Module 2:
Applied systems engineering
(an introduction)
Session 3 of 5

Before discussing 'what' to do, this module helps the student understand the current state of the discipline

Version 6.1.4

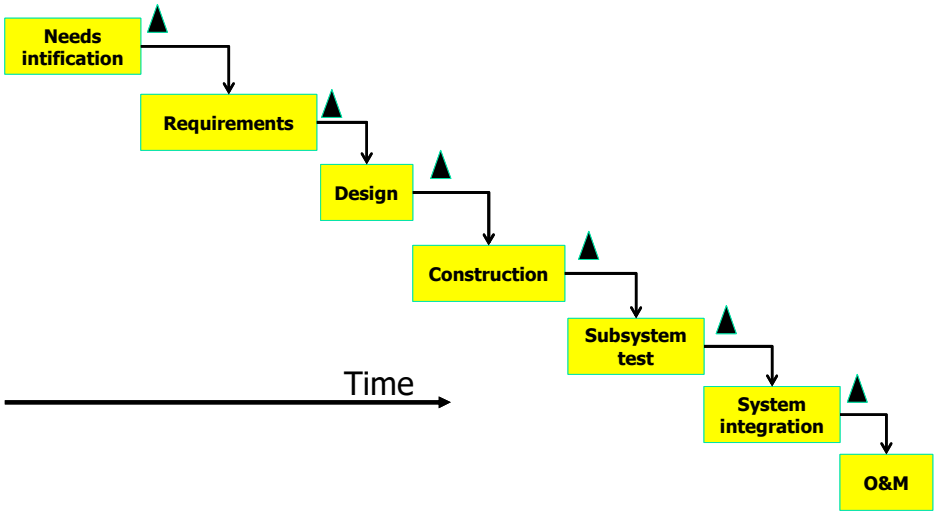
Topics

- Framing the problem
- **Systems engineering (SE) as perceived from the HTPs**
  1. *Big Picture*
  2. *Continuum*
  3. *Operational*
  4. ***Functional***
  5. ***Structural***
  6. *Generic*
  7. *Temporal*
  8. *Quantitative*
  9. *Scientific*

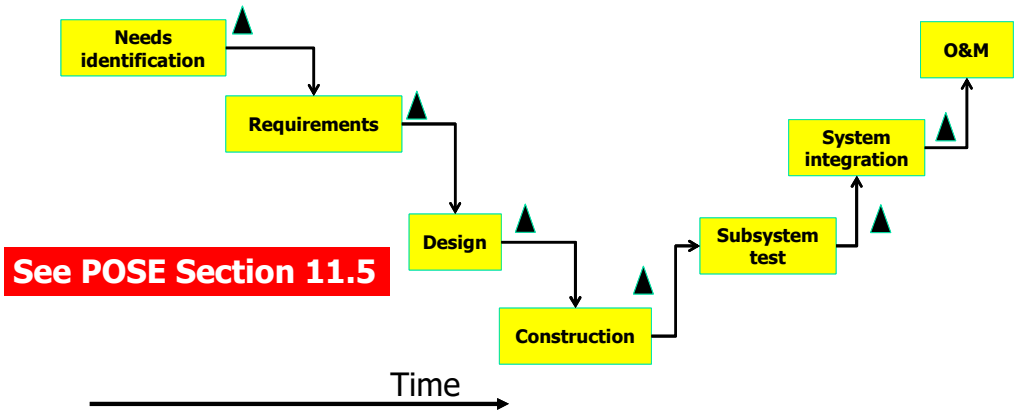
Functional perspective or Pure SE

- Systems thinking
- Holistic Thinking
  - Beyond systems thinking
- **Problem management**
  - Identification, remediation, (mitigation)
- Analysis
  - Using mathematical and other tools
  - Gaining understanding
- Synthesis
- Decision-making
  - Trade-offs
  - Hypotheses and guesses
- Communicating
  - Written and verbal
    - documents and presentations

The Waterfall view of the SDP



The V view of the SDP



See POSE Section 11.5

The Gantt chart planning view of the SDP

Needs							
Requirements							
Design							
Construction							
Subsystem test							
System integration and test							
O&M							

At planning time, times are nominal

The N² view of the SDP (ideal)

Needs	x					
	Requirements	x				
		Design	x			
			Construction	x		
				Subsystem test	x	
					System integration and test	x
						O&M

The N² view of the SDP (real-world)

Needs	x	x	x	x	x	x
	Requirements	x	x	x	x	x
	x	Design	x	x	x	x
	x	x	Construction	x	x	x
	x	x	x	Subsystem test	x	x
	x	x	x	x	System integration and test	x
	x	x	x	x	x	O&M

- Changes may cause return to previous states

The Testing view of the SDP

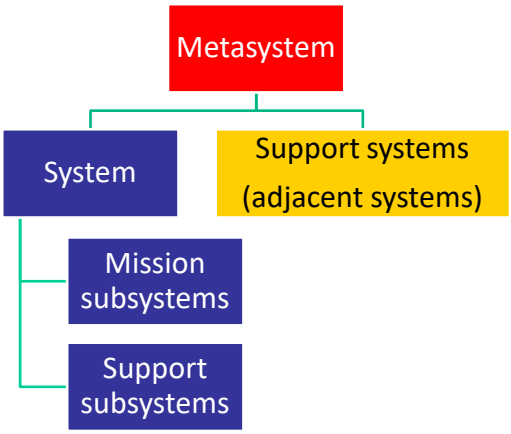
Needs						
o	Requirements					
o		Design				
o			Construction			
o		v		Subsystem test		
o	v				System integration and test	
v						O&M

Move the lower rows accross to the corresponding v and you have a V view

Structural perspective

- Definitions
  - Multiple definitions of systems engineering
- Standards
- People
- Tools
- Is systems engineering a discipline?
  - Pure and applied systems engineering
- Lack of a framework

Generic structure (template) of a system



Exercise 2-31

1. Examine the waterfall, spiral and V models of systems engineering (use material from outside this course as needed) from the *Continuum* and *Generic* HTPs
2. Note your findings for each model using the HTPs as an Idea Storage Template (IST)
3. Prepare and present (<5 minutes)
    1. Problem formulated according to the COPS problem-formulation template
    2. Compliance matrix
    3. This slide
    4. Version of Session
    5. The differences and similarities between the three models
    6. Conclusions from exercise
    7. Lessons learned from session
        - With source (lecture, reading, exercise, etc.)
4. Save as a PowerPoint file as Exercise2-31abcd.pptx
5. Post/email presentation as, when and where instructed

Exercise 2-32 knowledge reading

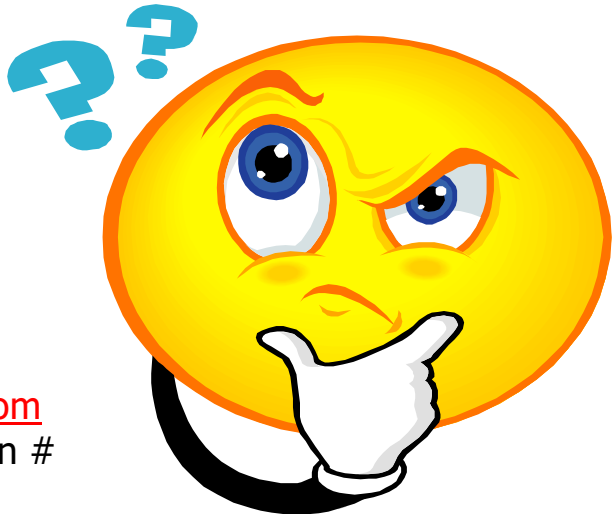
1. Prepare a brief on two main points in reading 0206 (< 5min)
2. Presentation to contain
    1. Formulated problem per COPS problem formulation template
    2. A summary of the content of the reading (<1 minute)
    3. The compliance matrix
    4. This slide and lesson version number
    5. A list of the main points
    6. The two briefings
    7. Reflections and comments on reading (<2 minute)
    8. Comparisons of content with other readings and external knowledge
    9. Why you think the reading was assigned to the module
    10. Lessons learned from module and source of learning e.g. readings, exercise, experience, etc. (<2 minutes)
3. Save as a PowerPoint file as Exercise2-32-abcd.pptx
4. Post/email presentation as, when and where instructed
5. Brief on one main point

Exercise 2-33 knowledge reading

1. Prepare a brief on two main points in reading 0207 (< 5min)
2. Presentation to contain
    1. Formulated problem per COPS problem formulation template
    2. A summary of the content of the reading (<1 minute)
    3. The compliance matrix
    4. This slide and lesson version number
    5. A list of the main points
    6. The two briefings
    7. Reflections and comments on reading (<2 minute)
    8. Comparisons of content with other readings and external knowledge
    9. Why you think the reading was assigned to the module
    10. Lessons learned from module and source of learning e.g. readings, exercise, experience, etc. (<2 minutes)
3. Save as a PowerPoint file as Exercise2-33-abcd.pptx
4. Post/email presentation as, when and where instructed
5. Brief on one main point

Any questions ?

1. Best
2. Worst
3. Missing



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