INCOSE Webinar Series

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Need help with Requirements? What you need to know, about the upcoming Requirements Manual and Guides from INCOSE.

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What Problem are We Solving

- There is a gap in guidance on how to perform several key requirements activities
  - Managing requirements, especially large sets
  - Organizing and managing Verification and Validation (V&V)
- INCOSE Requirements Working Group (Tami Katz, chair)
  - One manual and two guides being developed to fill this gap
  - Will be aligned with existing product, “Guide to Writing Requirements”
  - Lou Wheatcraft, RWG Co-chair and manual lead author

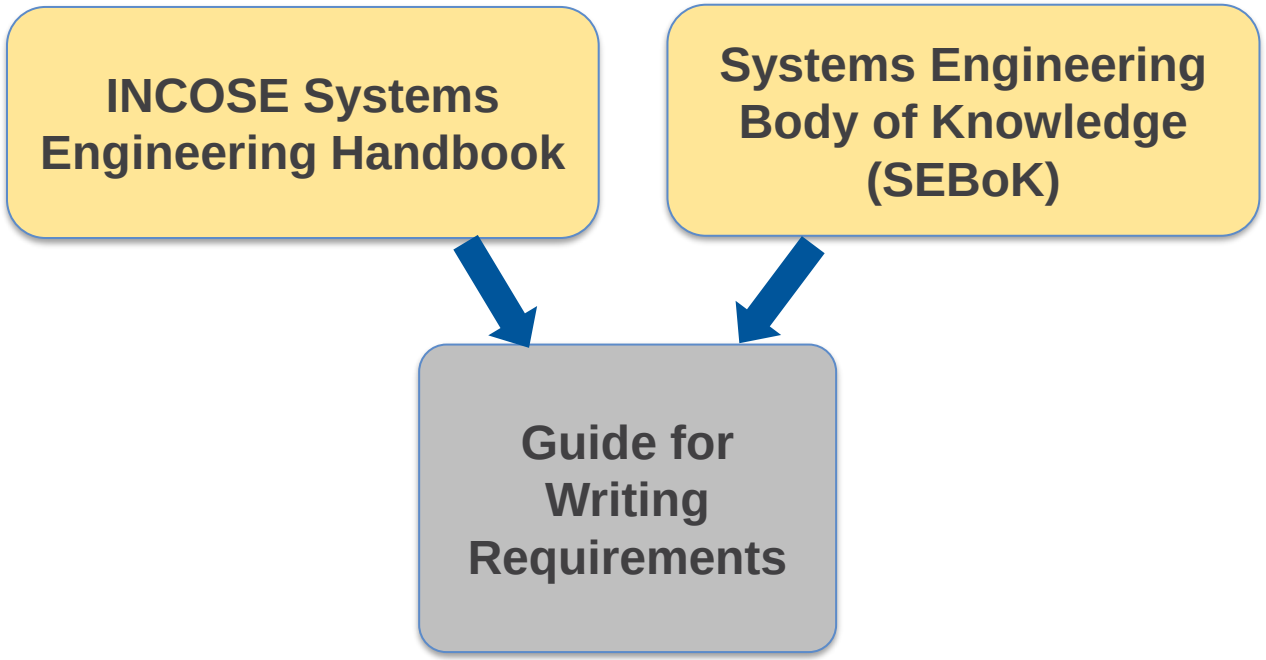
Two guides and one manual are currently in development. All will align with each other.

Outline

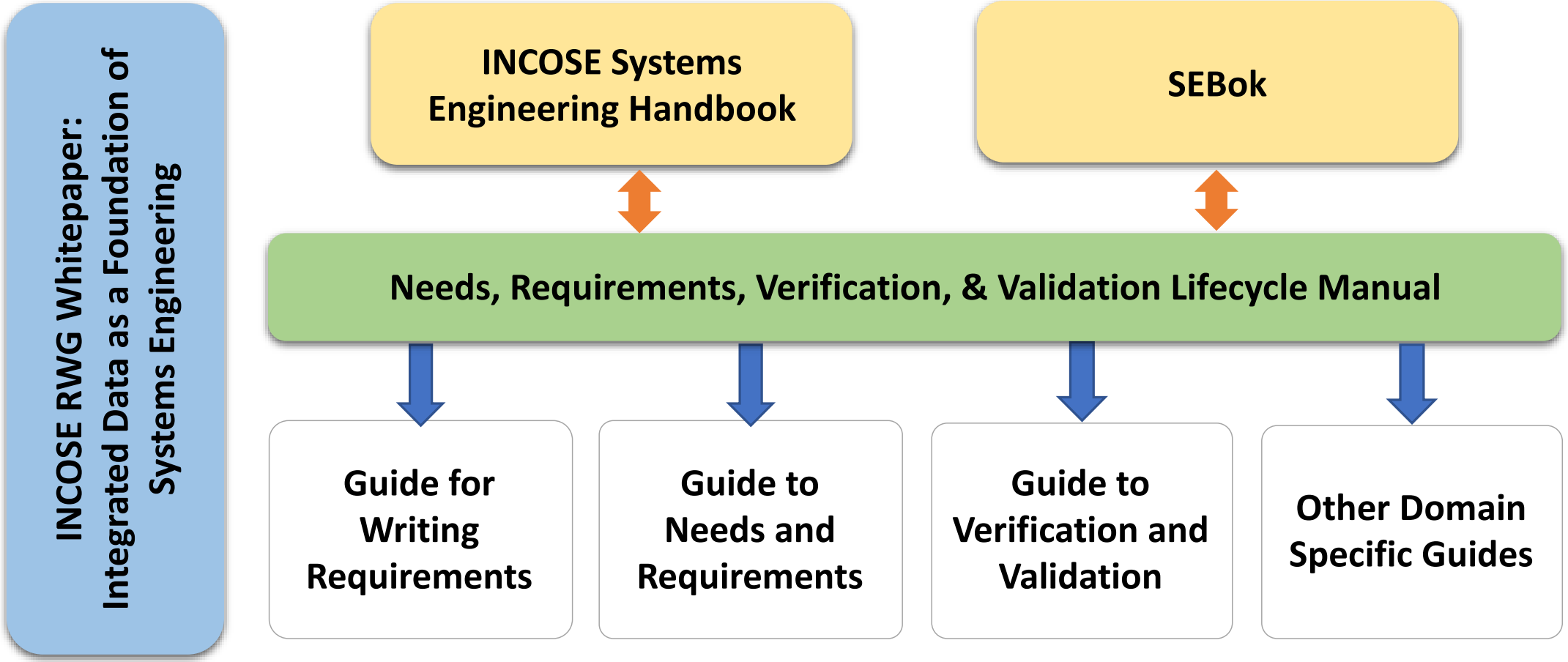
- Evolution of manual and two guides
- Introduction of terminology and context
  - Systems Vee
  - New Diagrams
- High-level outline of manual
  - Guide breakout

What Exists Today

- Two main sources for reference
  - INCOSE's own SE Handbook
  - SE Body of Knowledge (SEBoK)
- Existing INCOSE *Guide for Writing Requirements*



Current Approach Provides Full Coverage



Mapping of Common SE Terms

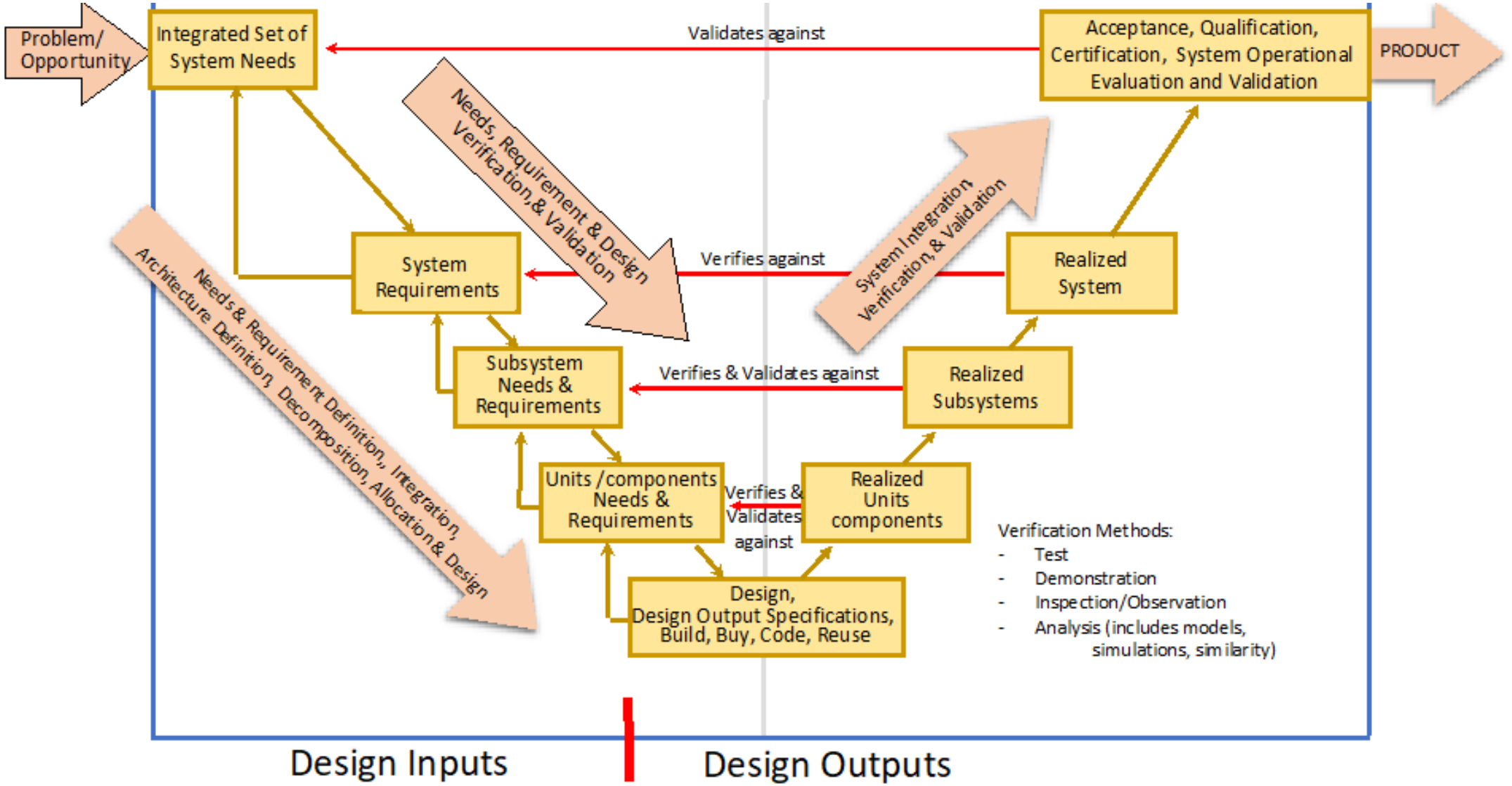
Idea is to "***transform***" from one stage to the next

Common Term	New Term
CONOPS, Goals	Integrated set of Needs
Requirements	*Design Input Requirements*
Design	*Design Output Requirements or Specifications*
Product, part, component	*System (or component) of Interest (SOI)*

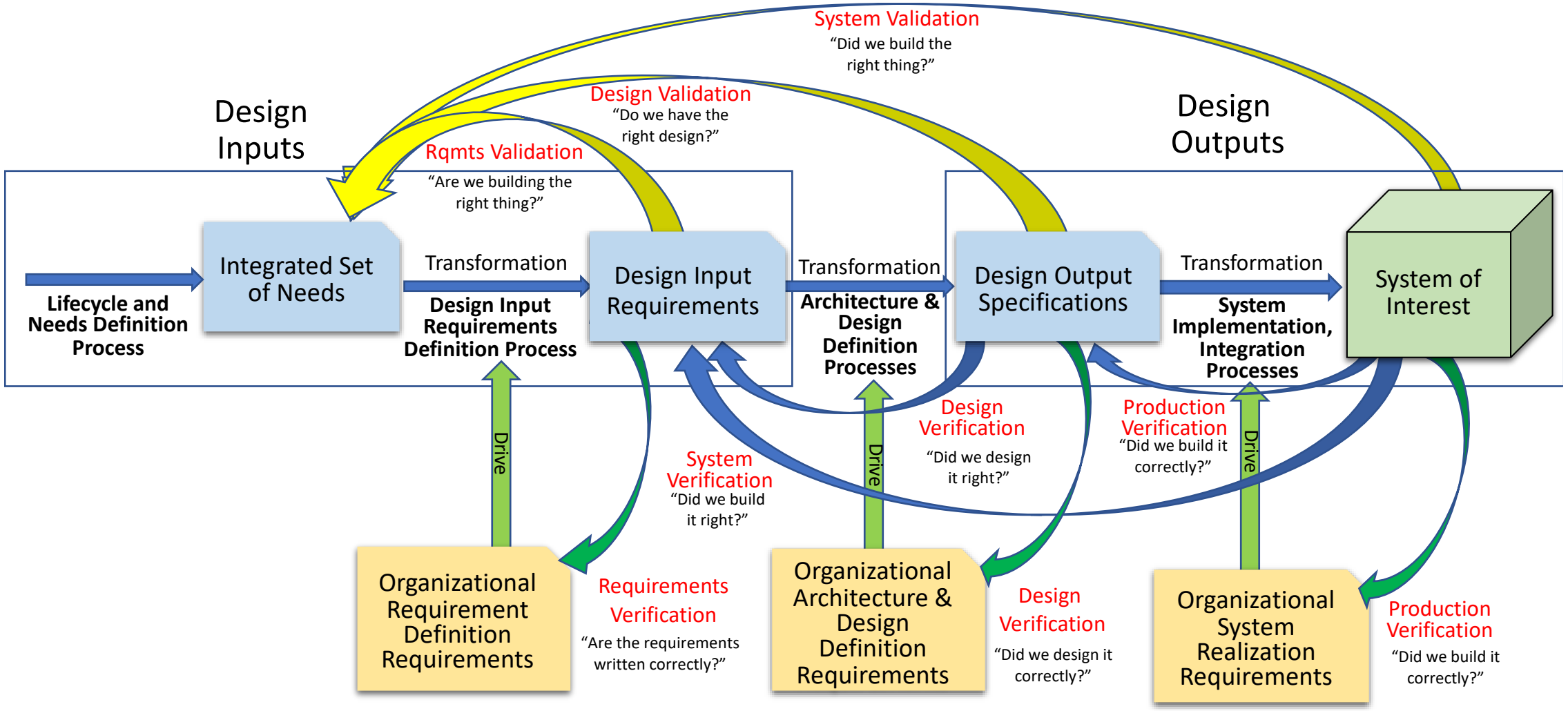
Same ideas, standardized vocabulary will facilitate communication, and help forward the technical work

Systems Vee Evolves

- The Vee we are familiar with still holds true
- If we draw the Vee out into a straight line, left to right …
- We can *open up our model* to more clearly show the process
  - Including V&V early-on
  - Easier to see the difference between Verification and Validation
- This model used throughout manual, guides



Adapted from Ryan, M. J.; Wheatcraft, L.S., "On the Use of the Terms Verification and Validation", February 2017 and INCOSE SE HB, Version 4, Figures 4.15 & 4.19



Derived from Ryan, M. J.; Wheatcraft, L.S., "On the Use of the Terms Verification and Validation", February 2017

Systems Engineering Model for NRVVLM

On the Left - Going Back Further: Lifecycle Concepts

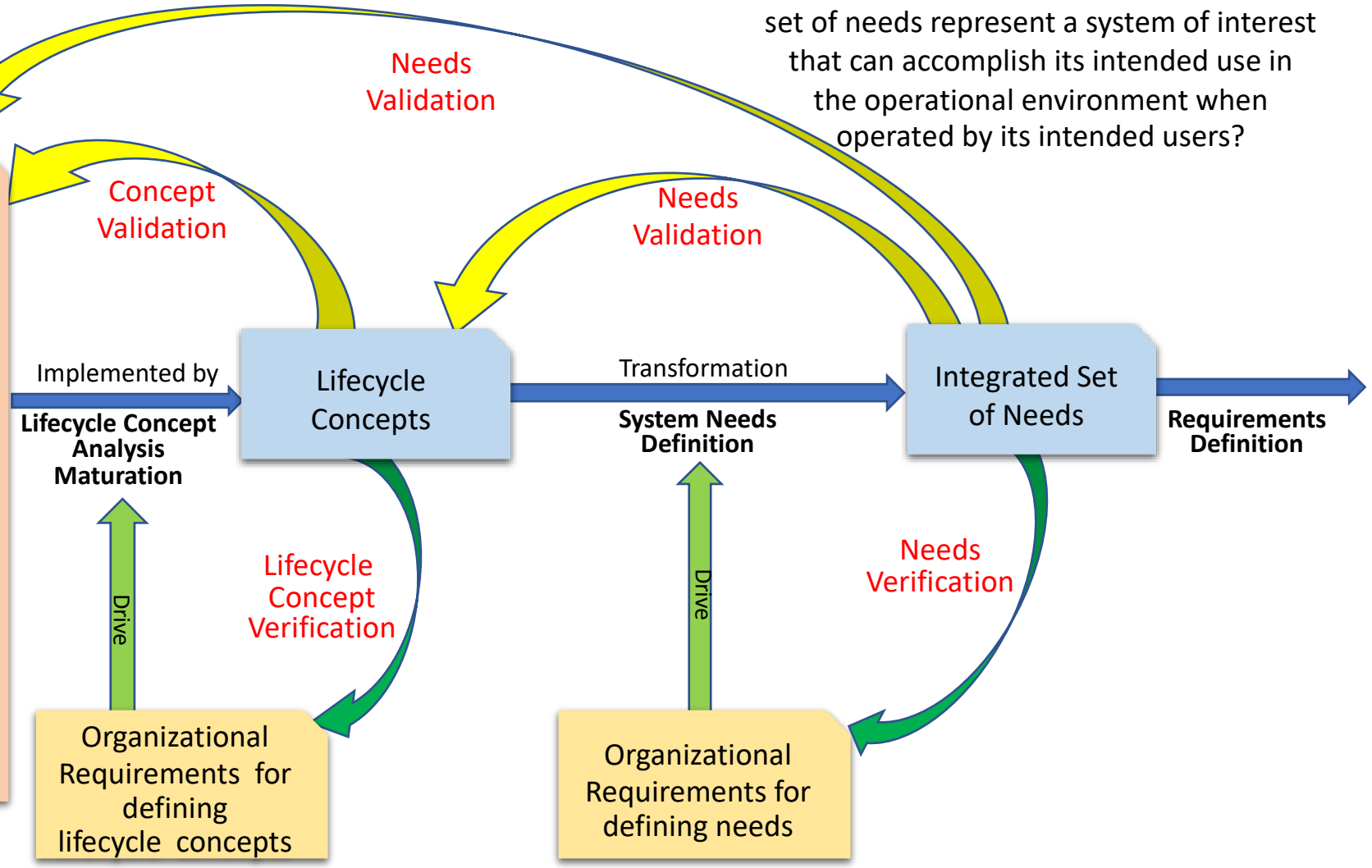
- What are “System Needs”, and where do they come from?
  - Parent needs
  - Drivers and constraints
  - KPPs
  - Measures of Effectiveness
- Lifecycle Concepts
  - Mission
  - Use cases
  - User stories
  - Goals
  - Objectives
  - Concept of Operations (CONOPS)

Can perform V&V on both the needs and the lifecycle concepts

Do the lifecycle concepts and integrated set of needs represent a system of interest that can accomplish its intended use in the operational environment when operated by its intended users?

- Problem or opportunity Mission, goals, objectives
- MOE's, MOPs, TPMs, KPPs
- Preliminary stakeholder needs & requirements
- Use cases, user stories, system concepts, OpsCon, ConOps
- Higher level Needs
- Higher level Requirements
- Higher level lifecycle concepts
- Drivers & constraints,
  - External systems
  - Standards
  - Regulations
  - Technology
  - Operating Environment
- Risks

Business & Mission Analysis Processes



Outline of Needs, Requirements, V&V Manual

Outline of Manual

- General Sequence
  - Needs
  - Requirements
  - Design
  - System, SOI, Produced Product
- Guides reflect the overall NRVVLM outline
  - Guide to Needs and Requirements: first half of manual
  - Guide to Verification and Validation: second half

The concepts are covered in the NRLM; the Guide provides process steps and some examples to show how the concepts might look

Each Guide Covers Half of NRVVLM

- First Half: Guide to Needs and Requirements
  - Needs elicitation and creation
  - Requirements development
  - Requirements management
  - Needs and requirements V&V – in particular, validation
- Second Half: Guide to V&V
  - Picks up with the design (design output specifications)
    - Drawings, logic flow, prints
    - Design is then verified, and validated
  - System (built or coded product) V&V follows

NRVVLM Outline;

Green Ital. is GtNR, **Blue bold is GtVV**

- 1. Introduction
  - Purpose, scope, and definition of process areas
- 2. Definitions and Concepts
  - Includes types: organizational, business unit, programmatic, technical
- 3. Information-Based Requirement Development and Management
  - Expands beyond ‘text-based’ requirements; models, diagrams
- *4. Lifecycle Concepts and Needs Definition Process*
  - *From fuzzy ideas of a concept, to a defined set of needs*
- *5. Needs Verification and Needs Validation*
  - *Verification and validation of the needs statements*

NRVVLM Outline

- *6. Design Input Requirements Definition Process*
  - *Creating the "requirements" for a product or system, from needs and more*
- *7. Design Input Requirements Verification and Requirements Validation*
  - *Performing a verification on the requirements statements and diagrams per se*
- **8. Design Verification and Design Validation Process**
  - **Creating, verifying, then validating**
- **9. Production Verification**
  - **Short section, most of this covered in an organizations Quality Mgmt. System**
- **10. System Verification and System Validation Common Principles**
  - **Now dealing with built product and SOIs**

NRVVLM Outline

- **11. System Verification and Validation Process**
  - **Verifying the SOI to input requirements, validating it to needs**
- **12. The Use of Off-The-Shelf System Elements**
- **13. Supplier-Developed Systems and System Elements**
- 14. Needs, Requirements, and V&V Management Process
  - Plans, monitoring, communication, change management, interface management
- 15. Attributes for Needs and Requirements
  - Needs, requirements, V&V, management attributes, guidance for use
- 16. Features a Systems Engineering Toolset Should Have
  - Functionality, attributes, reporting capability, other considerations

Guidance is On The Way!

- Multiple guides answer the SE community's request
  - Goes beyond current Guide to Writing Requirements
  - More detail provided than SE Handbook, SEBoK
  - Multiple documents provide different levels of detail and background
  - **Goal is to make our work as complete as possible, and accessible**
- Team effort
  - Over 20 different contributors and reviewers
  - Four different document leads
  - RWG participation at IS and IW

Large volume of new work will benefit SE community across disciplines
Target is to release the documents by Jan 2022.

RWG Leadership

- **Chair**: Tami Katz; Ball Aerospace, USA
- **Co-Chair**: Lou Wheatcraft, Wheatland Consulting, USA
- **Co-Chair**: Rick Zinni, Harris Corp, USA
- **Co-Chair**: Mike Ryan, Univ. of New South Wales, Retired

- **INCOSE Connect address:**
- **https://connect.incose.org/WorkingGroups/Requirements/Pages/Home.aspx**

The RWG is comprised of members from industry and academia with a common purpose of improving the practice of systems engineering through improvement of **Needs and Requirements** definition and management

YouTube Channel, “INCOSE RWG”

- What is the new paradigm? Details on the drawings:
  - https://www.youtube.com/watch?v=ZRli_wSCmRg
- Guide to V&V (IW2021)
  - https://www.youtube.com/watch?v=_33sZ0IntwY
- What is the RWG all about?
  - https://www.youtube.com/watch?v=L_Z6XitproI
- Overview of the manual
  - NRVVLM: https://www.youtube.com/watch?v=g_fJk_UBONM
- Integrated Data piece
  - https://www.youtube.com/watch?v=Rc3O6lPO5x4

Follow Up

- Questions:
  - Raymond.Wolfgang@incose.net
  - Any member of RWG leadership
- Full INCOSE members can join the RWG
  - Need to login to INCOSE-Connect site

Joining the RWG

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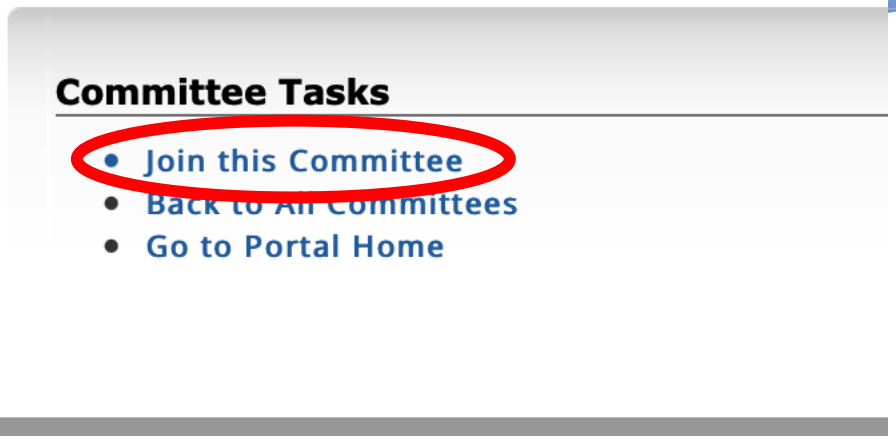

Product Line Engineering	151	(view)
Professional Development Initiative	33	(view)
Profl Development Steering Grp	29	(view)
Publications	1	(view)
Publications Office	4	(view)
Requirements	382	(view)
Resilient Systems	73	(view)
Risk Management	111	(view)

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