SEMP, TEMP and SHMEMP! Its time to stop the Mishigas

Dr Joseph Kasser

1

Joseph Kasser

- The real world
  - Electronic engineer, London, UK
  - ALSEP, Apollo's 15,16 & 17, USA
    - Systems engineer
  - TT&C, Comsat
  - LuZ SEGS-1, Israel
  - NASA-GSFC ground support
  - The Right Requirement Ltd
- Academia
  - GWU, UMUC
  - Ass/Prof, Deputy Director, UniSA
  - Leverhulme Visiting Professor, Cranfield, UK
  - NUS Visiting Associate Professor

2

Topics

- The context
- Systems engineering
- The SEMP
- The TEMP
- The SHMEMP
- The Mishigas
- How we might stop the Mishigas
- Recommendations
- Further information

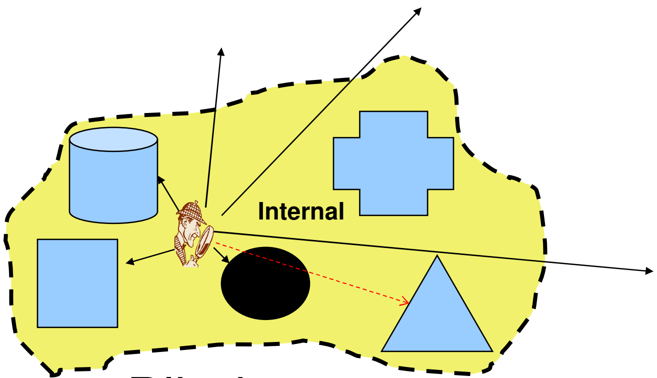
3

Context – problem

- Creating postgraduate courses in
  - Systems engineering
  - Project management
  - Integrated logistics support
  - Innovation and technology management
- Knowledge content
  - Same knowledge in different courses
    - Poor subsystem partitioning
  - Different terminology for same concepts in different courses
  - Difficulty of ‘independence’
  - Things not taught that should be

4

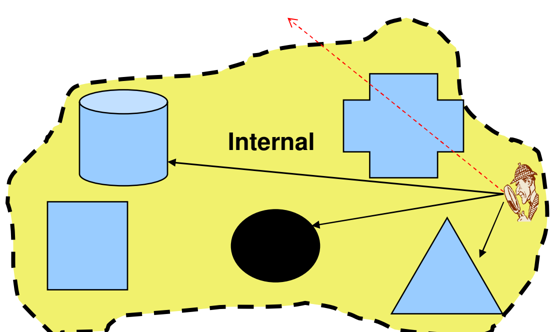
Perspectives of a problem-1



Blind spots

5

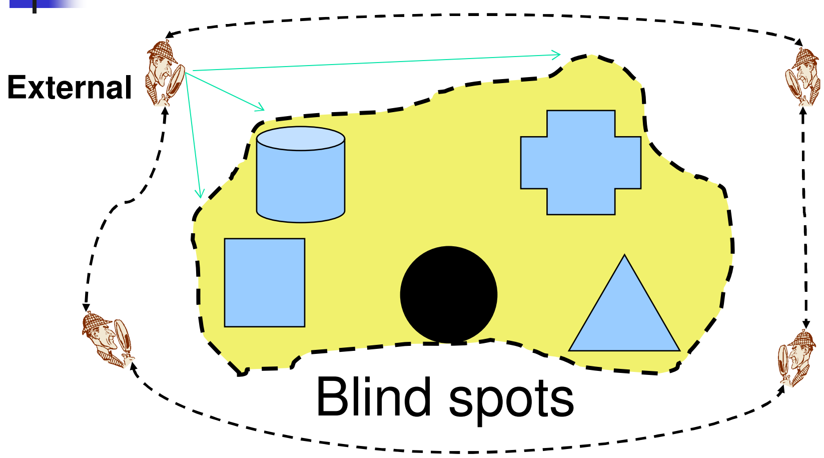
Perspectives of a problem-1a



Blind spots

6

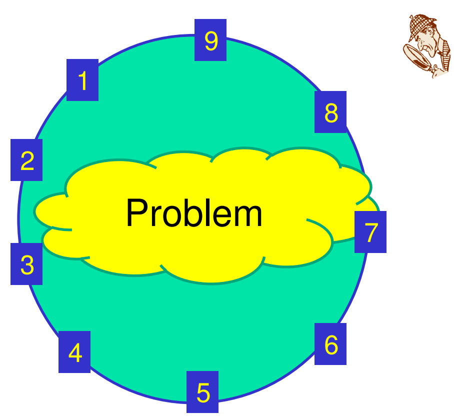
Perspectives of a problem-2



7

Systems thinking perspectives*

1. Big picture
2. Operational
3. Functional
4. Structural
5. Generic
6. Continuum
7. Temporal
8. Quantitative
9. Scientific

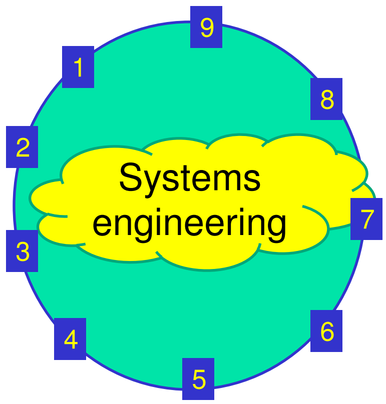


*Kasser and Mackley, INCOSE, 2008

8

Systems thinking perspectives*

1. Big picture
2. Operational
3. Functional
4. Structural
5. Generic
6. Continuum
7. Temporal
8. Quantitative
9. Scientific



*Kasser and Mackley, INCOSE, 2008

9

Systems engineering: Big picture observations -1

- The recommended way to solve the complex problems facing us today
- Aspects of success and failure discussed last year
  - The forthcoming Seldon crisis in systems engineering
- Multiple definitions of systems engineering
- DAU's two faces of systems engineering*
  - Technical domain - processes
  - **S**ystems **E**ngineering **M**anagement
    - Overlap with **P**roject **M**anagement

Systems Engineering Fundamentals. Defense Acquisition University Press, 2001

10

Systems engineering: Big picture observations -2

- A holistic approach (theory)
- Performed in a fragmented environment (practice)
  - Fragmented by discipline
- Different disciplines perform overlapping work
  - Legislated to do so in USA
  - e.g. engineering specialties

11

Topics

- The context
- Systems engineering
- **The SEMP**
- The TEMP
- The SHMEMP
- The Mishigas
- How we might stop the Mishigas
- Recommendations
- Further information

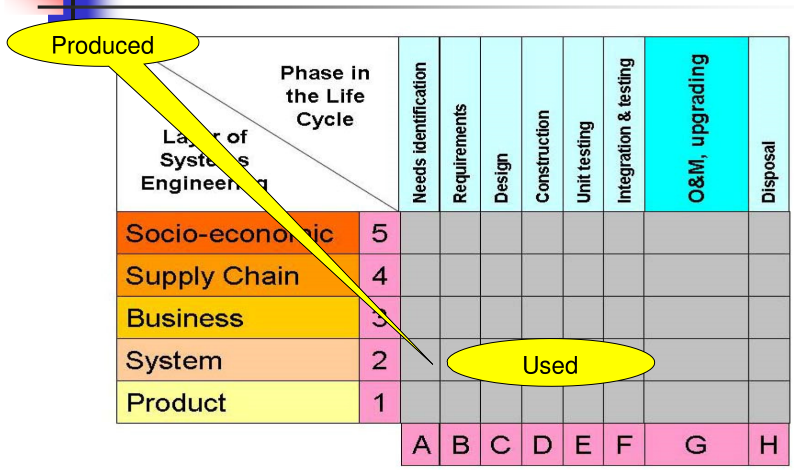
12

The systems engineering management **plan** (SEMP)

- One of the critical documents in the system development lifecycle
- Produced by systems engineers
  - In general,
    - we don't teach planning in SE courses
    - we teach planning in Project Management
- When do they produce it?
- When do they use it?
- Who uses it?

13

The context for the SEMP: Big picture perspective*



* Kasser, J. E., "The Hitchins-Kasser-Massie (HKM) Framework for Systems Engineering", Proceedings of the 17th International Symposium of the INCOSE, San Diego, CA., 2007.

14

Internal perspective: Contents of the SEMP*

- Technical Program Planning and Control
- Systems Engineering Process
- Engineering Specialty Integration

*Kasser J.E., Schermerhorn R., "Gaining the Competitive Edge through Effective Systems Engineering", *Proceedings of the NCOSE 4th International Symposium*, San Jose , CA., 1994.

15

Contents of the SEMP-1

- Technical Program Planning and Control
  - identifies organizational responsibilities and authority for **systems engineering management**
  - describes the method of controlling the program, subcontracted engineering, and schedules
  - contains
    - the contract work breakdown structure (WBS)
    - the specification tree that relates to the WBS
    - the program risk analysis, **system test planning**, the decision and control process
  - details the Technical Performance Measurements

16

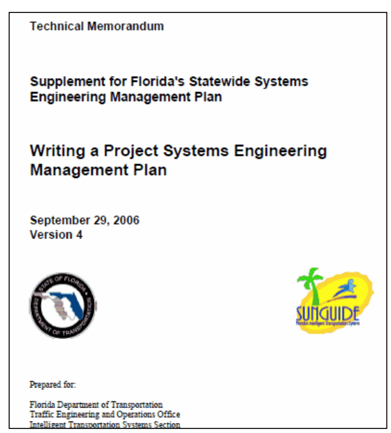
Contents of the SEMP-2

- Systems Engineering Process
  - describes **how the general process was tailored to the specifics of the project**
  - contains
    - details of the **process** to be used during the development program
    - information regarding procedures, documentation, methodology of trade-off studies, details about the models to be used for system cost effectiveness evaluation, and the generation of specifications
- Engineering Specialty Integration
  - shows how the **engineering specialties** involved apart from hardware and software design and production, are integrated into the overall effort
    - Where these disciplines overlap, the SEMP defines the responsibilities and authorities of each
  - contains guidance for the trade off to be made in the event of a conflict between the different engineering disciplines

17

Florida SEMP (Extracts)

- 1.4.9 System Testing, Integration, and Acceptance Planning
- 1.5.6 Engineering Specialty Integration
  - 1.5.6.1 Integrated Logistics Support and Maintenance Engineering


Technical Memorandum

Supplement for Florida's Statewide Systems Engineering Management Plan

Writing a Project Systems Engineering Management Plan

September 29, 2006
Version 4

Prepared for:

Florida Department of Transportation
Traffic Engineering and Operations Office
Intelligent Transportation Systems Section

http://www.floridaits.com/SEMP/Files/PDF_Report/060929-PSEMP-V4.pdf, accessed 14 June 2010

18

Appendices in Florida SEMP

- **J** - System **Test** Plan Template
- **K** - **Test** Procedures Template
- **L** - **Test** Report Template
- **T** - Human Factors Engineering Project Plan Template
- **U - Integrated Logistics Support** Plan Template
- **V** - Risk Management Plan Template
- **W** - Reliability and Maintainability Program Plan Template
- **X** - System Safety Plan Template

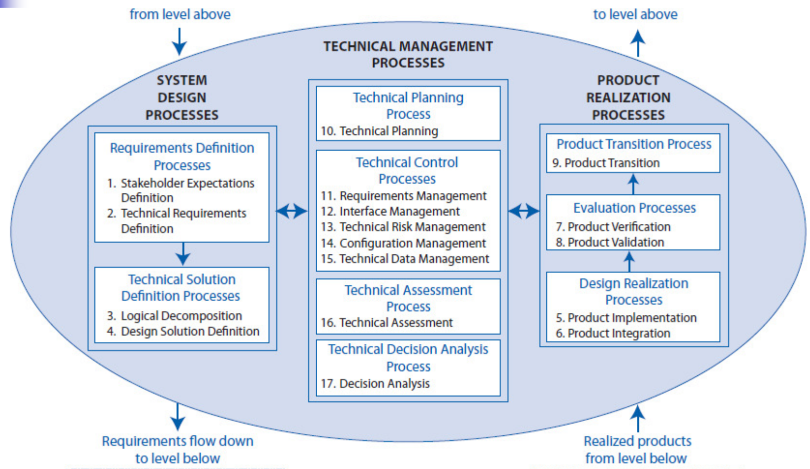
19

NASA Systems Engineering Handbook, 2007

- Technical effort integration
- Project's approach to:
  - Specialty disciplines
  - Role of specialty disciplines in V&V
  - Reliability
  - Maintainability
- Project specific description of each of the 17 technical processes (NPR7123.1)
  - See next slide

20

Systems engineering engine



21

What about the TEMP?

22

The TEMP

- Documents the overall structure and objectives of the Test and Evaluation program.
- Provides a framework within which to generate detailed T&E plans and documents schedule and resource implications associated with the T&E program.
- Identifies the necessary Developmental Test and Evaluation, Operational Test and Evaluation, and Live Fire Test and Evaluation activities.
- Relates program schedule, test management strategy and structure, and required resources to:
  - Critical Operational Issues , Critical Technical Parameters, objectives and thresholds documented in the Capability Development Document , evaluation criteria, and milestone decision points.

https://acc.dau.mil/CommunityBrowser.aspx?id=29065 Accessed 11 may 2010.

23

Topics

- The context
- Systems engineering
- The SEMP
- The TEMP
- **The SHMEMP**
- The Mishigas
- How we might stop the Mishigas
- Recommendations
- Further information

24

The SHMEP

- Integrated Logistics Support
  - Sustainment
- Configuration Management
- Project Management
- Human interface
- Etc.

25

Definitions: Logistics Support Analysis (LSA)

- An activity **within Integrated Logistics Support** which generates a Logistics Support Analysis Record
  - Wikipedia
- **The iterative process of identifying support requirements for a new system, especially in the early stages of system design**.
- **The main goals of LSA are to ensure that the system will perform as intended** and to influence the design for supportability and affordability.
  - Air Force Institute of Technology, Graduate School of Acquisition and Logistics

7-26

And in the lifecycle …

- LSA performed as integral part of system design (up front)
  - Produces supportability requirements as an **integral part of system requirements and design**.
  - Defines support **requirements** that are optimally related to the design and to each other.
  - Defines the **required** support during the operation phase of the system.

7-27

Configuration management (CM)

- A field of management that focuses on establishing and maintaining consistency of a **system's or product's performance and its functional and physical attributes with its requirements, design, and operational information throughout its life**
  - MIL-HDBK-61A, Military Handbook: Configuration Management Guidance (7 February 2001).

9-28

Elements of CM

- Cross development and operational lifecycle phases
- Processes – tasks -activities
  - Configuration identification
  - Configuration control
  - Configuration status accounting
  - **Configuration audits**
- Data
  - Configuration items and associated information
  - Stored in computer accessed via software
- Computer software is ONLY a part of configuration management system

9-29

Definitions

- Configuration audits
  - Functional configuration audits.
    - **ensure that functional and performance attributes of a configuration item are achieved,**
  - **Physical configuration audits.**
    - ensure that a configuration item is installed in accordance with the requirements of its detailed design documentation.
  - Occur either at delivery or at the moment of effecting the change.
  - **Commonly known as verification and validation or testing**

9-30

Project management

- Same knowledge and skills as systems engineering
  - Roe, 1995
    - SE technical breadth
    - PM management expertise
- Activities overlap systems engineering
  - E.G. Sheard 1996, Eisner 1997
- Manages cost and schedule without managing technical content.
  - Mooz and Forsberg, 2007

31

Topics

- The context
- Systems engineering
- The SEMP
- The TEMP
- The SHMEMP
- **The Mishigas**
- How we might stop the Mishigas
- Recommendations
- Further information

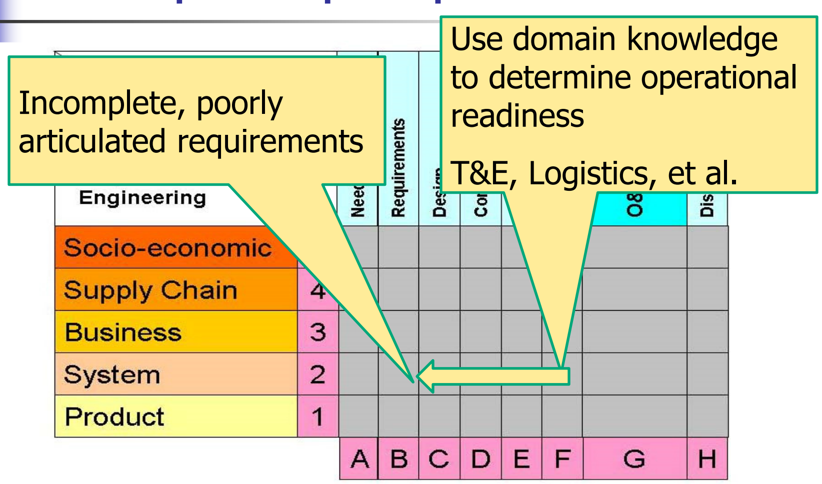
32

Overlapping streams of work

- Focus on processes
  - Independent
  - Asynchronous
- Leads to Shelfware
- Inflates costs
- No holistic picture of plan relationships
- Encourages fragmentation
  - Violates the essence of the systems approach

33

Temporal perspective



34

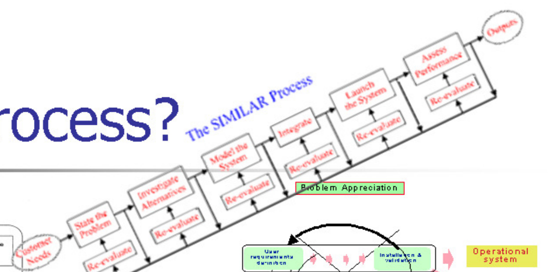
Focus on systems engineering process

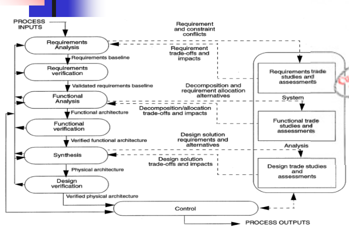
- The successful implementation of proven, disciplined systems engineering processes results in a total system solution that is--
  - Robust to changing technical, production, and operating environments;
  - Adaptive to the needs of the user; and
  - Balanced among the multiple requirements, design considerations, design constraints, and program budgets.*
- A single process, standardizing the scope, purpose and a set of development actions, has been traditionally associated with systems engineering.**

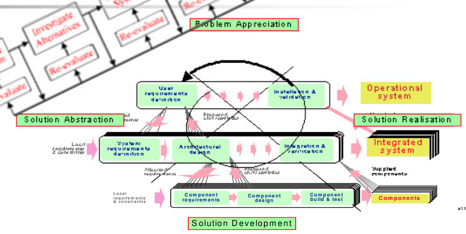
* United States Department of Defense 5000 Guidebook 4.1.1
** Arnold, 2000 quoting (MIL-STD-499B, 1993) and (IEEE 1220, 1998)

35

Which process?







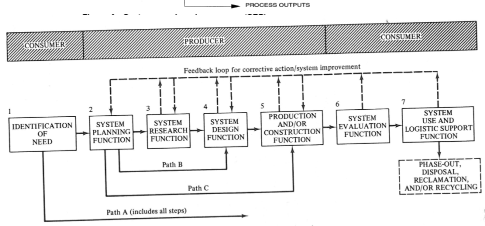
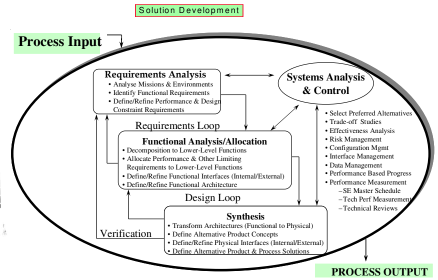
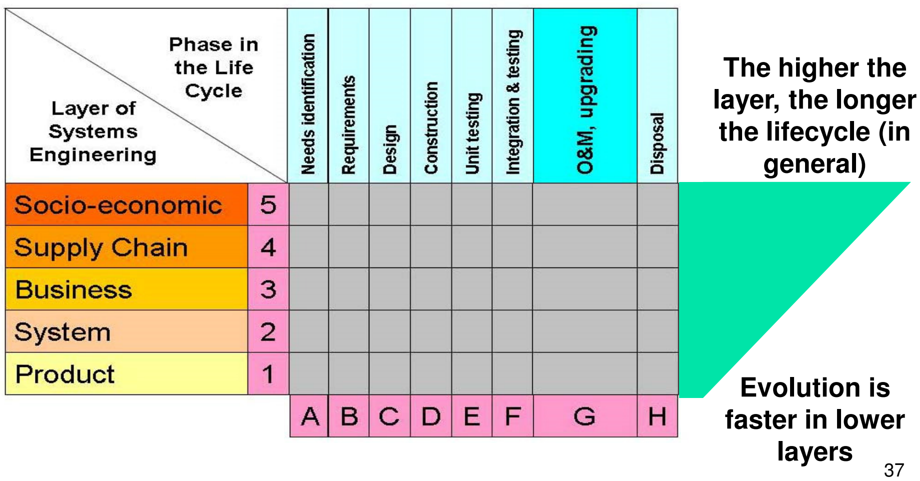


Figure 2.2. System-life-cycle functions.*



36

Big picture and temporal perspectives



37

Five generations of new product development models*

Generation	Type	Characteristics
1	Technology push	Simple linear sequence, emphasis on R&D. Market is receptacle for fruits of R&D.
2	Need pull	Simple linear sequence, emphasis on marketing. Market is source of ideas for R&D.
3	Coupling	Sequential but with feedback loops. R&D and marketing in balance
4	Integrated	Parallel development with integrated teams, coupling with supplier and customer
5	Systems integration and networking	Integrated parallel development, **use of models** and tools, **agile development**, focus on quality and non price factors

* Based on Rothwell, **1992** in Bettina, Managing innovation design and creativity

38

Generic-temporal-scientific perspective

So, how did we get into this Mishigas?

Topics

- The context
- Systems engineering
- The SEMP
- The TEMP
- The SHMEMP
- The Mishigas
- **How we might stop the Mishigas**
- Recommendations
- Further information

Standish Report 1994* Top 10 reasons for …

Where is "**process**" mentioned?
Focus is on people!

Proj

1. User involvement
2. Executive management support
3. Clear statement of requirements
4. Proper planning
5. Realistic expectations
6. Smaller project milestones
7. Competent staff
8. Ownership
9. Clear vision & objectives
10. Hard-working, focused staff

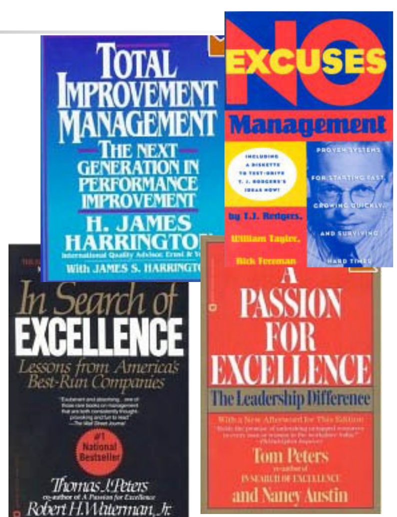
1. Incomplete requirements
2. Lack of user involvement
3. Lack of resources
4. Unrealistic expectations
5. Lack of executive support
6. Changing requirements and specifications
7. Lack of planning
8. Didn't need it any longer
9. Lack of IT management
10. Technology illiteracy

* http://www.cs.nmt.edu/~cs328/reading/Standish.pdf

41

The focus is on **people** not process

- Literature
  - Is full of advice as to how to make projects succeed
  - Has little if anything to say about the proliferating process standards
- Garbage-in-garbage-out



42

Topics

- The context
- Systems engineering
- The SEMP
- The TEMP
- The SHMEMP
- The Mishigas
- How we might stop the Mishigas
- **Recommendations**
- Further information

43

Effective systems engineers

- *"Systems, even very large systems, are not developed by the tools of Systems Engineering, but only by the engineers using the tools."*

•Dr. Robert A. Frosch, 1969
- •Assistant Secretary of the Navy for Research and Development
- •Later becoming NASA Administrator during the Carter Administration (1977-1981)

44

Recommendations

- **Educate more competent engineer-leaders**
  - **Provide the right solution to the right problem in the right way**
    - Focus on outcomes not processes and documents
  - Change in what we teach and how we teach it
    - Stop teaching process and teach problem solving and solution providing
- Implement an paradigm of interdependence not independence
  - Activities in one plan depend on activities in another plan
- Remove redundancy and overlaps in work activities
- Integrate project management and systems engineering
  - Mooz and Forsberg, 2007

45

Requirements for competencies

- Those extracted from a list of specifications or traits for an "Ideal Systems Engineer" (Hall, 1962), pages 16-18).
- Being able to define the problem (Wymore, 1993), page 2).
- Competent, skilled and knowledgeable systems engineers capable of effectively working on various types of complex integrated multi-disciplinary systems in different application domains, in different portions of the system lifecycle, in teams, alone, and with cognizant personnel in application and tool domains.
- Important skills and knowledge to include in corporate systems engineering training programs (Watts and Mar, 1997).
- The ability to communicate systems engineering principles to others.
- In the acquisition portion of the system lifecycle, facilitate the effective acquisition of solution systems that meet the customer's needs at the time the system is specified, at the time the solution system is actually acquired and during the full length of its operational life.
- Engineers who are effective at solving open-ended problems (Durward K. Sobek II and Jain, 2004).
- Ways of identifying the five different types of systems engineers (Kasser, et al., 2009).

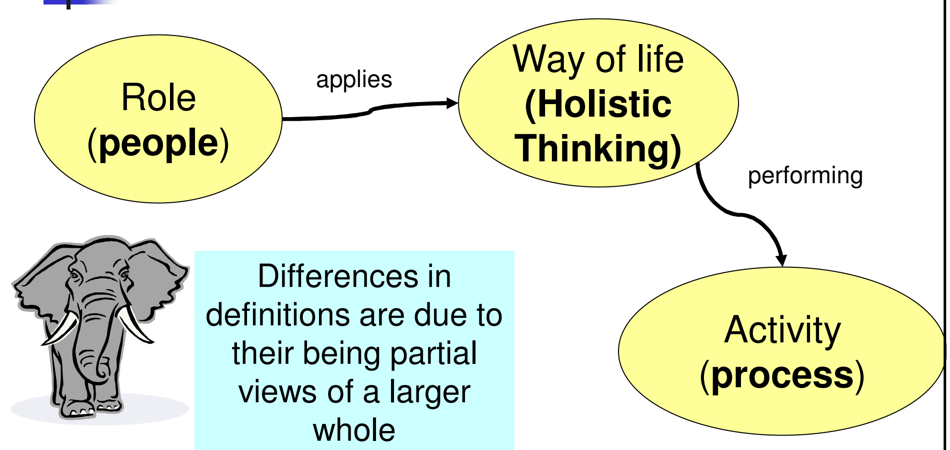
46

Three dimensions of systems engineering

- **Activity**
  - Systems engineer**ing**, project managem**ent**, etc.
  - Objective criterion (INCOSE Fellows, 2009)
- People – **Role**
  - Systems engine**er**, project manag**er**, design**er**, etc.
    - Systems engineers perform mix of systems engineering and non-system engineering activities
  - Different mix in each organization
- People - **Way of life** (Hitchins)
  - [interpreted as] application of Holistic Thinking
    - Analysis, system thinking and critical thinking (Kasser 2010)

47

Definitions of systems engineering: Linking the dimensions



48

Characteristics of systems engineers

- **Knowledge – (activity)**
  - Systems engineering
  - Application domain
- **Cognitive capabilities - (problem solving – way of life)**
  - Analysis
  - Systems thinking
  - Critical thinking
- **Individual traits - (role)**
  - Leadership
  - Management
  - Administration
  - Communications
  - Integrity
  - Earned respect
  - Ethics
  - Etc.

49

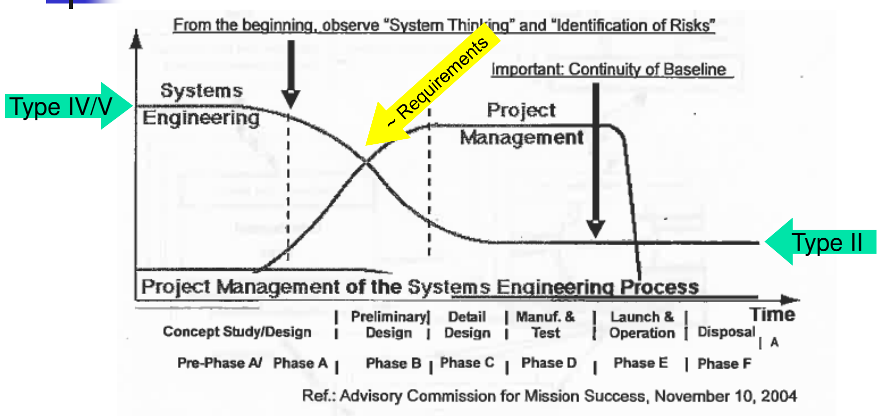
Five types of systems engineers and project managers* (engineer-leaders)

- **Type V** - who can "define the problem" and then determine "what" needs to be done to implement an optimal solution
  - (Wymore, Model Based Systems Engineering, 1993 p 2)
- **Type IV** - who can "define the problem"
- **Type III** - who can be given the problem and can then determine "what" needs to be done to implement an optimal solution
- **Type II** – who can be told "what" needs to be done to implement a solution and can work out "how" to do it
- **Type I** – (apprentices) who can be told "how" to implement a solution and can then do it

* Kasser, J. E., Hitchins, D. and Huynh, T. V., "*Reengineering Systems Engineering*", proceedings of the 3rd Annual Asia-Pacific Conference on Systems Engineering (APCOSE), Singapore, 2009.

50

Best practice use of Types



JAXA Basics of Systems Engineering (draft), Version 1B, 2007

51

Two-dimensional assessment*

- [Knowledge of] the process, or set of processes, considered relevant to the discipline of interest
- The level of proficiency attained
  - typically using a progression of increasing-value cardinal points that are defined in terms of attainment or performance criteria.

* Arnold, 2000

52

Knowledge*

- **Declarative knowledge** - knowledge that can be declared in some manner.
  - It is “knowing that” something is the case.
- **Procedural knowledge** - “knowing how” to do something and must be demonstrated.
  - Describing a process is declarative knowledge.
  - Performing the process demonstrates procedural knowledge.
- **Conditional knowledge** - “knowing when and why” to apply the declarative and procedural knowledge.

* A. E. Woolfolk, "Chapter 7 Cognitive views of learning," in *Educational Psychology*, 7th ed. Boston: Allyn and Bacon, 1998, pp. 244-283.

53

Assessment approaches

- Knowledge, Skills, and Abilities (KSA)
- INCOSE Certified Systems Engineer Professional (CSEP) Examination
- INCOSE UK Systems Engineering Competencies Framework
  - (Hudson, 2006).
- Capacity for Engineering Systems Thinking (CEST)
  - (Frank, 2006).

54

Knowledge, Skills, and Abilities (KSA).

- **Knowledge** is a body of information needed for the successful performance of a function
- **Ability** is the required competence to perform the function successfully
- **Skill** is the observable or measured competence in performing the function

- KSAs tend to be lists of statements written by, or on behalf of, candidates

55

INCOSE CSEP Examination

- Tests the applicant's declarative knowledge* or ability to retain and declare the knowledge in the INCOSE Systems Engineering Handbook
  - focus is on process-based systems engineering (Type II)
- Does not test cognitive skills and individual traits
- Once having passed the exam, the applicant has to demonstrate procedural knowledge by providing a detailed curriculum vitae containing KSAs

56

INCOSE UK Systems Engineering Competencies Framework (SECF)

- Focus is on the Competencies of Systems Engineering rather than the competencies of a Systems Engineer
- Primarily covers the knowledge requirements
  - Would tend to make it process oriented
- Groupings
  - See following slides
- Assessment
  - See following slides

57

SECF Groupings

- **Systems Thinking** contains the underpinning systems concepts and the system/super-system skills including the enterprise and technology environment.
- **Holistic Lifecycle View** contains all the skills associated with the systems lifecycle from need identification, requirements through to operation and ultimately disposal.
- **Systems Engineering Management** deals with the skills of choosing the appropriate lifecycle and the planning, monitoring and control of the systems engineering process.

58

SECF Assessment

- **Awareness:** The person is able to understand the key issues and their implications.
  - They are able to ask relevant and constructive questions on the subject.
    - **This level is aimed at enterprise roles that interface with Systems Engineering and therefore require an understanding of the Systems Engineering role within the enterprise.**
- **Supervised Practitioner:** The person displays an understanding of the subject but requires guidance and supervision.
  - This level defines those engineers who are "in-training" or are inexperienced in that particular competency.
- **Practitioner:** The person displays detailed knowledge of the subject and is capable of providing guidance and advice to others.
- **Expert:** The person displays extensive and substantial practical experience and applied knowledge of the subject.

59

SECF Discussion

- Seems to be a work in process
- The four levels of competency are not in the same dimension
- The allocation of knowledge to the systems thinking competency theme does not match the cognitive skills used in the systems thinking and critical thinking professions
- While lists of abilities of within the competencies make it easy to assess compliance by checking off experience against the items on the list, the method has the same intrinsic defect as the use of KSAs

60

Use of SECF

- The SECF provides a way of setting the systems engineering knowledge requirements for jobs in a process-oriented (Type II) work environment.
- Use with care due to
  - its lack of coverage;
  - its lack of an objective way of assessing cognitive skills and individual traits;
  - its being based on the **observed role** of a systems engineer in a number of UK organisations;
    - namely the knowledge systems engineers in the UK **have**, **rather than the knowledge systems engineers need.**

61

Capacity for Engineering Systems Thinking (CEST)

- CEST is a **proposed** set of high order thinking skills that may allow early detection of a person's suitability to become a Type V systems engineer
- 38 characteristics
  - 14 cognitive characteristics,
  - 12 capabilities,
  - 9 behavioural competences
  - 3 knowledge and experience characteristics

62

Assessment discussion-1

- **Each of the ways of assessing competences has been developed as a result of a different need.**
- KSAs are designed to be used to assess the suitability of applicants for job positions.
- CEST focuses on the cognitive skills, individual traits, capabilities and knowledge and background characteristics of a systems engineer.
- CEST was developed based on a survey of what people thought were characteristics of successful systems engineers.

63

Assessment discussion-2

- INCOSE UK SECF is designed to be used to assess the systems engineering knowledge capability of organisations and individuals.
- INCOSE Certified Systems Engineer Professional (CSEP) Examination seems to be designed to be used to assess the applicant's knowledge of the contents of the INCOSE Systems Engineering Handbook.
- The INCOSE CSEP and UK SECF focus mainly on the [systems engineering] knowledge domain.
- The CSEP and SECF focus on assessing declarative and procedural knowledge and tend to produce Type II systems engineers.

64

Assessment discussion-3

- None of ways of assessing competency provides a way of differentiating between the five types of systems engineers
- Recommendation
  - A maturity model for distinguishing between the five types of systems engineers should be developed.

65

Measuring competencies (skills) of systems engineers

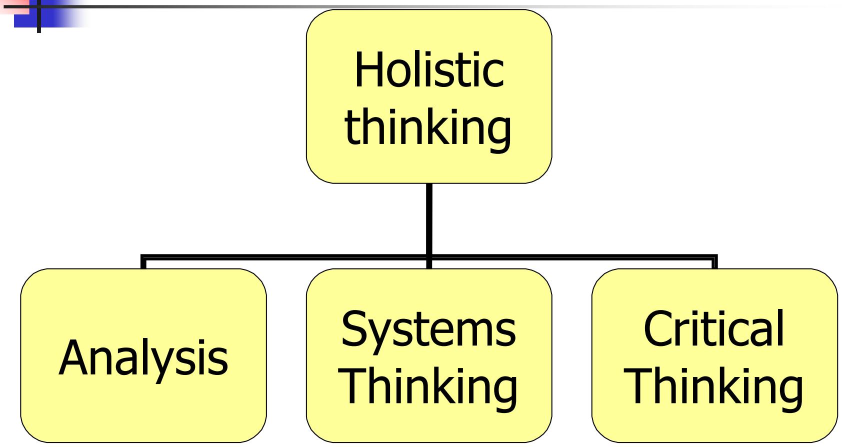
- **Knowledge**
  - Systems engineering
  - Domain
- **Holisitic thinking**
  - Analysis
  - Systems thinking
  - Critical thinking
- **Individual traits**
  - Communications leadership
  - Management
  - Etc.
- **Abilities** (requirements)
  - Type V
  - Type IV
  - Type III
  - Type II
  - Type I

Generic to professions

Exam and experience

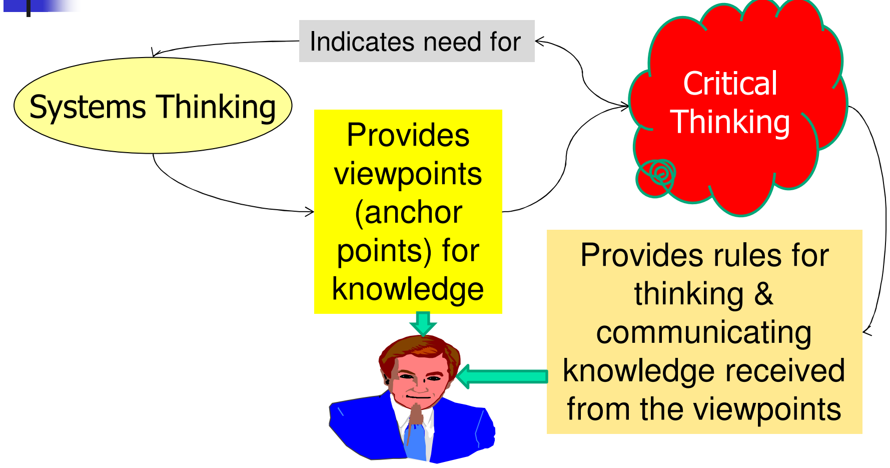
66

Holistic thinking: structural perspective



6-67

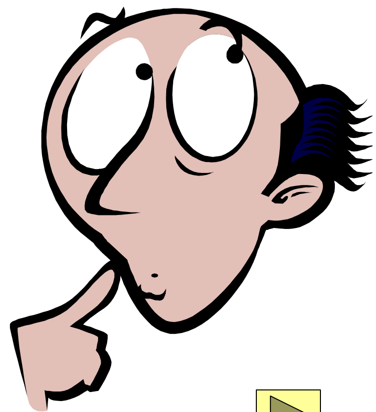
Systems thinking & critical thinking



68

(Back to cognitive characteristics) Critical thinking

- Five steps or levels*
  - 4 Strategic re-visioner
  - 3 Pragmatic performer
  - 2 Perpetual analyzer
  - 1 Biased jumper
  - 0 Confused fact finder



69

0 - Confused fact-finder

- Looks for the "only" answer
- Doesn't seem to "get it"
- Quotes inappropriately from textbooks
- Provides illogical/contradictory arguments
- Insists professor, the textbook, or other experts provide "correct" answer even to open-ended problems

70

1 - Biased Jumper

- Jumps to conclusions
- Does not recognise own biases; accuses others of being biased
- Stacks up evidence for own position; ignores contradictory evidence
  - Uses arguments for own position
  - Uses arguments against others
- Equates unsupported personal opinion with other forms of evidence
- Acknowledges multiple viewpoints but cannot adequately address a problem from viewpoint other than own

71

2 - Perpetual analyzer

- Does not reach or adequately defend a solution
- Exhibits strong analysis skill, but appears to be "wishy-washy"
- Write papers that are too long and seem to ramble
- Doesn't want to stop analysing
  - "I can look at it this way, and I can look at it that way..."
  - Wait! What about _______?"

72

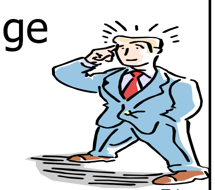
3 – Pragmatic performer

- Objectively considers alternatives before reaching conclusions
- Focuses on pragmatic solutions
- Incorporates others in the decision process and/or implementation
- Views task as finished when a solution/decision is reached
- Gives insufficient attention to limitations, changing conditions, and strategic issues
- Sometimes comes across as a "Biased Jumper", but reveals more complex thinking when prompted

73

4 – Strategic Re-Visioner

- Seeks continuous improvement/lifelong learning
- More likely than others to think "out of the box"
- Anticipates change
- Works toward construction knowledge over time



74

Proposed Maturity Model for measuring competencies of engineer-leaders

	Type I	Type II	Type III	Type IV	Type V
Knowledge					
Systems engineering	Declarative	Procedural	Conditional	Conditional	Conditional
Domain (problem solution)	Declarative	Declarative	Conditional	Conditional	Conditional
Cognitive characteristics					
System Thinking					
Descriptive	Declarative	Procedural	Conditional	Conditional	Conditional
Prescriptive	No	No	Procedural	No	Conditional
Critical Thinking	Confused fact finder	Perpetual analyser	Pragmatic performer	Pragmatic performer	Strategic re-visioner
Individual traits					
Communications	Yes	Yes	Yes	Yes	Yes
Management	No	Yes	Yes	Yes	Yes
Leadership	No	No	Yes	Yes	Yes

5-75

Benchmarking findings of Master's degrees (2000-2006)

- Knowledge component
  - Systems engineering process (Type II)
  - Requirements
  - Architecting
  - Remainder varies according to institution
    - Faculty expertise
  - Seem to be teaching cookbook approach, not an understanding of the basics
- Skills component
  - Difficult to determine
  - **Systems thinking is not taught very well in SE courses**
- Students graduate with different knowledge and skills from each institution

76

Type II systems engineering

- Approach
  - Start with a process
  - Add bolt-on processes as needed
    - Quality assurance
    - Risk management
    - Etc.
  - Follow the process
    - Go by the book
  - Institutionalize the process in Standards
- Result
  - Continuing cost and schedule overruns
  - Failure to make good on promises of the 50's and 60's
  - Linear representations
  - We need people who can write the book
    - Type V

77

More processes for the Type II cookbook approach

- Incremental modifications to acquisition process
  - Linear thinking/representation
- New processes
  - for Agile
  - For Lean
  - Type Vs are locked in Type II process mold/thinking frame
- Solution language implementation constraints
  - C4ISR, LISI
  - DODAF, MODAF

78

Final comments

- Current paradigm develops Type IIs
- Type V paradigm contains more vagueness
- Students don't like vagueness
  - They have not been taught to deal with it
  - Holistic thinking
    - Analysis, systems thinking and critical thinking
- Instructors who teach Type V style can get poorer student evaluations
  - Unless they teach Holistic Thinking first ?
- How do we educate Type V's?

79

II's don't understand V's

Dilbert 20/6/2010

80

What students want ☺

81

What does it mean to think systemically?" *

- "If you're considering something in its totality along with its characteristics as well as it's interaction with its environment AND considering its parts along with the interactions between the parts then you are thinking systemically"
- "Approach to a system with love, understand it holistically and heuristically"

* Systems Thinking Internet discussion group, June 2010

82

Topics

- The context
- Systems engineering
- The SEMP
- The TEMP
- The SHMEMP
- The Mishigas
- How we might stop the Mishigas
- Recommendations
- **Further information**

83

Further information-1

- Kasser, J. E. and Hitchins, D. K., "*Unifying the different systems engineering processes*", proceedings of the Conference on Systems Engineering Research, Hoboken, NJ., **2010.**
- Kasser, J. E., "*Seven systems engineering myths and the corresponding realities*", proceedings of the Systems Engineering Test and Evaluation Conference, Adelaide, Australia, **2010.**
- Kasser, J. E., Frank, M. and Zhao, Y. Y., "Assessing the competencies of systems engineers", proceedings of the 7th bi-annual European Systems Engineering Conference (EuSEC), Stockholm, Sweden, **2010.**
- Kasser, J. E. and Frank, M., "*A Maturity Model for the Competency of Systems Engineers*", proceedings of the International Symposium of the INCOSE, Chicago, IL., **2010**.
- Kasser, J. E., "A theoretical multi-tasking executive function for the information processing model of the human brain", proceedings of the 3rd International Conference on Applied Human Factors and Ergonomics (AHFE), Miami, FL, **2010.**

84

Further information-2

- Kasser, J. E. and Hitchins, D. K., "A framework for a systems engineering body of knowledge, 0.6," Report to the Fellows Committee, International Symposium of the International Council on Systems Engineering, Singapore, 2009.
- Kasser, J. E., Hitchins, D. and Huynh, T. V., "*Reengineering Systems Engineering*", proceedings of the 3rd Annual Asia-Pacific Conference on Systems Engineering (APCOSE), Singapore, 2009.
- Kasser, J. E., *A Framework for Understanding Systems Engineering*, Booksurge Ltd, 2007.
- Kasser, J. E., "*A Proposed Framework for a Systems Engineering Discipline*", proceedings of The Conference on Systems Engineering Research, Hoboken, NJ, 2007.
- Kasser, J. E., "*Eight deadly defects in systems engineering and how to fix them*", proceedings of the 17th International Symposium of the INCOSE, San Diego, CA, 2007.

85

Further information-3

- Kasser, J. E., "*The Hitchins-Kasser-Massie (HKM) Framework for Systems Engineering*", proceedings of the 17th International Symposium of the INCOSE, San Diego, CA., 2007.
- Kasser, J. E., "*Reducing the cost of doing work by an order of magnitude (by applying systems thinking to systems engineering)*", proceedings of 21st Centre of Excellence Workshop: Challenges for life-based systems development, Tokyo, Japan, 2006.
- Kasser, J. E. and Palmer, K., "*Reducing and Managing Complexity by Changing the Boundaries of the System*", proceedings of the Conference on Systems Engineering Research, Hoboken NJ, 2005.

- Available from: Http://therightrequirement.com

86

Summary

- The context
- Systems engineering
- The SEMP
- The TEMP
- The SHMEMP
- The Mishigas
- How we might stop the Mishigas
- Recommendations
- Further information

87

Questions and comments?

88