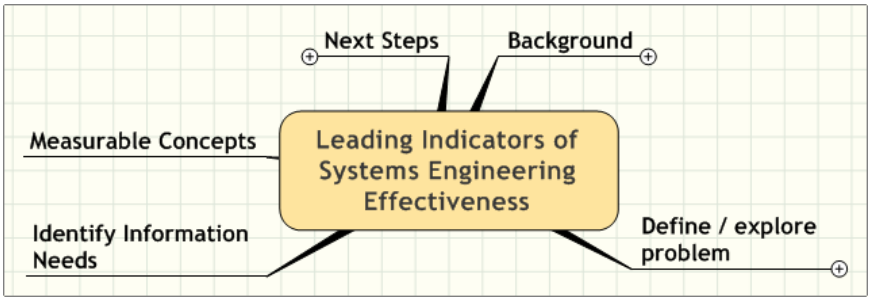
Leading Indicators of Systems Engineering Effectiveness

PSM TWG Workshop

Leading Indicators of Systems Engineering Effectiveness

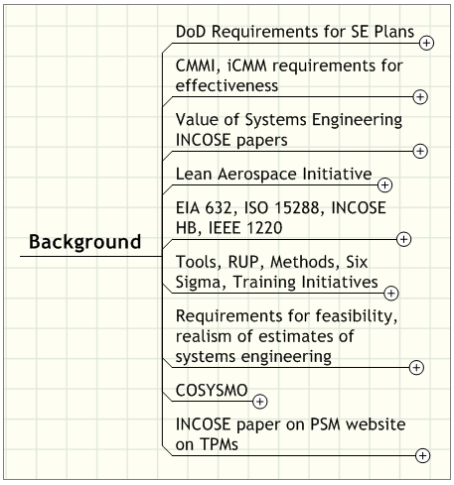


The purpose of this workshop was to discover what might be appropriate leading indicators of systems engineering effectiveness.

Attendees

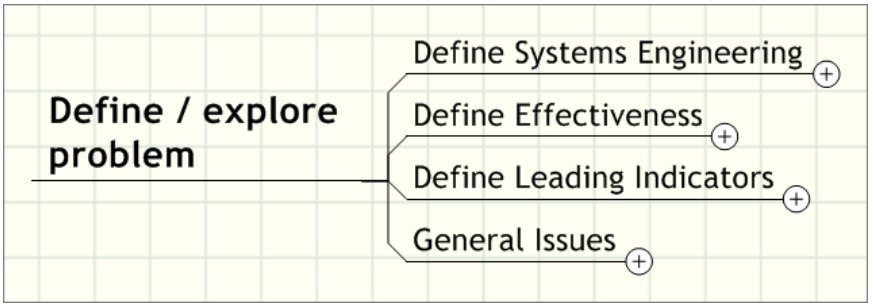
- Dave Card, facilitator, SSCI
- Mike Rodriguez, Northrup Grumman Sperry Marine
- Amos Rohrer, BAE
- Renee Hall, CSC
- Doug Ishigiki, IBM
- Maryam Mohadjer, Boeing
- Antonio Moya, Ericsson Spain
- Virginia Slavin, SSCI
- Chris Miller, SSCI
- Kathy King, CSM
- Wendell Mullison, GDLS
- Paul Jean, MITRE
- Janice Day, GDLS
- Tom Solosky, DCMA
- Arnold Das, SAIC
- Cheryl Jones, PSM

Background



The first topic was to discuss areas or standards that may already address or touch on this issue of systems engineering effectiveness.

Define / explore problem



The next step was to define and explore the problem. As shown above, there were several issues that required an understanding before the problem was "understood" by the working group. These were broken up into definitions and other general issues.

Define Systems Engineering

- not hardware design and implementation
- not software design and implementation
- interfaces, interactions, integration
- engineering management, critical path
- simulation, modeling, prototyping
- big picture
- EIA 632
- allocate functionality
- cost modeling

The group determined that for purposes of this workshop, systems engineering at least covered these areas.

Define Effectiveness

- Customer (C)
  - reconcile consumer and user expectations, customer buyin (C)
  - "ilities" - user perspective (C,T)
  - customer satisfaction (C)
- Management (M)
  - Management Satisfaction (M)
  - anticipation of future needs and evolution of product (M)
  - conformance to plan (M)
  - economical performance to requirements (M,C,T)
  - lack of appropriate technical communication channels (M,T)
    - involvement of key stakeholders
  - comprehensive risk management (M)

It was also determined that there were different concepts of “effectiveness”, which were generally influenced mainly by three different basic drivers.

- Technical (T)
  - satisfaction of key performance parameters (T)
    - Capacity
    - conformance to plan
  - systems fails validation / operational test (T)
  - late, untestable, incomplete requirements (T)
  - failure / problems in technical reviews (T)
  - system hard to support (T)
  - failure to recognize interactions between components (T)
    - implications of decisions
    - systems don't interoperate
  - misunderstanding of business model (T,C,M)
    - bad prioritization of requirements
    - unrealistic concept of operations
    - customer needs
  - misunderstandings (T,M,C)
    - inconsistent definitions -terminology
  - understand feasibility of proposed solution (T,C,M)
  - fidelity of simulations and modeling (T)
  - bad / ineffective allocation of requirements (T)
    - discover through prototyping, simulating, test
  - good solution to a problem (T)
    - can be "effective" even if no system produced
  - successful system (T)

Define Leading Indicators

- criteria of leading indicators
- Actual Indicators

Criteria of Leading Indicators

- early in lifecycle
- in process (before)
- in time to make decisions
  - actionable
  - key decisions
- objective
- relative to goals / obstacles
- regular feedback
- defined user / checkpoint
  - technical reviews, etc.
- confidence
  - possibly statistical
- tailorable or universal
- decision criteria for interpretation
  - thresholds

Actual Indicators

- management satisfaction
  - risk - quality of risk plan
  - conformance to plan (EV), processes
    - adequacy of staffing
    - turnover
  - action items, questions
  - input to business plan
  - award fee (sometimes)
  - requirement stability
  - customer satisfaction
  - interaction / communication with management
- can be "effective" even if no system produced
  - Quality of SE processes
    - conformance to process
    - CMMI capability, maturity
  - simulation, prototype, etc. were effective
  - feedback from technical reviews / checkpoints
  - "good" requirements, accounted for, stable, compliant
  - problem understanding
  - considered all possible solutions
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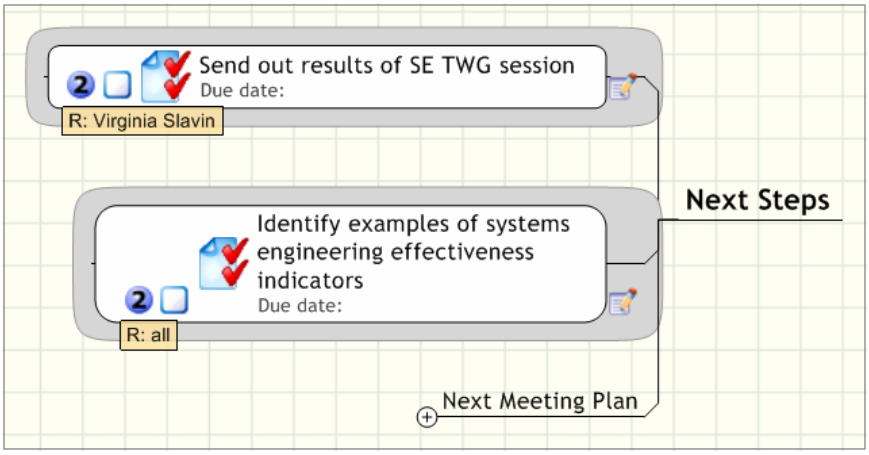
Work began on identifying potential indicator areas to explore that would address some of the issues brought up on the previous slides…

General Issues

- sizing of systems engineering
  - common size measures across disciplines
- lack of methodology for defining "nonfunctional" requirements like scalability
- prioritization of indicators

These questions were put off for future discussion

Next Steps



Next Meeting Plan

- Revisit these results
- Prioritize issues
- Present examples
- Discuss tools being used
- Work on indicator definitions
  - finalize list of measures based on these workshop results
  - identify existing indicators

Next meeting to be held at PSM conference scheduled in July at Keystone, CO.

Resulting Action Items

- Identify any effectiveness requirements from DoD requirements for SE Plans – Tom Solosky
- Identify any requirements for SE effectiveness contained within CMMI – Arnold Das
- Identify any requirements for SE effectiveness contained within iCMM – Amos Rohrer
- Identify any SE effectiveness requirements contained in INCOSE papers re: value of systems engineering – Paul Jean
- Identify any requirements for SE effectiveness contained in the Lean Aerospace Initiative – Dave Card
- Identify actual names and locations of identified items for Maryam Mohadjer – Chris Miller
- Identify any requirements or mention of SE effectiveness measures in industry standards – Maryam Mohadjer
- Identify SE effectiveness issues and/or helps in tools/methods – Doug Ishigiki
  - Tools, RUP, Methods, Six Sigma, Training Initiatives
- Identify any SE effectiveness items in papers on rqmts for feasibility, realism of estimates of systems engineering – Kathy King
- Identify any information in COSYSMO that relates to SE effectiveness – Chris Miller
- Identify any SE effectiveness information contained in INCOSE papers on PSM website
- Send out results of SE TWG – Virginia Slavin
- Identify examples of systems engineering effectiveness indicators - all
- Identify who will take the lead on the SE Effectiveness workshop – Cheryl Jones