How to write good requirements
Module 4 of 10
Converting stakeholder wants to needs
Session 2 of 2

Version 1.2.7

Knowledge components

- Lecture
  - Sets the context and provides overview
- Readings
  - ~~0402 Systems Thinker's Toolbox Section 13.1: Checkland's Soft System Methodology~~
  - 0403 Kasser, J.E., Applying Holistic Thinking to the Problem of Determining the Future Availability of Technology, IEEE Transactions on Systems, Man, and Cybernetics: Systems, Volume 46, Number 3, 2016.
- Exercises
  - ~~4-11 Scenarios to requirements~~
  - 4-21 Knowledge reading 403 (optional)

Module topics

- Converting wants to needs
- An introduction to Misuse Functions (risks and risk management)
- **Prioritization of needs**
- Converting needs to functions
- Scoping for affordable cost and realistic schedules
- Ways of influencing stakeholders
- When the need is for COTS
- Exercises

Why prioritize?

- Value for money spent
- Identify relative importance
- Schedule planning
    - Implement high priority needs early in program
- Contingency planning
    - Budget cuts
    - Feasibility issues

How to prioritize

- Use decision-making tools appropriate to the situation and number of requirements
- Quantitative and qualitative
    - Decision Trees (STT 4.6.1)
    - Multi-attribute Variable Analysis (MVA) (STT 4.6.2)
    - Ordering and Ranking (STT 4.6.3)
    - Pair-wise Comparison (STT 4.6.4)
        - useful with stakeholders who are not sure
    - Perfect Score (STT 4.6.5)
    - Pugh Matrix
    - Best Guess

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What' next?

- Traditional approach
  1. Convert the quantified needs scenarios to system requirements
  2. Write system requirements
  3. Estimate cost and schedule to implement requirements (ideal)
  4. Adjust for feasible schedule and affordable cost (ideal)
  5. Do some risk management
  6. Create
     1. Project Plan (PP) or Systems Engineering Master Plan (SEMP)
     2. Test and Evaluation Master Plan (TEMP)
     3. Other appropriate documents

- Systems approach
  1. Add quantified misuse scenarios (risk management)
  2. Estimate cost and schedule to implement need scenarios
  3. Prioritize needs
  4. Adjust for feasible schedule and affordable cost
  5. Write good system requirements
  6. Create
     1. Project Plan (PP) or Systems Engineering Master Plan (SEMP)
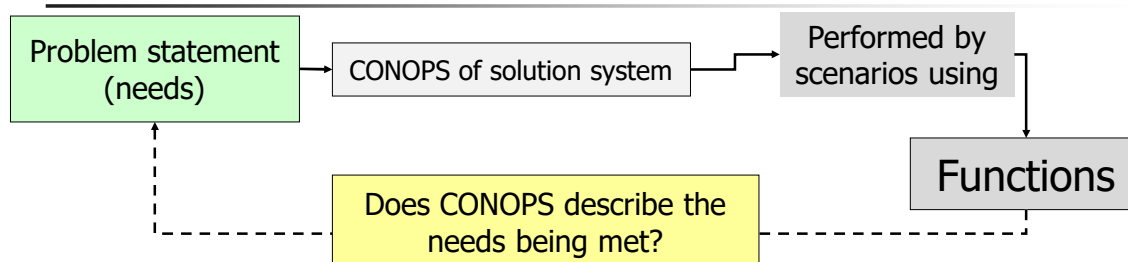   2. Test and Evaluation Master Plan (TEMP)
     3. Other appropriate documents

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Converting needs to functions

Problem statement (needs) → CONOPS of solution system → Performed by scenarios using → **Functions**

Does CONOPS describe the needs being met?

- Do for all needs
- Join scenarios into a representation
- Assign identification to scenarios
- Ensure no (minimal) missing scenarios
- Group scenarios into functions
- Ensure misuse functions are prevented/mitigated (risk management)

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At this time

- All needs are stored in a set of functional scenarios
    - Mission and support product/system
    - Acquisition process (build/buy) and transition
- Remove contradictions and duplications from set of scenarios
- Perform appropriate feasibility studies
    - Technical
    - Cost
    - Schedule
- Adjust until affordable and achievable within time constraints
    - Remove needs or add costs and schedule time

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Estimating schedules and costs

- Project management
- Work to be done from process transition model
- Schedules are based on need-by dates and resource availability
    - Personnel, specialized capital equipment, etc.
- Costs are based on schedules
    - Salaries (hours * $/hour) + materials + overhead
    - Produces pre-baseline estimates
- Estimate 1: Pre-baseline estimate of real cost and schedule of needed system

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Two ways of scoping cost and schedule

1. Iterate until feasible, acceptable and affordable (with customer)
   - Remove low priority (and high cost) needs
   - Adjust schedule
   - Alternatively, increase priority and cost, and extend schedule
   - Let customer explain why (any) needs were removed to remaining stakeholders
   - Baseline
     - Estimate 2: Cost of affordable system (customer is willing to pay for)
2. Truth or consequences
   1. Use Real Estimate 2 to bid low
      - To get the contract (true cost or schedule being unnacptabble)
      - To enter new market, or attract new customer
      - To make it up on changes
      - Once the incomplete project runs out of funds or time, hope customer will agree to pay excess or extend the schedule

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- **Ways of influencing stakeholders**
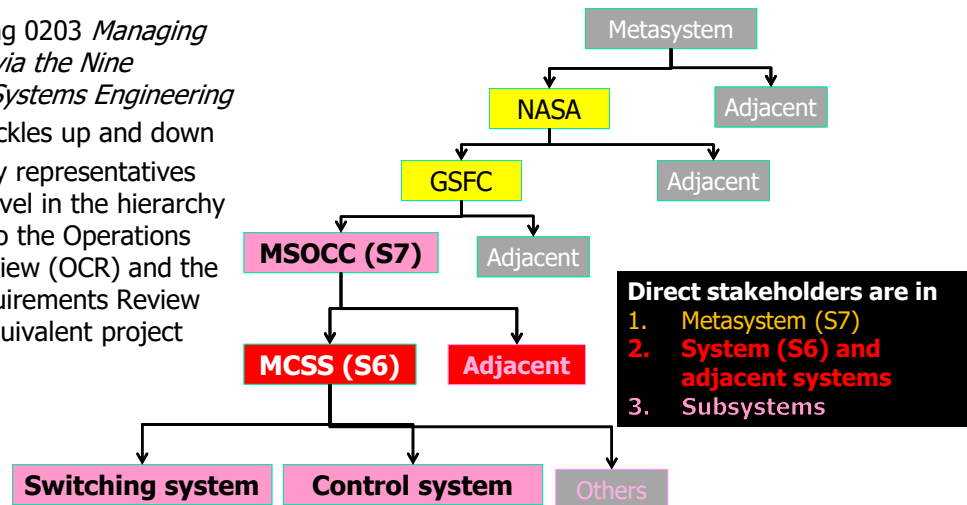- When the need is for COTS
- Exercises

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Influencing direct/indirect stakeholders

- From Reading 0203 *Managing Complexity via the Nine Systems in Systems Engineering*
- Influence trickles up and down
- Which is why representatives from each level in the hierarchy are invited to the Operations Concept Review (OCR) and the System Requirements Review (SRR) (or equivalent project milestones)

```
                    Metasystem
                   /          \
                 NASA        Adjacent
                /    \
             GSFC     Adjacent
            /    \
      MSOCC (S7)  Adjacent
          |
     MCSS (S6)    Adjacent
      /   |   \
```

Switching system | Control system | Others

Direct stakeholders are in
1. Metasystem (S7)
2. **System (S6) and adjacent systems**
3. Subsystems

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Three ways to influence stakeholders*

1. Gentle persuasion for mild or unintentional resistance
2. Trade to align interests and commitments
3. Power play to overcome significant resistance

* Kambil Ajit, influencing stakeholders: Persuade, trade, or compel, https://www2.deloitte.com/us/en/insights/focus/executive-transitions/influencing-stakeholders.html, accessed 12 September 2023

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Influencing the stakeholders-1

- Building and maintaining relationships with stakeholders
  - Is a continuing process
  - Requires time, patience, and a genuine commitment to their interests
  - Often relies on your ability to create a sense of trust and collaboration, ensuring that all parties feel their concerns and interests are considered and addressed
  - Does not end once the requirements are written
  - Needs to be customized to the project

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Influencing the stakeholders-2

1. Identify and understand your stakeholders:
   1. Create an appropriate list of all the stakeholders involved. The more influential the more information
   2. Analyze their interests, needs, and concerns
   3. Understand what motivates them and what they value
2. Build strong relationships:
   1. Establish open and honest communication channels with stakeholders
   2. Actively listen to their feedback and concerns
   3. Show empathy and respect for their perspectives
3. Communicate clearly and transparently:
   1. Use simple and understandable language, avoiding jargon
   2. Continuously update them on progress, but
   3. Customize your communication style and approach to suit each stakeholder
      - Some stakeholders may prefer regular updates, while others may not

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Influencing the stakeholders-3

4. Address concerns and objections:
    - Be prepared to address questions, concerns, or objections from stakeholders
    - Provide evidence or data to support your arguments
    - Avoid a confrontational or win-lose mindset
5. Demonstrate credibility and expertise:
    - Showcase your knowledge and expertise in the subject matter
    - Build trust by delivering on your promises and commitments
    - Don't be arrogant or boring
6. Keep records:
    - Use emails to confirm agreements and other pertinent information
    - Maintain a record of all communications and agreements with stakeholders
    - This helps in accountability and ensures that commitments are met
7. Avoid the bad you have experienced or read/heard about
    - If you didn't like it, the probability is others won't like it as well

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Build - buy

- If need can be met by a cost effective purchase of a Commercial Off-The-Shelf (COTS) product
    - Need is for all or part of the COTS functionality
- Watch out for technical obsolescence
    - See 0403 Kasser, J.E., Applying Holistic Thinking to the Problem of Determining the Future Availability of Technology, IEEE Transactions on Systems, Man, and Cybernetics: Systems, Volume 46, Number 3, 2016.
- Specifying current version
    - Can end up with obsolescent systems
- Specifying current version or later
    - Can end up with incompatibilities
- Always specify product, and version (at least, equivalent, or better)

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Exercise 4-21 knowledge reading (optional)

1. Prepare a brief on two main points on reading 0403 (< 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 the version number of the session
    5. 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 Exercise4-21-abcd.pptx
4. Post/email presentation as and where instructed
5. Brief on one main point

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Meeting the objectives

#	Objectives	Met
1	Explained how to convert stakeholder functional and performance "wants" to "needs"	16-21
2	Explained the difference between functions and misuse functions	23-28
3	Introduced risk management	29-35
4	Explained three ways to maximize the completeness of the needs	21
5	Explained need for prioritization of needs and how to prioritize them	37-38
6	Explained how to influence the stakeholders to want the system they need	46-50
7	Explained how to determine if the need is for COTS equipment	52
8	Provided the opportunity to exercise 5 levels of knowledge in the updated Blooms taxonomy	54-56

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Any questions ?

1. Best

2. Worst

3. Missing

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Subject: <class title> BWM Module #

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