Achieving Designs that Satisfy Stakeholders Through Better Requirements

Tami Katz

Presentation Objectives

- This presentation will demonstrate how INCOSE material can be used to help with the requirements development process, leading to a system development effort that satisfies stakeholder expectations.

- Discussion will include:
    - Traditional requirements processes and associated challenges
    - Highlights from the International Council on Systems Engineering (INCOSE) Needs and Requirements Manual (NRM) with proposed approaches to engineer requirements that enable development of a system which satisfies its stakeholders.
    - Examples for a sample project

INCOSE Requirements Working Group and Products

INCOSE Requirements Working Group

- **Purpose:** A volunteer INCOSE working group with the objective to advance practices, education, and theory of needs and requirements development and management as related to other systems engineering activities.

- **Chair**: Tami Katz; Ball Aerospace, USA

- **Co-Chair**: Lou Wheatcraft; Wheatland Consulting, USA

- **Co-Chair**: Mike Ryan; Capability Associates Pty Ltd, AU

- **Co-Chair**: Raymond Wolfgang; Sandia National Labs, USA

- **INCOSE Websites:**
  - https://www.incose.org/incose-member-resources/working-groups/process/requirements
  - https://connect.incose.org/WorkingGroups/Requirements/Pages/Home.aspx
  - https://www.youtube.com/channel/UCadgYaqKWDckenP2SU8-cPw

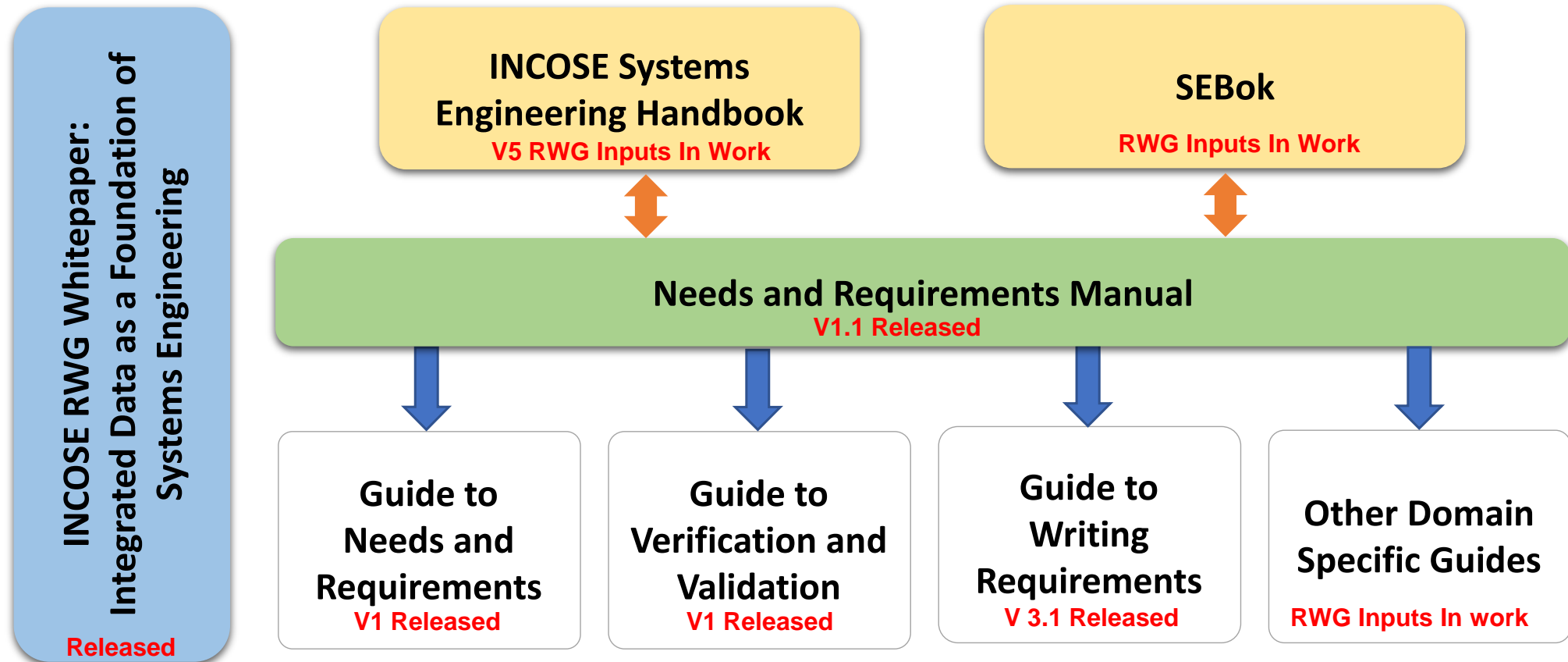- **Number of Members:** 402 (one of INCOSE's largest WG)

RWG is About…

- How to improve the practice of systems engineering through excellence in needs and requirements development and management across the lifecycle

- Learning from experiences and sharing with the SE community

- Questioning approaches that yield poor outcomes

- Publishing guidance and continuing research into requirements development and management, including the understanding of Needs, Requirements, Verification, and Validation
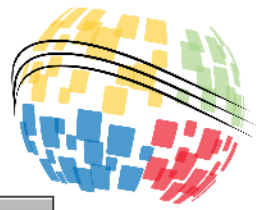
INCOSE RWG Product Tree

- The RWG has been working on new products in alignment with other INCOSE publications

INCOSE RWG Whitepaper: Integrated Data as a Foundation of Systems Engineering

Released

INCOSE Systems Engineering Handbook
V5 RWG Inputs In Work

SEBok
RWG Inputs In Work

Needs and Requirements Manual
V1.1 Released

Guide to Needs and Requirements
V1 Released

Guide to Verification and Validation
V1 Released

Guide to Writing Requirements
V 3.1 Released

Other Domain Specific Guides
RWG Inputs In work

RWG Products are in the INCOSE Store!

- RWG Products are released in the [INCOSE Store](#).
- Free to INCOSE members and CAB associates!
- All are encouraged to download and start using, feedback is welcome!
- This presentation will provide content from the Needs and Requirements Manual (NRM).
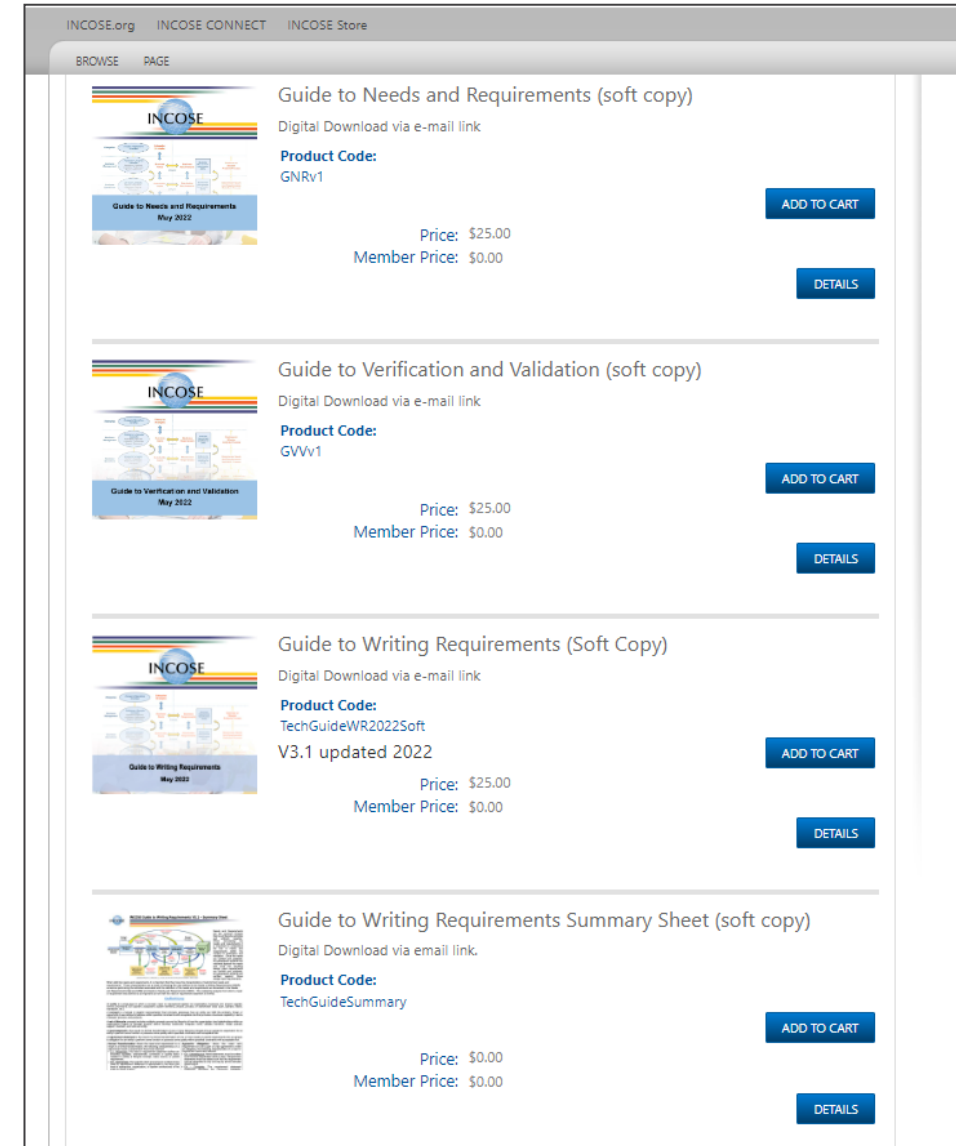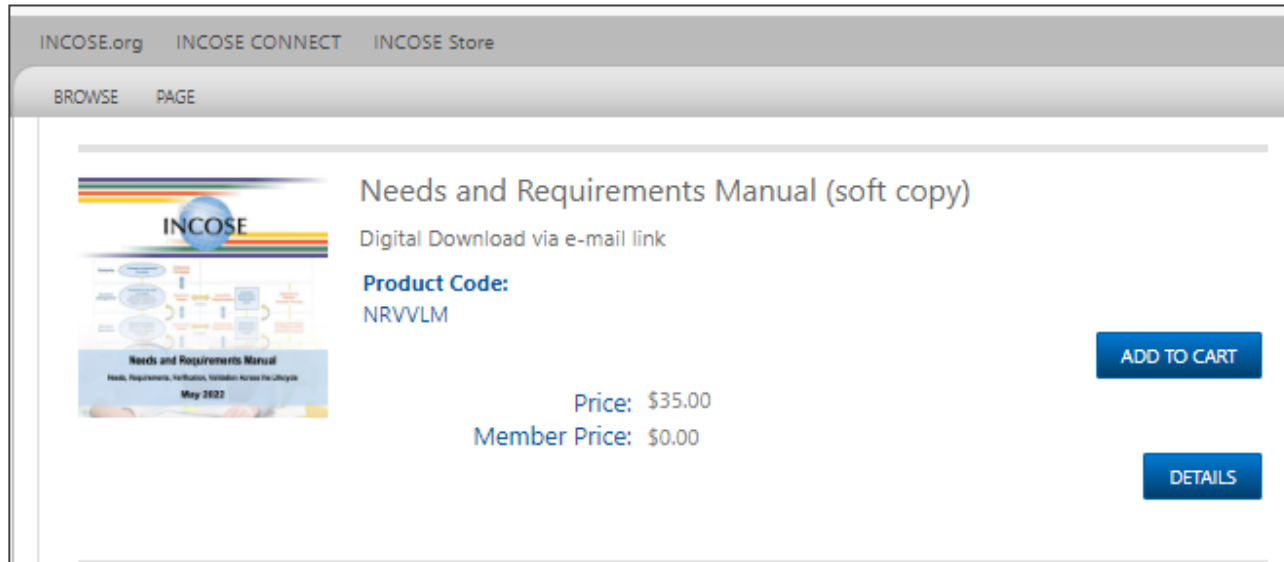
Current Systems Engineering Technical Processes

Systems Engineering Standards

- IEEE/ISO/IEC 15288 is a technical standard in systems engineering which covers processes and lifecycle stages, developed by the International Organization for Standardization and the International Electrotechnical Commission.

- IEEE/ISO/IEC 29148-2018 was generated to further elaborate the engineering activities that result in requirements for systems and software products (including services) throughout the lifecycle and provides guidelines for applying the requirements and requirements-related processes described in ISO/IEC/IEEE 15288.

- The INCOSE Systems Engineering Handbook and INCOSE guides also provide additional guidelines for applying 15288, which will be expanded upon in this presentation.

INTERNATIONAL STANDARD

ISO/IEC/ IEEE 15288

First edition 2015-05-15

Systems and software engineering — System life cycle processes

Ingénierie des systèmes et du logiciel — Processus du cycle de vie du système

ISO 15288 SE Processes

- ISO/IEC/IEEE identifies four systems engineering process groups; system development is based on the technical processes.
- Per the INCOSE SE Handbook, a process is an integrated set of activities that transforms inputs to desired outputs.
- These processes are performed iteratively and recursively throughout the development lifecycle (not just in a linear fashion).
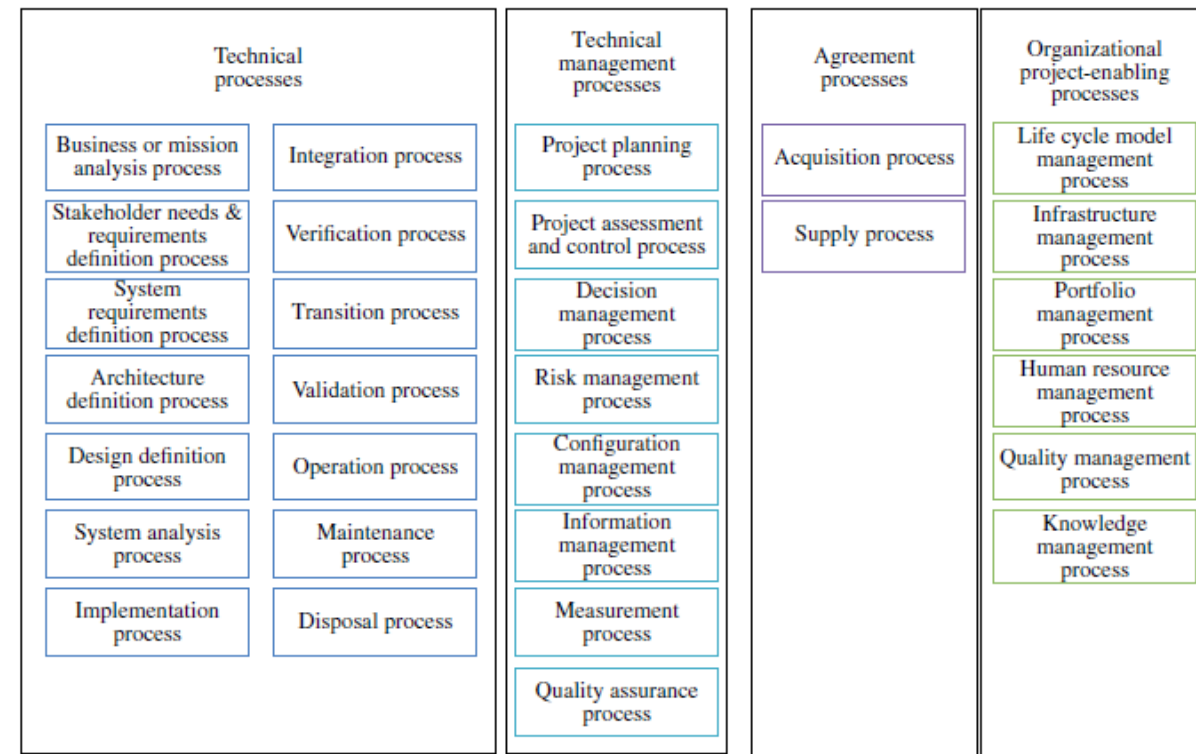- How these processes are implemented can greatly impact the outcome of the developed system!

Technical processes		Technical management processes	Agreement processes	Organizational project-enabling processes
Business or mission analysis process	Integration process	Project planning process	Acquisition process	Life cycle model management process
Stakeholder needs & requirements definition process	Verification process	Project assessment and control process	Supply process	Infrastructure management process
System requirements definition process	Transition process	Decision management process		Portfolio management process
Architecture definition process	Validation process	Risk management process		Human resource management process
Design definition process	Operation process	Configuration management process		Quality management process
System analysis process	Maintenance process	Information management process		Knowledge management process
Implementation process	Disposal process	Measurement process		
		Quality assurance process		

FIGURE 1.1 System life cycle processes per ISO/IEC/IEEE 15288. This figure is excerpted from ISO/IEC/IEEE 15288:2015, Figure 4 on page 17, with permission from the ANSI on behalf of the ISO. © ISO 2015. All rights reserved.

Figure from INCOSE Systems Engineering Handbook, V4

The first three technical processes are responsible for establishing the overall requirements for a system of interest.

ISO 15288 SE Processes

[6.4] The Technical Processes are used to define the requirements for a system, to transform the requirements into an effective product, to permit consistent reproduction of the product where necessary, to use the product to provide the required services, to sustain the provision of those services and to dispose of the product when it is retired from service.
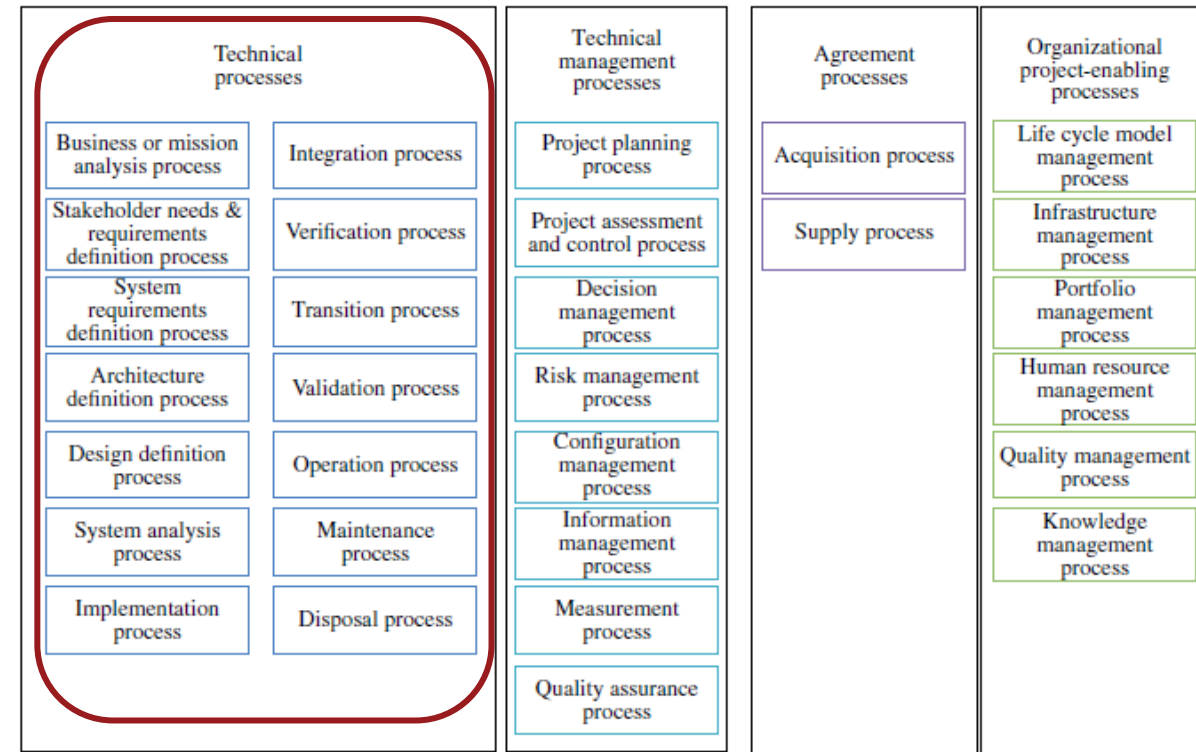
From ISO/IEC/IEEE 15288:2015

FIGURE 1.1 System life cycle processes per ISO/IEC/IEEE 15288. This figure is excerpted from ISO/IEC/IEEE 15288:2015, Figure 4 on page 17, with permission from the ANSI on behalf of the ISO. © ISO 2015. All rights reserved.

Figure from INCOSE Systems Engineering Handbook, V4

The first three technical processes are responsible for establishing the overall requirements for a system of interest.

Business/Mission Analysis Technical Process

FIGURE 4.1 Transformation of needs into requirements. Reprinted with permission from Mike Ryan. All other rights reserved.

Figure from INCOSE Systems Engineering Handbook, V4
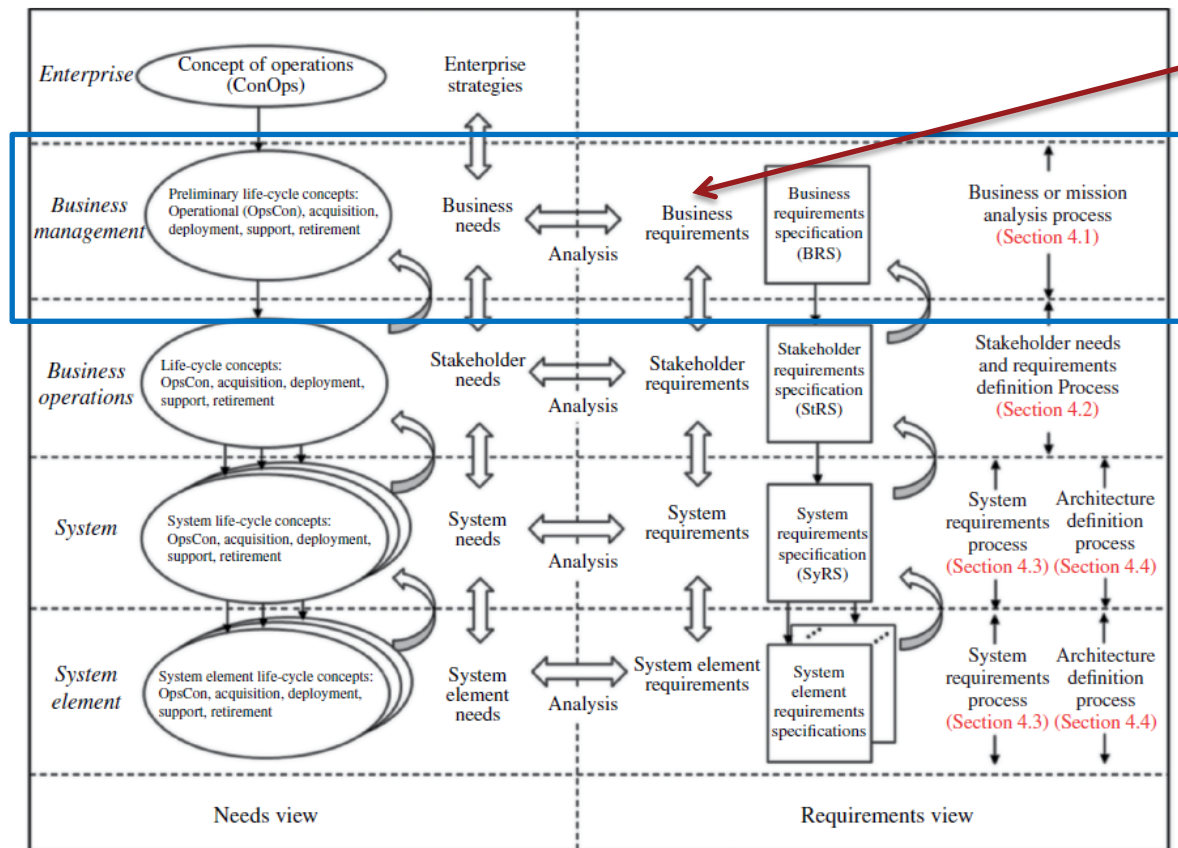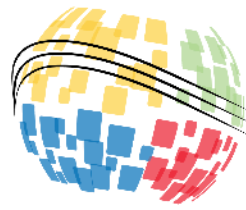
4.1.2.4 Business Requirements and Validation *Specify business requirements*—It is often helpful to specify business requirements as part of the business and mission analysis process. Business requirements are often contained in a BRS, which the *Guide to the Business Analysis Body of Knowledge* (IIBA, 2009) calls the business requirement document. The term "specification" has some variation in use in various industries, but it is used here to be synonymous with "document"—that is, business requirements are captured in the BRS, stakeholder requirements in the StRS, and system requirements in the SyRS.

Business requirements | Definition of the business framework within which stakeholders will define their requirements. Business requirements govern the project, including agreement constraints, quality standards, and cost and schedule constraints. Business requirements may be captured in a Business Requirements Specification (BRS), which is approved by the business leadership

Note: Business requirements may not always be formally captured in the system life cycle

Business/Mission Analysis captures the concept for a system of interest and initial set of requirements (Business requirements specification)

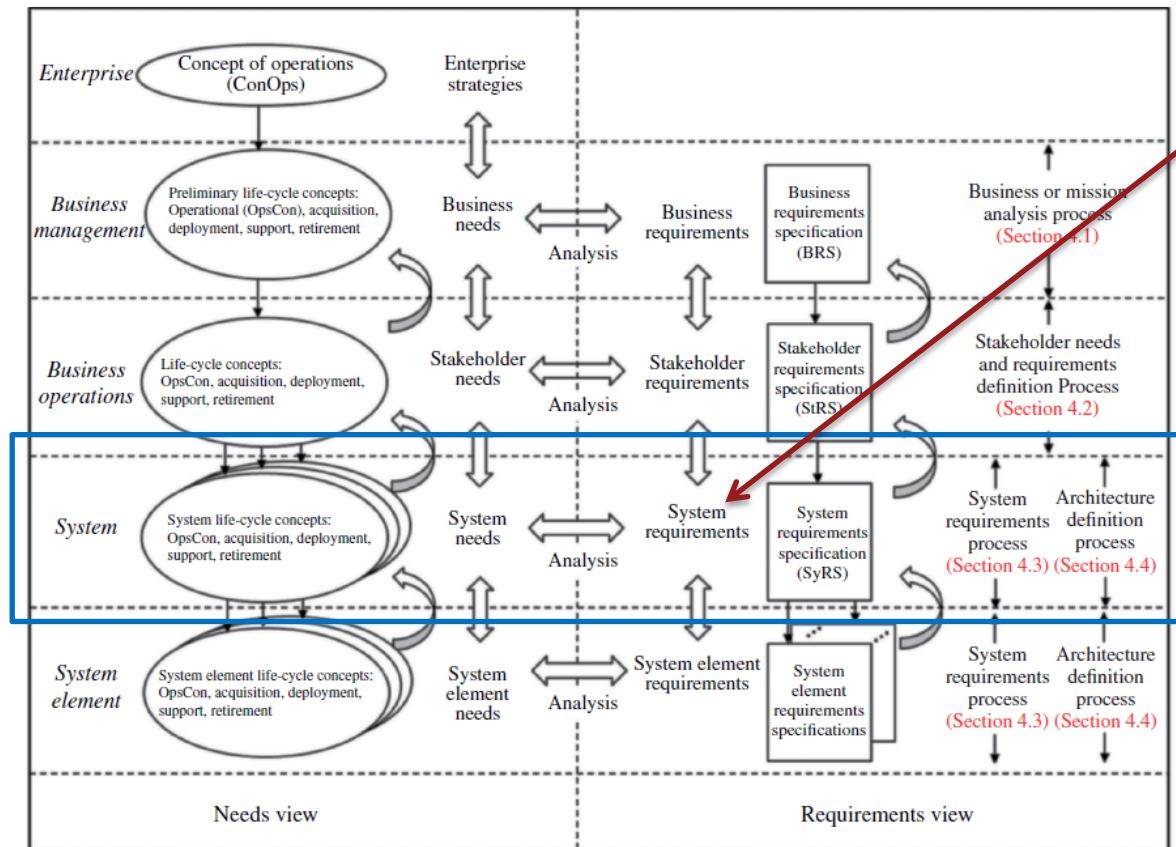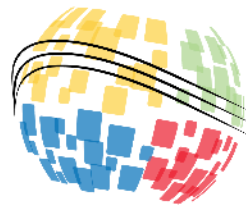# Stakeholder Needs/Requirements Technical Process

FIGURE 4.1 Transformation of needs into requirements. Reprinted with permission from Mike Ryan. All other rights reserved.

Figure from INCOSE Systems Engineering Handbook, V4
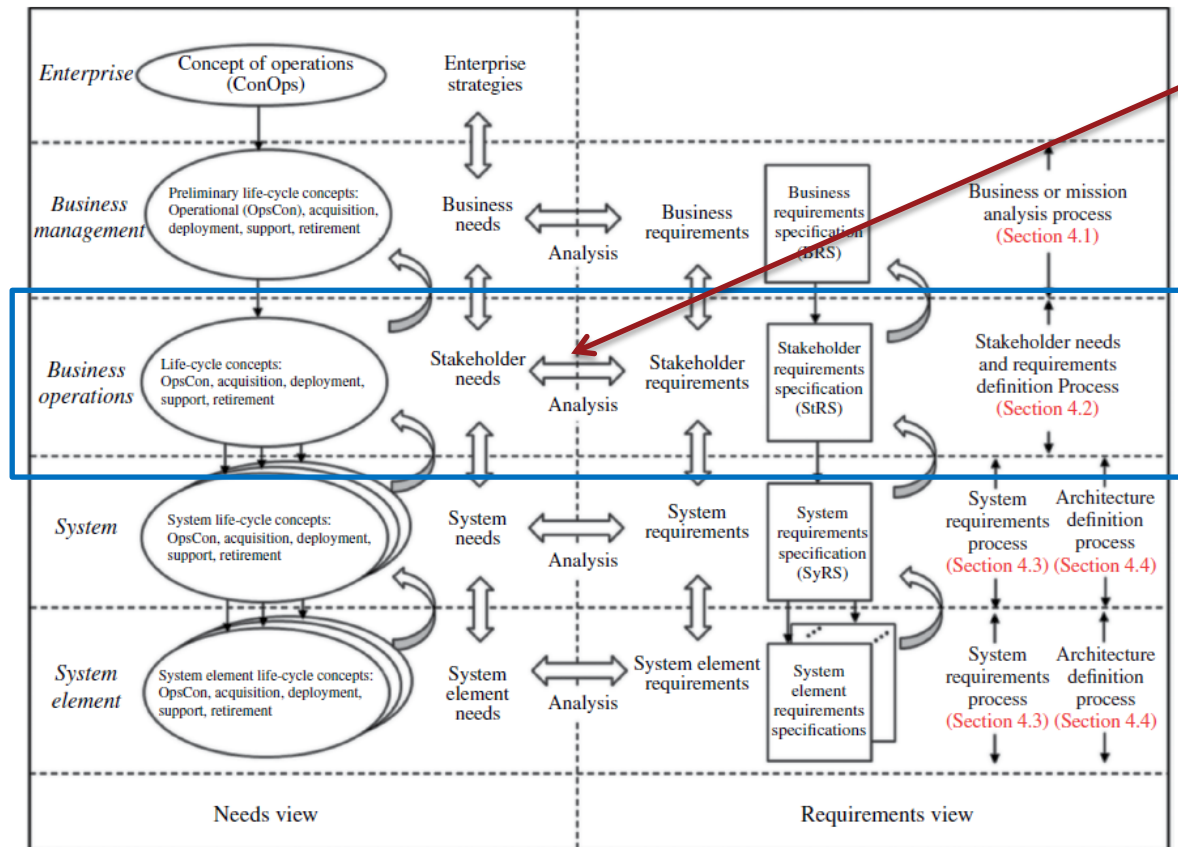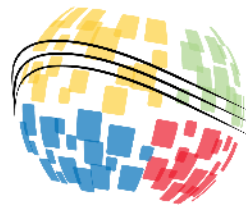
- *Transform stakeholder needs into stakeholder requirements.*
  - Identify constraints on the solution (imposed by agreements or interfaces with legacy or interoperating systems). The constraints need to be monitored for any interface changes (external or internal) that could alter the nature of the constraint.
  - Specify health, safety, security, environment, assurance, and other stakeholder requirements and functions that relate to critical qualities.
  - Specify stakeholder requirements, consistent with scenarios, interactions, constraints, and critical qualities.

4.2.2.5 Generate the StRS A draft StRS should be generated to formally represent the stakeholder requirements. The StRS should be traceable to the stakeholder needs and to the BRS.

Stakeholder needs Needs determined from communication with external and internal stakeholders in understanding their expectations, needs, requirements, values, problems, issues, and perceived risks and opportunities

Stakeholder requirements Requirements from various stakeholders that will govern the project, including required system capabilities, functions, and/or services; quality standards; system constraints; and cost and schedule constraints. Stakeholder requirements may be captured in the Stakeholder Requirements Specification (StRS)

Stakeholder Needs/Requirements captures the stakeholder interest in the system of interest and initial set of their needs and requirements (stakeholder requirements specification)

System Requirements Technical Process

FIGURE 4.1 Transformation of needs into requirements. Reprinted with permission from Mike Ryan. All other rights reserved.

Figure from INCOSE Systems Engineering Handbook, V4

[6.4.3.1] The purpose of the System Requirements Definition process is to transform the stakeholder, user-oriented view of desired capabilities into a technical view of a solution that meets the operational needs of the user.

System requirements — What the system needs to do, how well, and under what conditions, as required to meet project and design constraints. Includes types of requirements such as functional, performance, interface, behavior (e.g., states and modes, stimulus responses, fault and failure handling), operational conditions (e.g., safety, dependability, human factors, environmental conditions), transportation, storage, physical constraints, realization, integration, verification, validation, production, maintenance, disposal constraints, and regulation. System requirements may be captured in a document called the System Requirements Specification (SyRS) or just System Specification. This includes the requirements at any level in the system hierarchy

System Requirements captures the requirements for the system of interest (system requirements specification)

Challenges of Current Requirement Development Approaches

Importance of Stakeholder Needs and Requirements Development

- Looking at the entire system development life cycle, the ability to show validation (did we build the right thing?) is traced to the Stakeholder Needs and Requirements.

- In practice, it is observed by the INCOSE RWG that the approach to capture stakeholder requirements and system requirements are often combined, where more focus is on capturing the system requirements compared to the stakeholder needs and requirements
  - Common response: why have two specifications?

- Additional confusion comes from ISO 29148, which also refers to stakeholder-owned system requirements (are these stakeholder requirements, or system requirements?).

From INCOSE Systems Engineering Handbook, V4:

[6.4.2.1] The purpose of the Stakeholder Needs and Requirements Definition process is to define the stakeholder requirements for a system that can provide the capabilities needed by users and other stakeholders in a defined environment.

[6.4.11.1] The purpose of the Validation process is to provide objective evidence that the system, when in use, fulfills its business or mission objectives and stakeholder requirements, achieving its intended use in its intended operational environment.

Missing the Stakeholder Needs and Requirements technical process can result in a system that conforms to requirements (fully verified) yet does not address the needs of the stakeholders.

Confusion – is it a Need or a Requirement?

From INCOSE Systems Engineering Handbook, V4:

- Are needs the same as requirements? Not per SE Handbook (see excerpt).

- Are stakeholder requirements same as system requirements? Not per SE Handbook (see earlier slides), yet many practitioners cannot tell the difference.

- Researching many publications and courses, it is observed that the majority of focus is on **requirements** (development, syntax, management, verification), where needs are less discussed.

- *Needs*—Per the Oxford English Dictionary, a need is a thing that is wanted or required. For a system, needs are often capabilities or things that are lacking but wanted or desired by one or more stakeholders. These can be viewed in at least three contexts in which SE is performed: (i) projects with customers internal to the enterprise that is doing the engineering, (ii) development under an agreement with an external entity, and (iii) entrepreneurial product development in anticipation of future sales.
- *Requirements*—Requirements are formal structured statements that can be verified and validated. There may be more than one requirement defined for each need.

Strong focus on "Requirements" terminology and the standardization of requirement conventions leads many to bypass the concepts and efforts of Needs elaboration.

SE Vee Starts with System Requirements

- As shown in the SE Handbook, and other SE material, the SE Vee provides the overview of the requirement, architecture development and the verification and validation activities.

- Notice that this Vee model from the INCOSE Handbook starts with the system level and its requirements.
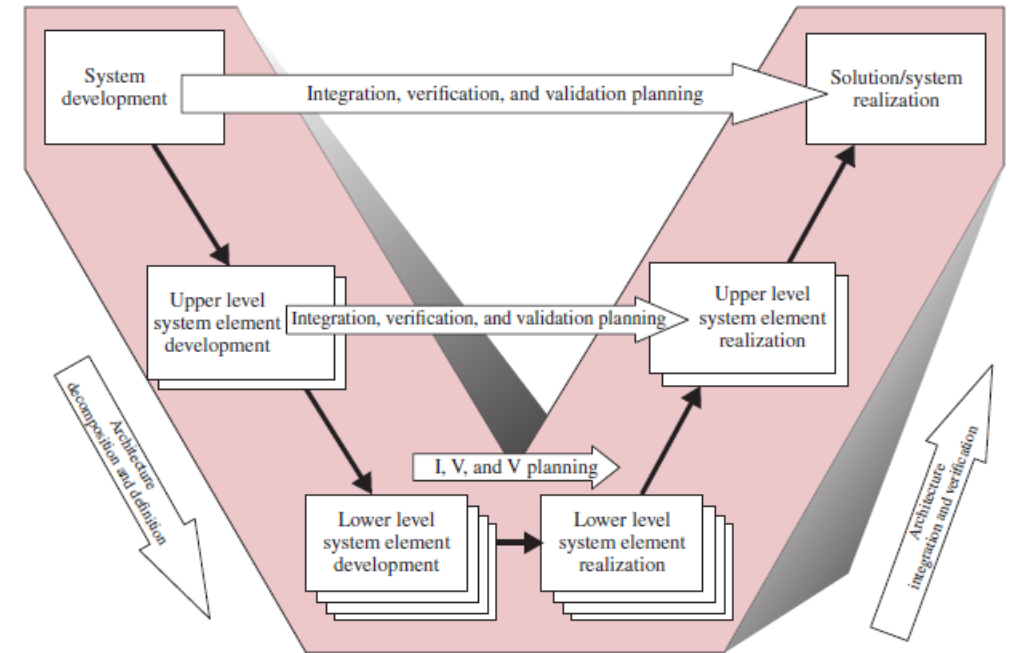

FIGURE 3.6 Vee model. Derived from Forsberg et al. (2005), Figure 7.10. Reprinted with permission from Kevin Forsberg. All other rights reserved.

Figure from INCOSE Systems Engineering Handbook, V4

SE Vee has emphasis on the system requirements, less on the Business/Mission Analysis and Stakeholder Needs and Requirements Outputs.

Nomenclature Challenges

- Stakeholder needs and requirements process is performed at the "Business Operations" level in the INCOSE Handbook.

- Similar to the SE Vee diagram, most System Engineers view the start of their effort at the System Level, not the Business Operations level.

- Remember that the 15288 processes are iterative and recursive, and this nomenclature implies it is an early effort and not done at the lower levels of abstraction.
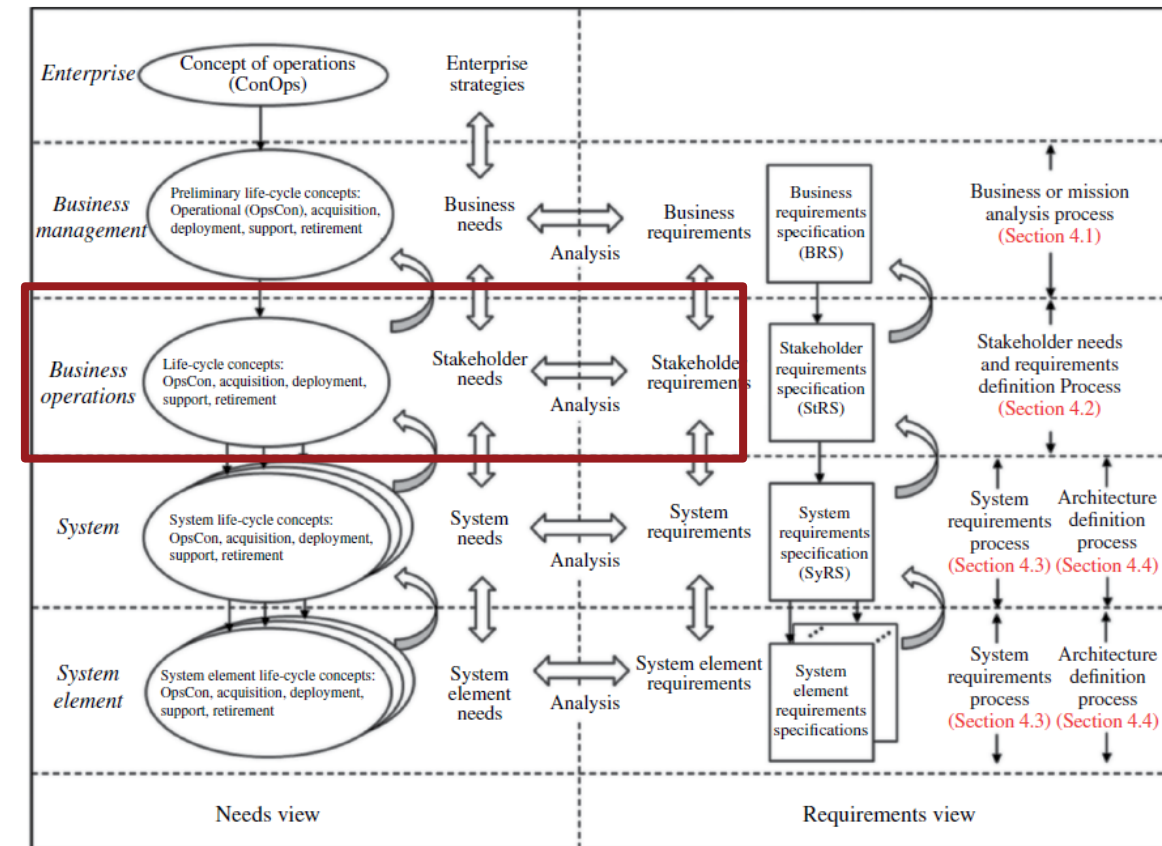
FIGURE 4.1 Transformation of needs into requirements. Reprinted with permission from Mike Ryan. All other rights reserved.

Figure from INCOSE Systems Engineering Handbook, V4

Stakeholder Needs and Requirements "level" nomenclature is misleading, leading many systems engineers to start their efforts at the "System" level, which bypasses the focus on Stakeholder Needs.

RWG Proposed Needs and Requirements Development Approach

Key RWG Proposed Approaches

- Focus more on the Needs
  - Promote methods for establishing an Integrated set of Needs
  - By moving more emphasis on the integrated set of needs before development of system requirements, the expectation is that the resultant set of requirements will be more complete and enable system validation.
- Ensure Verification and Validation is Addressed based on Context
  - V&V terms are often interchanged, and validation is often under-addressed
  - Activities and outcomes are situation dependent, and terminology needs to be clear, to avoid missing key activities.
- Emphasize a Data-Centric Approach
  - Utilizing a data-centric approach aligns development of needs and requirements with the concepts of digital engineering, enabling traceability with system data that supports system verification and validation.

First Recommendation: Focus more on the Needs
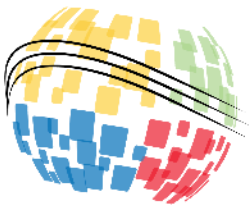
- Needs represent the stakeholder and customer/acquirer view of the system of interest (SOI)
  - What do the stakeholders need the system to do that will result in their problem to be solved or opportunity to be realized within defined constraints?
  - Communicates the stakeholder expectations for the end-state once the SOI is delivered – in the end **what will satisfy the stakeholder**?
  - Stakeholders are not limited to the customer/acquirer and reflect those impacted by the system in some way (internal/external stakeholders).
  - The SOI will be <u>validated</u> against its <u>integrated set of needs</u>

- Requirements represent the technical, developer view of the SOI
  - What must the SOI do in order to meet the needs?
  - Inputs to the design definition process
  - Both the design and realized SOI will be <u>verified</u> against its <u>requirements</u>

The quality of the requirements is dependent on the quality of the needs from which they are transformed.

Terminology

To avoid ambiguity in the use of the terms Stakeholder Needs, Stakeholder Requirements, System Requirements, the RWG uses the following convention in the NRM:

- **Integrated set of needs** represent the integrated and baselined set of stakeholder needs that were transformed from the set of lifecycle concepts for the SOI. This set of needs communicate all stakeholders' perspective concerning their expectations what they need the SOI to do. Because needs are not requirements, they do not contain the word "shall".

- **Design input requirements** represent the technical requirements that were transformed from the baselined integrated set of needs for the SOI and are inputs to the architecture and design definition processes. The design input requirements are written in a structured, natural language as textual "shall" statements that have the characteristics defined in the Guide to Writing Requirements for well-formed requirement statements and sets of requirements.

Notice that there is less emphasis on the word "Stakeholder Requirements" – intent is to mitigate confusion of terms between stakeholder requirements (what the stakeholder wants) and system requirements (what the system is expected to do).

Establishing the Integrated Set of Needs

The integrated set of needs is developed using the approach of Systems Thinking.

- "Define the Why" by establishing the Problem, Threat, or Opportunity as well as the Mission, Goals, Objectives, and Measures (MGOs).
- "Define the Who" by Identifying External and Internal Stakeholders
- "Define What is Needed" by Eliciting Needs from the Stakeholders
- "Establish the Boundaries" by Identifying Drivers and Constraints
- "Understand Risk to Success" by Identifying and Analyzing Risks
- Define system lifecycle concepts from several perspectives (use cases for different users).

Initial Set of Stakeholder's Needs Feed Into the Lifecycle Concept Analysis & Maturation Activities

Traceability is critical to managing relationships
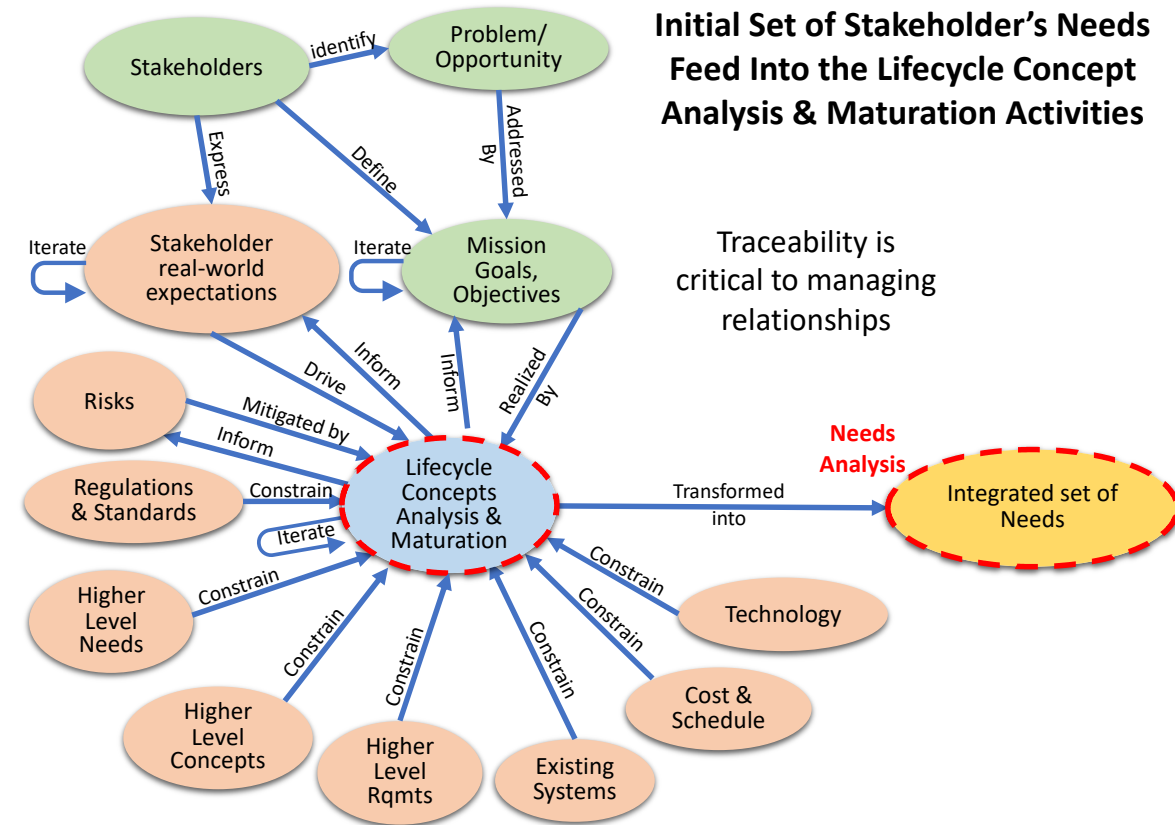
Figure from INCOSE Needs and Requirements Manual, V1.1

Requirements come from the Integrated Set of Needs

- The efforts described on the prior slide result in an "Integrated set of Needs".

- It is this integrated set of needs that will be transformed into the set of requirements for the SOI which are used to generate the system design and realization.

- The approach in ISO 15288 is to develop "stakeholder needs and requirements".
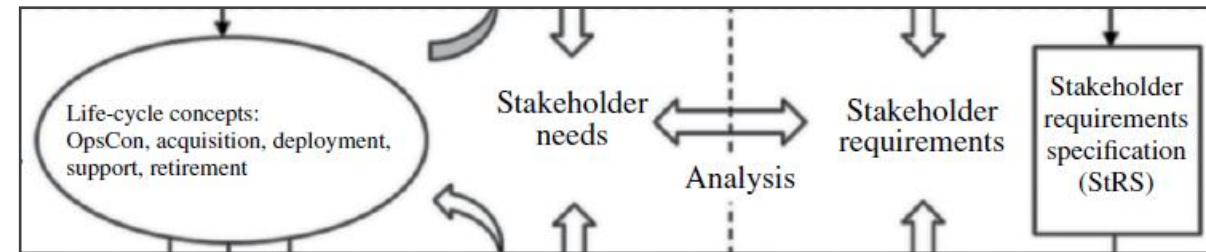
From ISO/IEC/IEEE 15288:2015

Per the iterative and recursive efforts of the technical processes, this set of needs is unique for each level of the hierarchy in the system of interest and is worked at each level.

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- The approach in ISO 15288 is to develop "stakeholder needs and requirements".
- The INCOSE RWG recommendation is to establish an integrated set of needs.
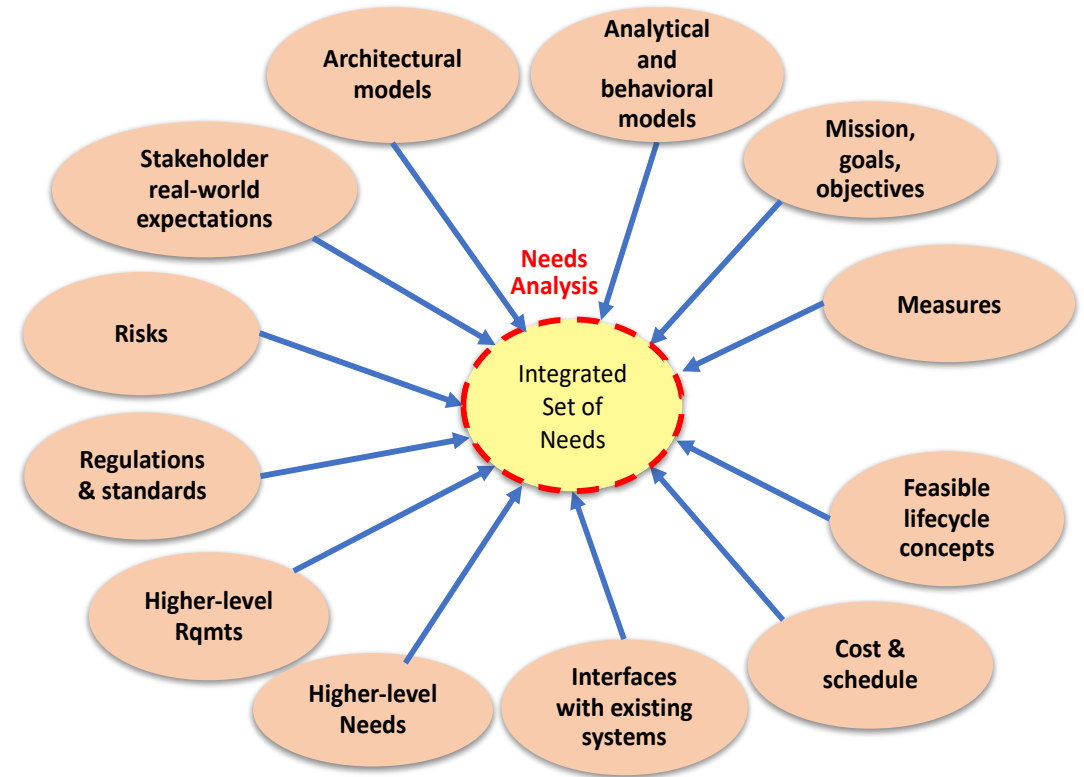
Figure from INCOSE Needs and Requirements Manual, V1.1

Per the iterative and recursive efforts of the technical processes, this set of needs is unique for each level of the hierarchy in the system of interest and is worked at each level.

Second Recommendation: V&V in Context

- The concepts associated with the terms **verification** and **validation** are distinctly different depending on the context; however, the terms are often used interchangeably without making clear the context in which they are used, resulting in ambiguity and a failure to communicate.

- To avoid this ambiguity, each of these terms should be preceded by a modifier (i.e., the subject) which clearly denotes the proper intended context in which the term is being used.
  - Needs verification / needs validation for verification and validation of the *need expressions*
  - Requirement verification / requirement validation for verification and validation of the *design input requirement expressions*
  - Design verification / design validation for verification and validation of the design and associated *design output specifications (drawings, artifacts, etc.)*
  - System verification / system validation for verification and validation of the *realized system of interest.*

Verification and Validation in Context
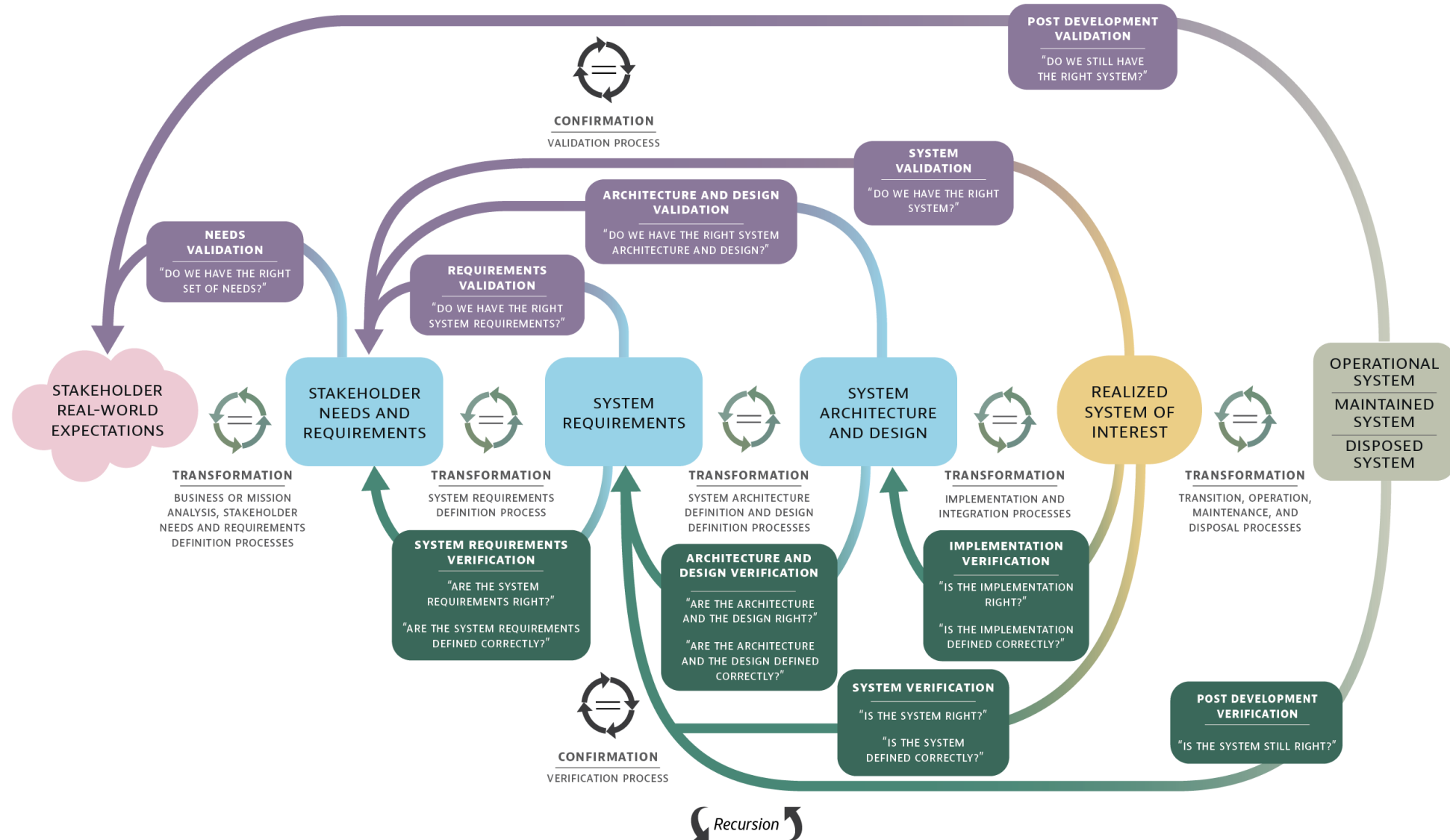
Key Concept

- Verification, & Validation occur across the lifecycle
  - Each stage in the lifecycle addresses the quality and content of the development artifacts.
  - Validation is more important than verification
  - Validation is against a set of needs that represents key stakeholders – not just the customer
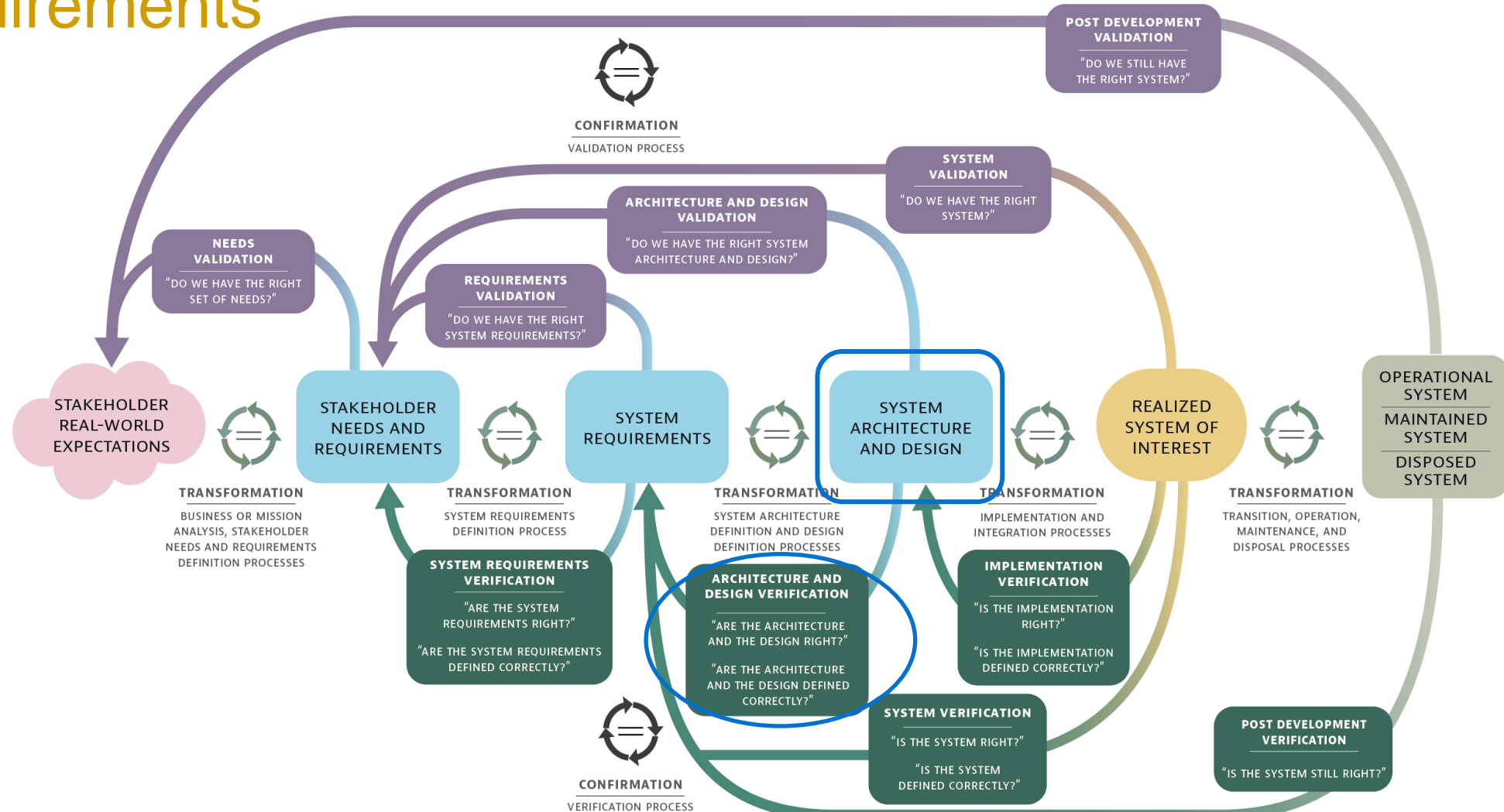
Needs, Requirements, Verification, & Validation are the common threads that tie all SE activities together.

Requirements Verification is Against Best Practices
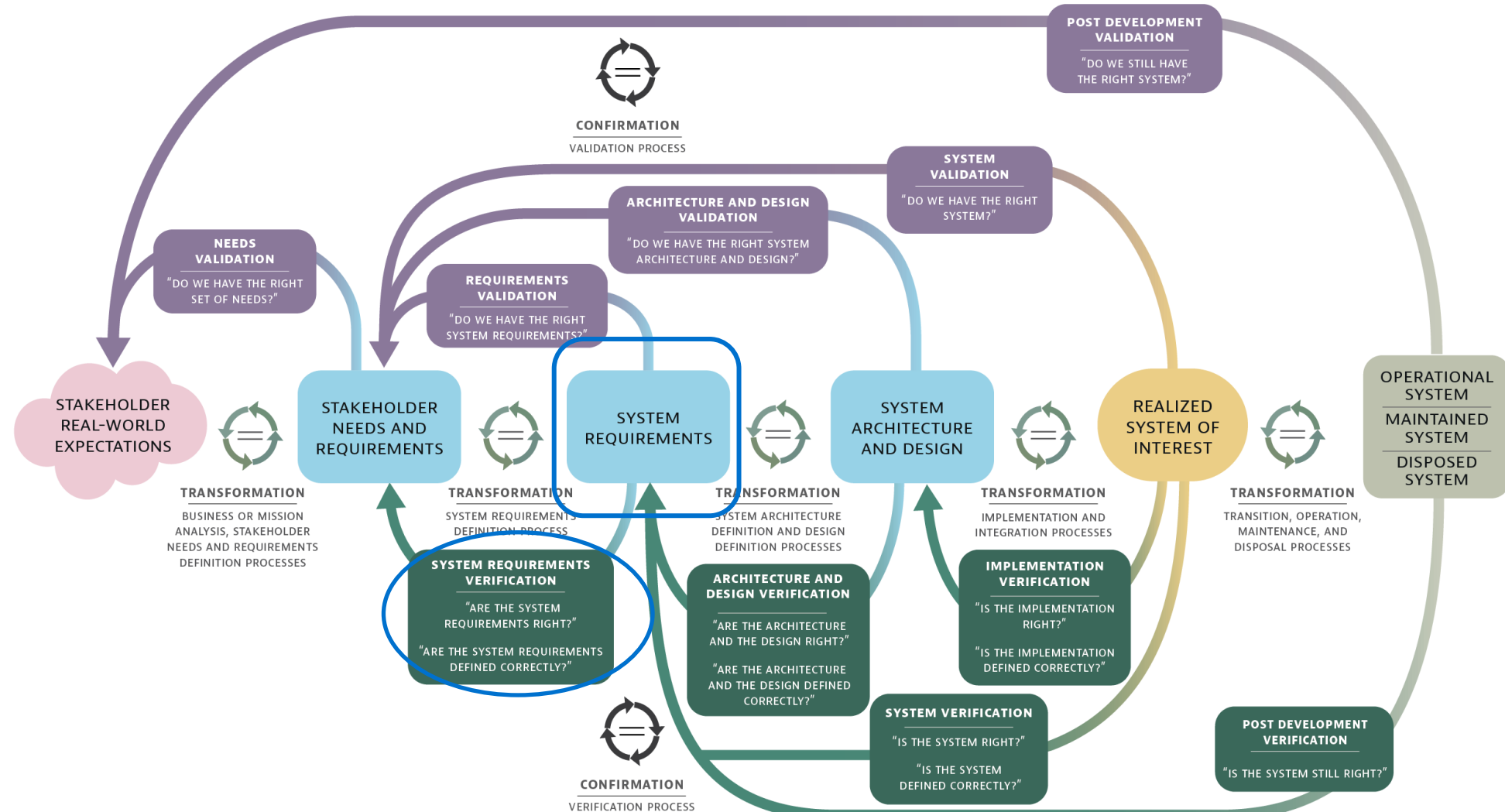
Verification that requirements conform to standards and are correct

Design Verification is Against Best Practices and Requirements

Verification that Design conforms to standards and is correct, and it satisfies requirements (compliance)

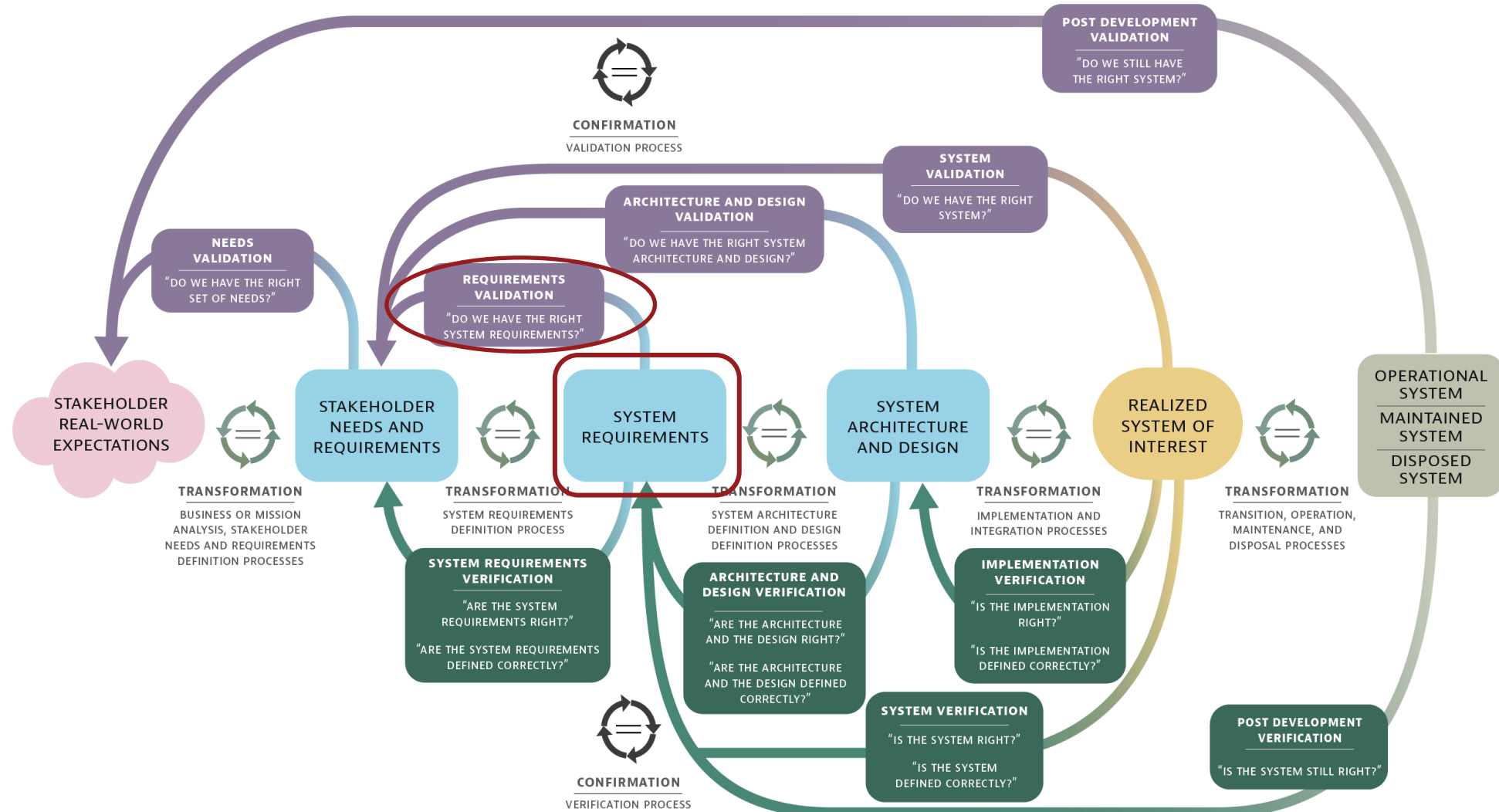# System Verification is Against the Design Artifacts and Requirements
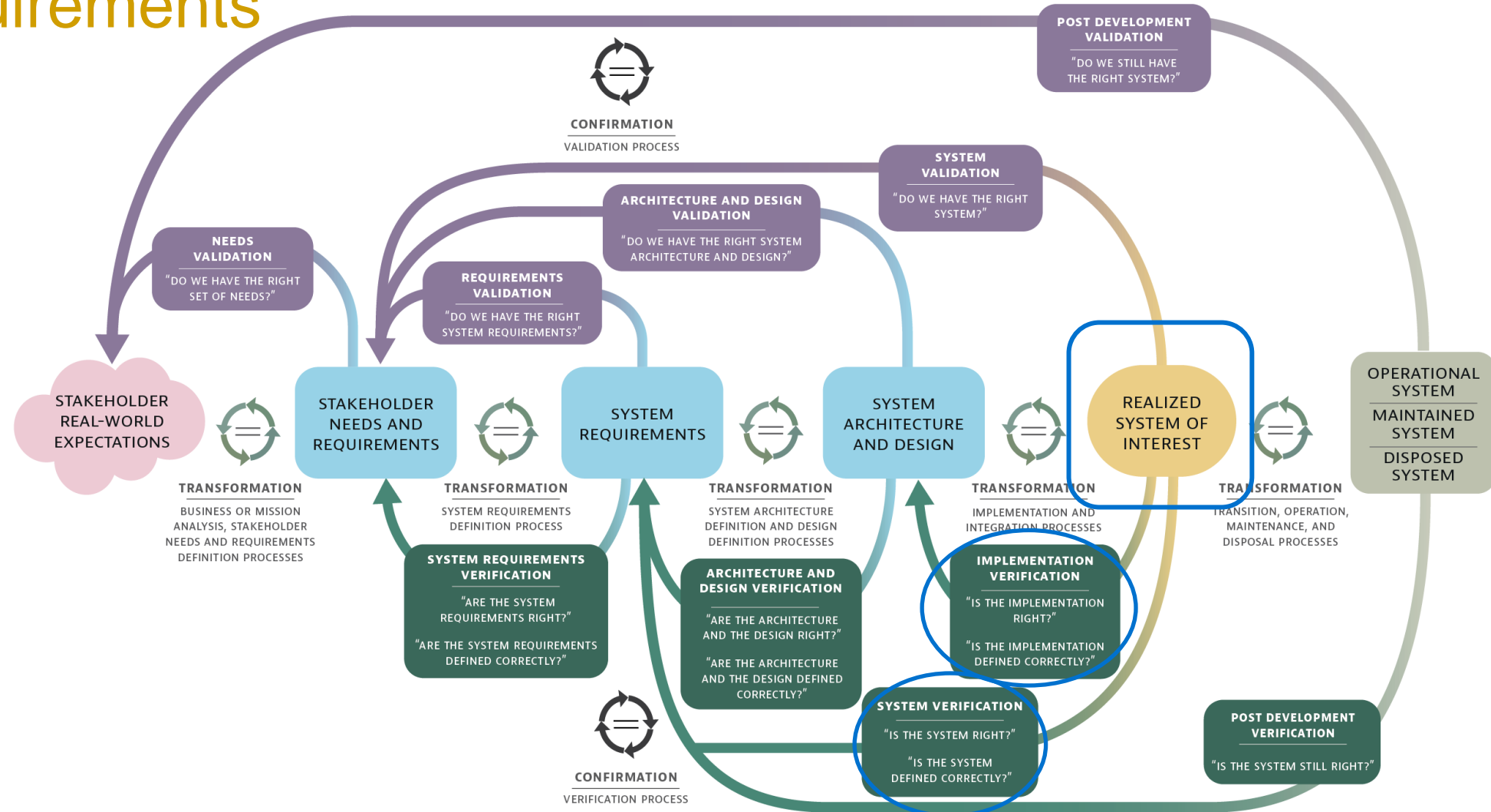
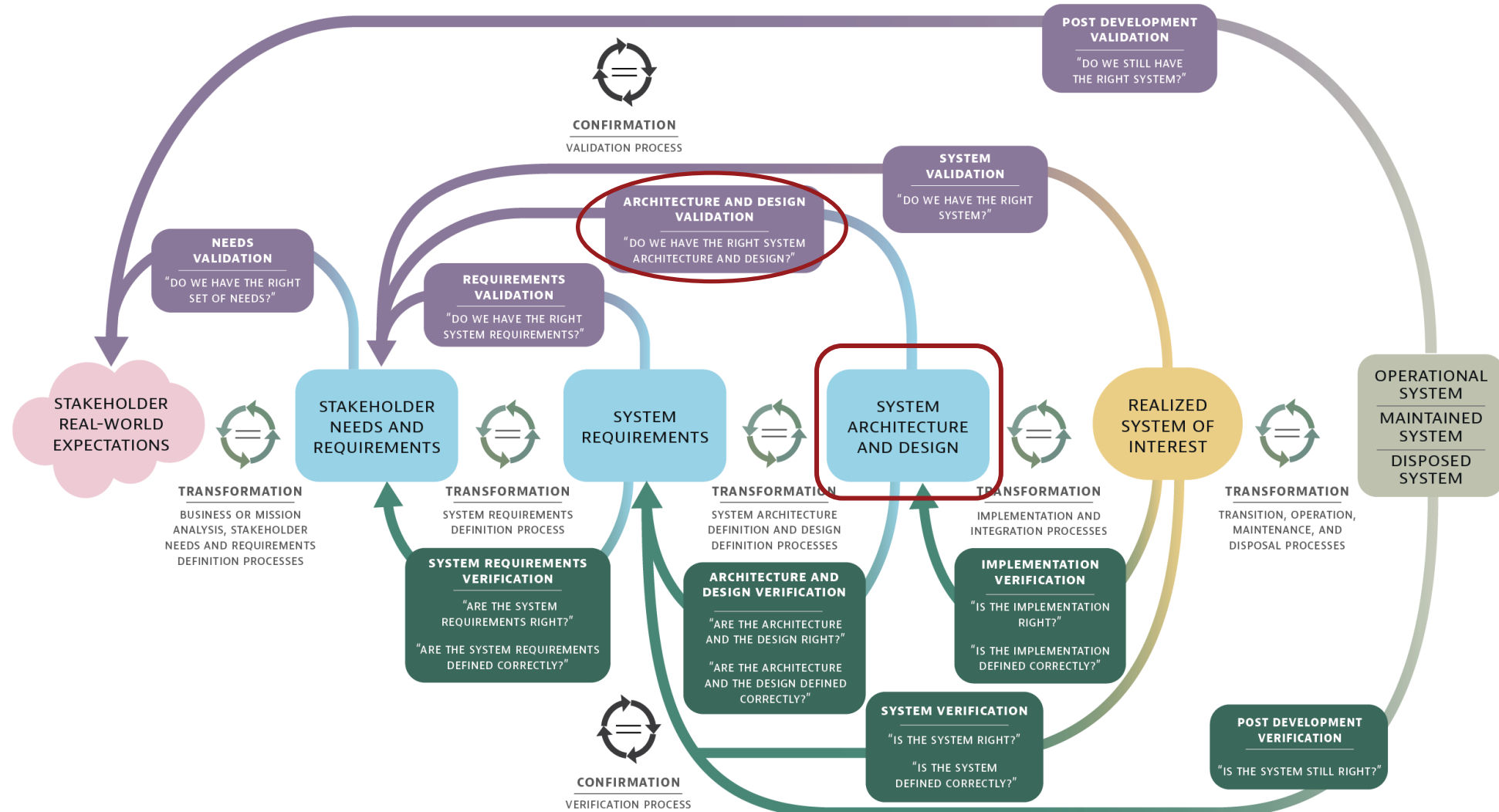Verification that System built correctly and satisfies requirements

Needs Validation is Against Stakeholder Inputs
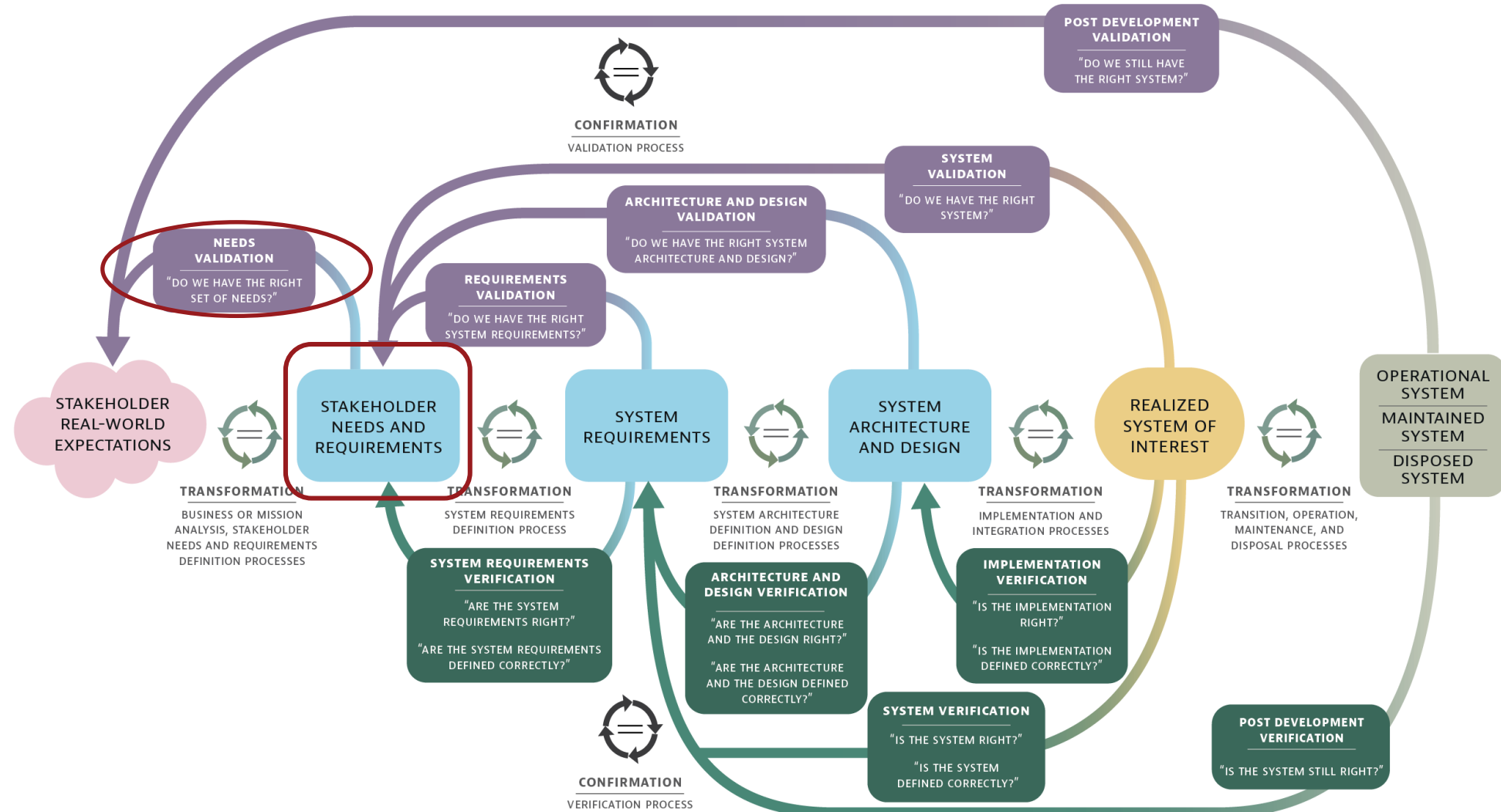
Validation that the Needs address the Stakeholder Expectations
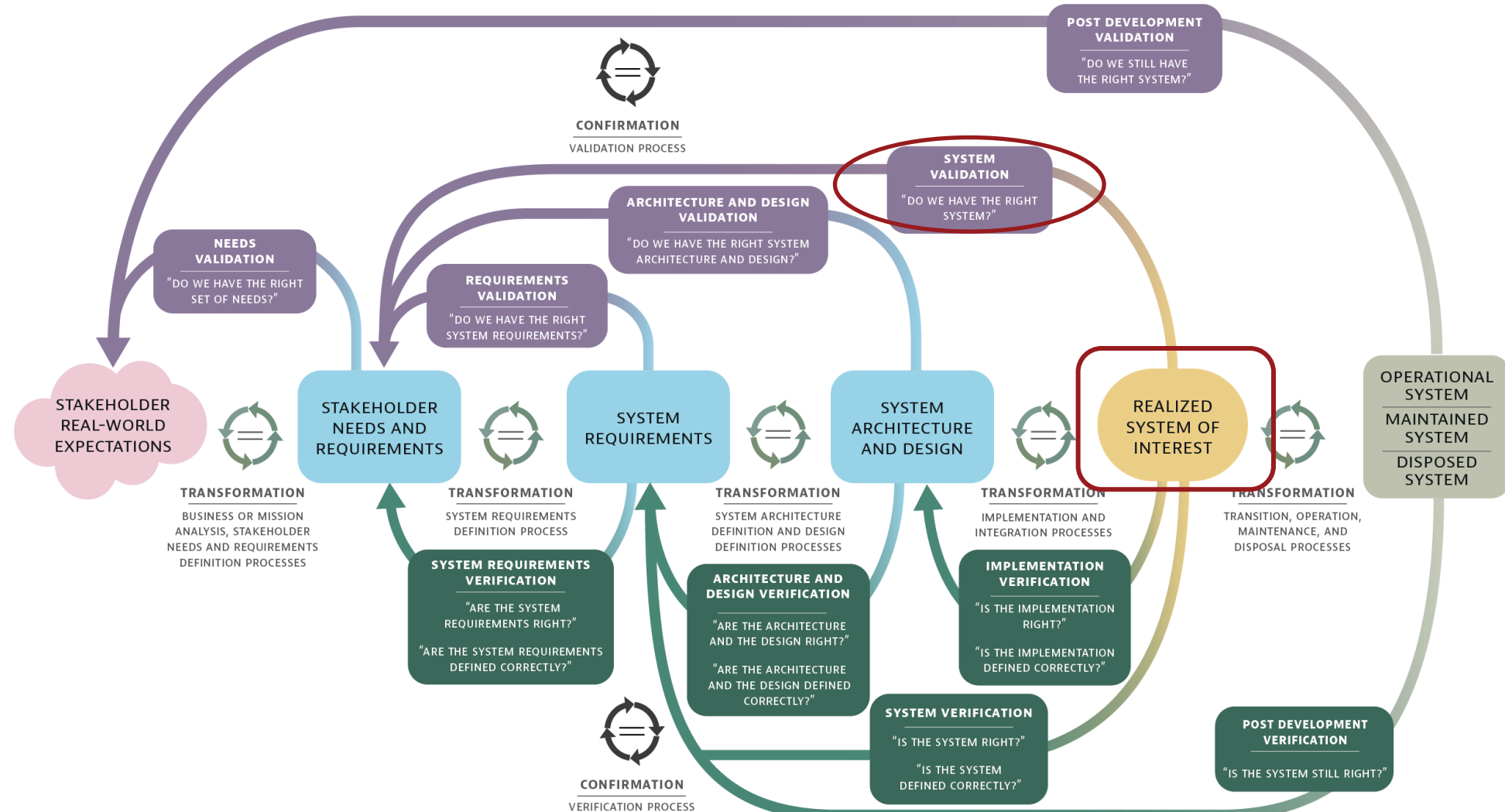
Requirements Validation is Against the Needs

Validation that the Requirements address the Needs
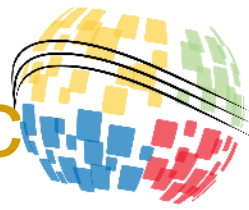
Design Validation is Against the Needs

Validation that the Design addresses the Needs

System Validation is Against the Needs

Validation that the Realized SOI addresses the Needs

Third Recommendation: Emphasize a Data-Centric Approach

- Using a data-centric approach, system engineering is practiced from the perspective that needs, requirements, and other development artifacts (models, diagrams, drawings, etc.) are visualizations of an integrated data and information model of the system.

- This approach is enabled by use of software toolsets which support the development of all work products and artifacts within an integrated set of tools.

- Data-centric practice of SE versus a document-centric practice of SE enables a single source of truth and traceability of all artifacts across the system lifecycle.
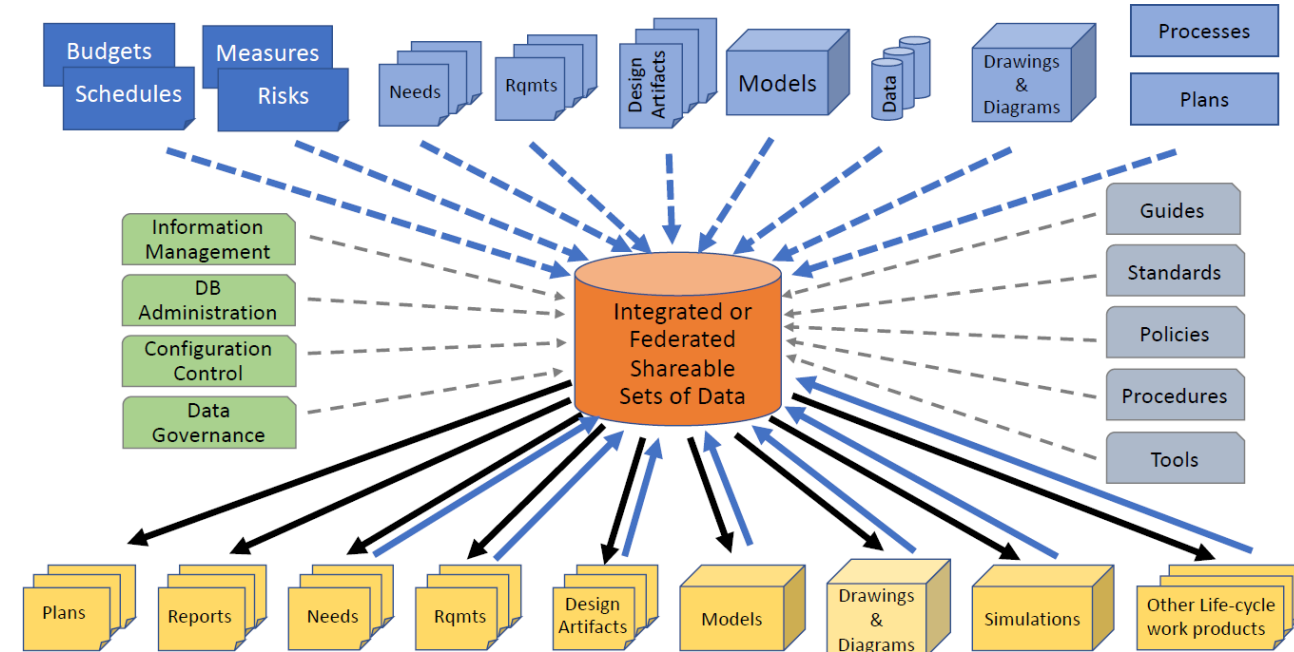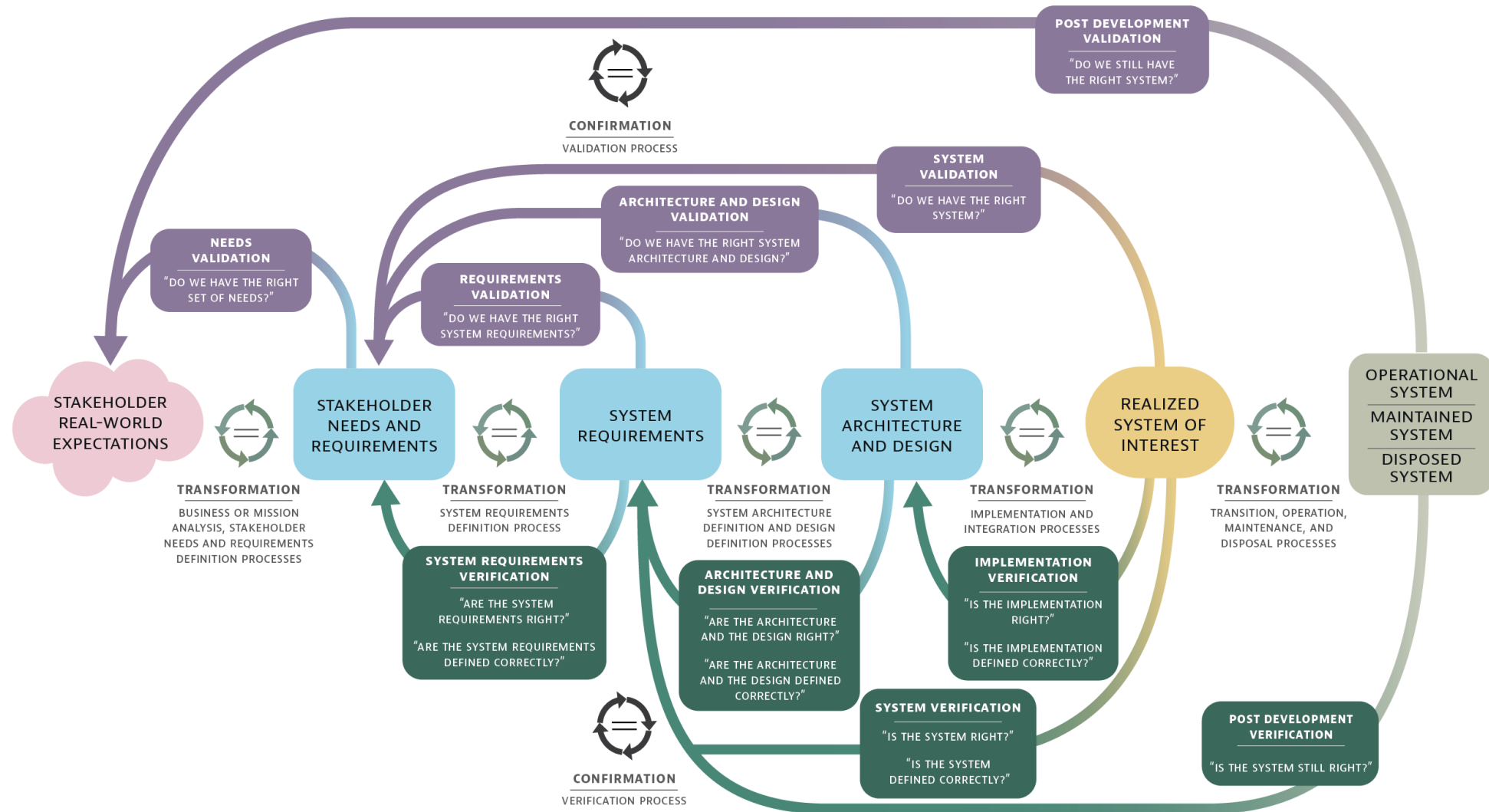

Figure from INCOSE Needs and Requirements Manual

Instead of individual and separate documents, the results of the system development are inter-connected and leveraged for System Validation.

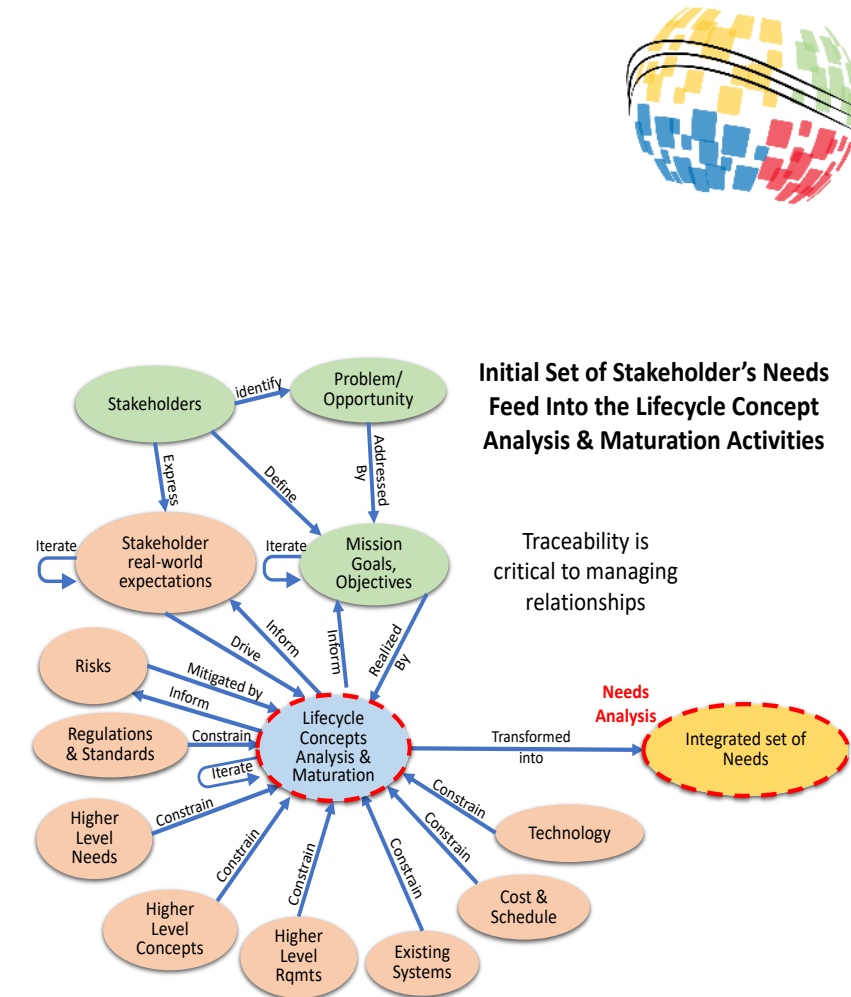# Data Traceability Enables Verification and Validation

Data connected across the development effort enables V&V at all stages of lifecycle!
Using a data-centric approach mitigates manual efforts, double-booking, and disconnects.

Example Application

SOI Concept Development

- During Proposal, a potential customer has provided a specification and operational concept, the project proposal team then:
    - Develops a SOI concept to comply with the operational concepts and specification.
    - Models how the SOI meets the overall system CONOPS (activity diagrams, operational views)
    - Identifies external and internal stakeholders (sources beyond the customer include those that establish regulations, certifications, safety, production, testability, manufacturing, affordability, facility usage, etc.)
- Team generates the integrated set of needs by capturing the lifecycle concepts (use cases), as well as expected functions, performance and constraints from all stakeholders (examples next slide).
- The integrated set of needs are traced to the stakeholders, customer documentation (CONOPS, statement of work, etc.) and system model to build a traceability model to the sources and the implementation of the needs.
- During concept design development, the team ensures the SOI concepts address the needs as well as the customer specification requirement statements.
- During the development of the integrated needs, attributes are generated that enable the team to understand parameters such as priority, criticality, risk, etc.
- Aalidation plans are created against the high priority/critical needs (customer based, business critical needs, safety needs, etc.). Note: The program could choose to validate all needs or limit to those needs considered critical towards affecting the project's execution of the project.

Initial Set of Stakeholder's Needs Feed Into the Lifecycle Concept Analysis & Maturation Activities

Traceability is critical to managing relationships

SOI Integrated Set of Needs

- The integrated set of needs are derived based on an assessment of the SOI lifecycle concepts and stakeholder viewpoints, which are not specifically addressed in the customer specification.

- Examples:
  - Customer needs SOI operational by 2026 (constraint).
  - Customer needs SOI to support activities in the operational concepts provided in the request for proposal (source of derived functions).
  - SOI operators need a method to upload new configurable parameters during a mission (derived function).
  - Customer needs to leverage existing Operation Infrastructure and Software (constraint)
  - Company production team needs to be able to transport the SOI within the facilities (design characteristic and need for GSE).
  - Project test team needs to be able to connect test equipment to the SOI to provide power, upload software, send commands, and obtain telemetry inputs (design characteristic)
  - Company leadership needs to leverage work done on a prior effort for strategic purposes (design constraint).
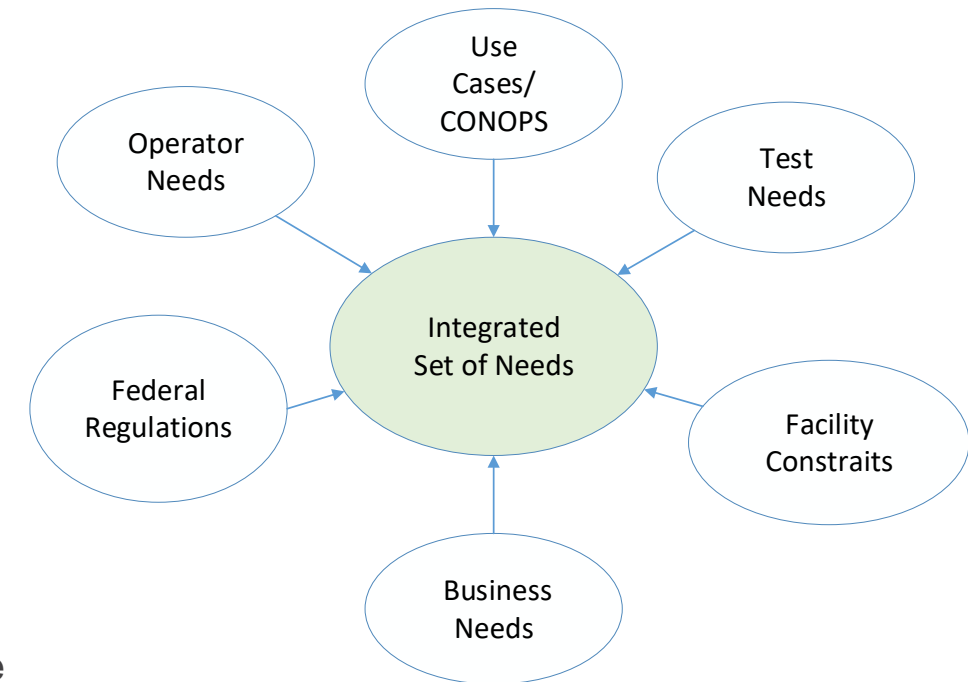
SOI Requirements are Generated

- After contract award, the team captures the final customer specification in the requirements tool and refines the concept model based on final contract agreement.
- The integrated set of needs are scrubbed for any additional needs to ensure they are still correct and are also captured in the requirements tool; traceability to system model is maintained.
- Any other contract documents (standards, ICDs, etc.) are captured in the tools and traced to ensure alignment (conflicts are resolved upon discovery).
- The needs are transformed to SOI design input requirements, and are put into requirements tool.
  - Each SOI requirement is traceable to a customer parent requirement or a stakeholder need.
- The SOI requirements are allocated to the integrated product teams (IPTs); a set of lower requirements are generated.
  - Decomposition of requirements and needs are placed into the IPT requirement artifacts.
- The IPTs would receive the requirements, and perform a comparable assessment of stakeholders and needs at their levels to ensure they have a complete set of design input requirements for their efforts (highlighting the iterative and recursive aspect of refining the needs and requirements for the SOI and its elements).
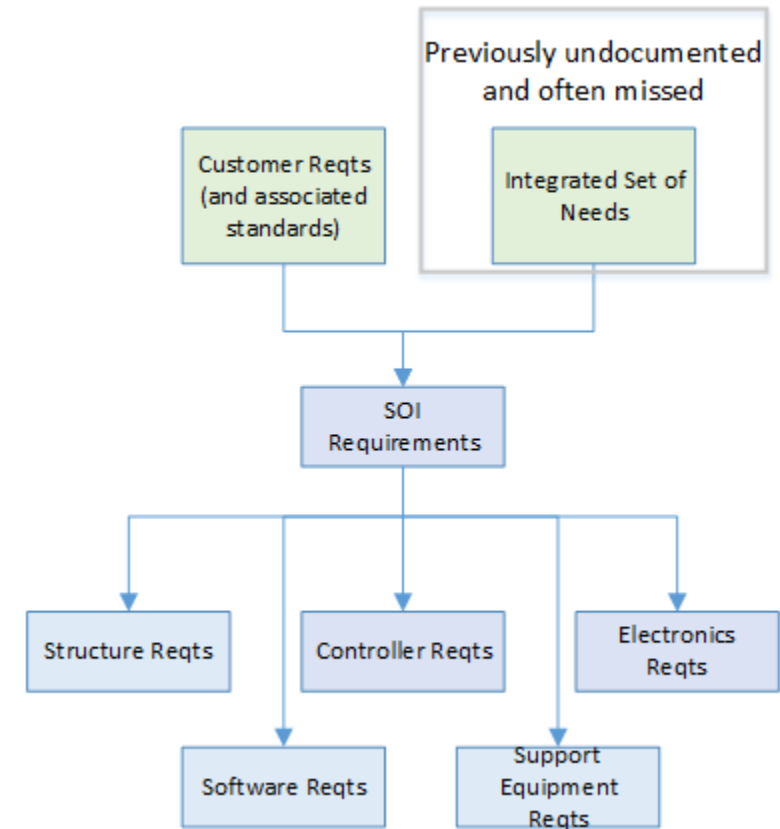
SOI Data is Connected

- As the SOI is developed, the models, requirements, verification and test plans are connected to capture what artifacts will support verification and eventual validation (and when).
- Artifacts from the information and data models are used to show progress and compliance towards system verification and validation.
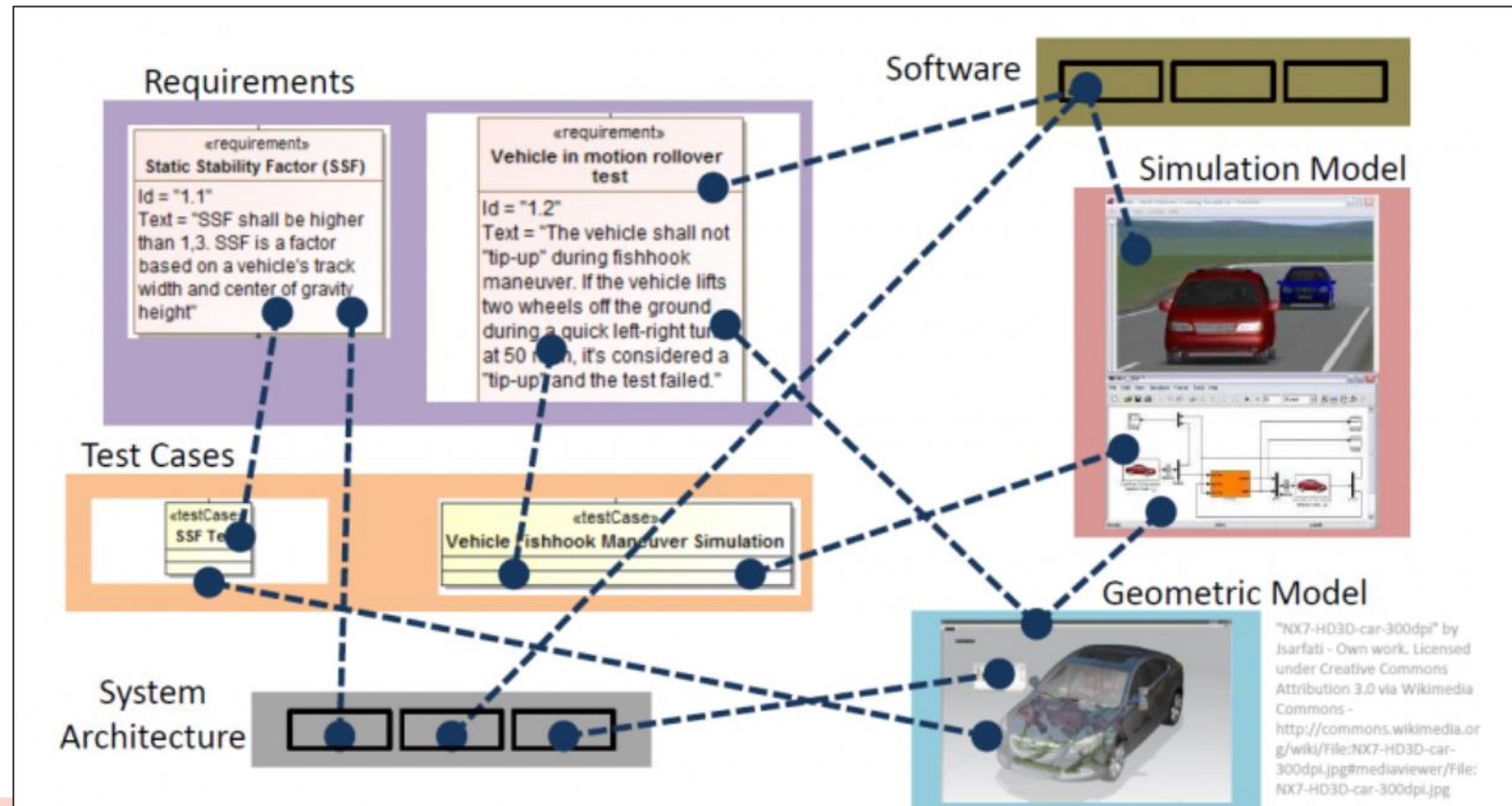
System Validation is Achieved

- During the development effort, the SOI is verified against the requirements in the SOI specification.
- During the development effort, data is obtained to show how each prioritized need is satisfied, leading to system validation.
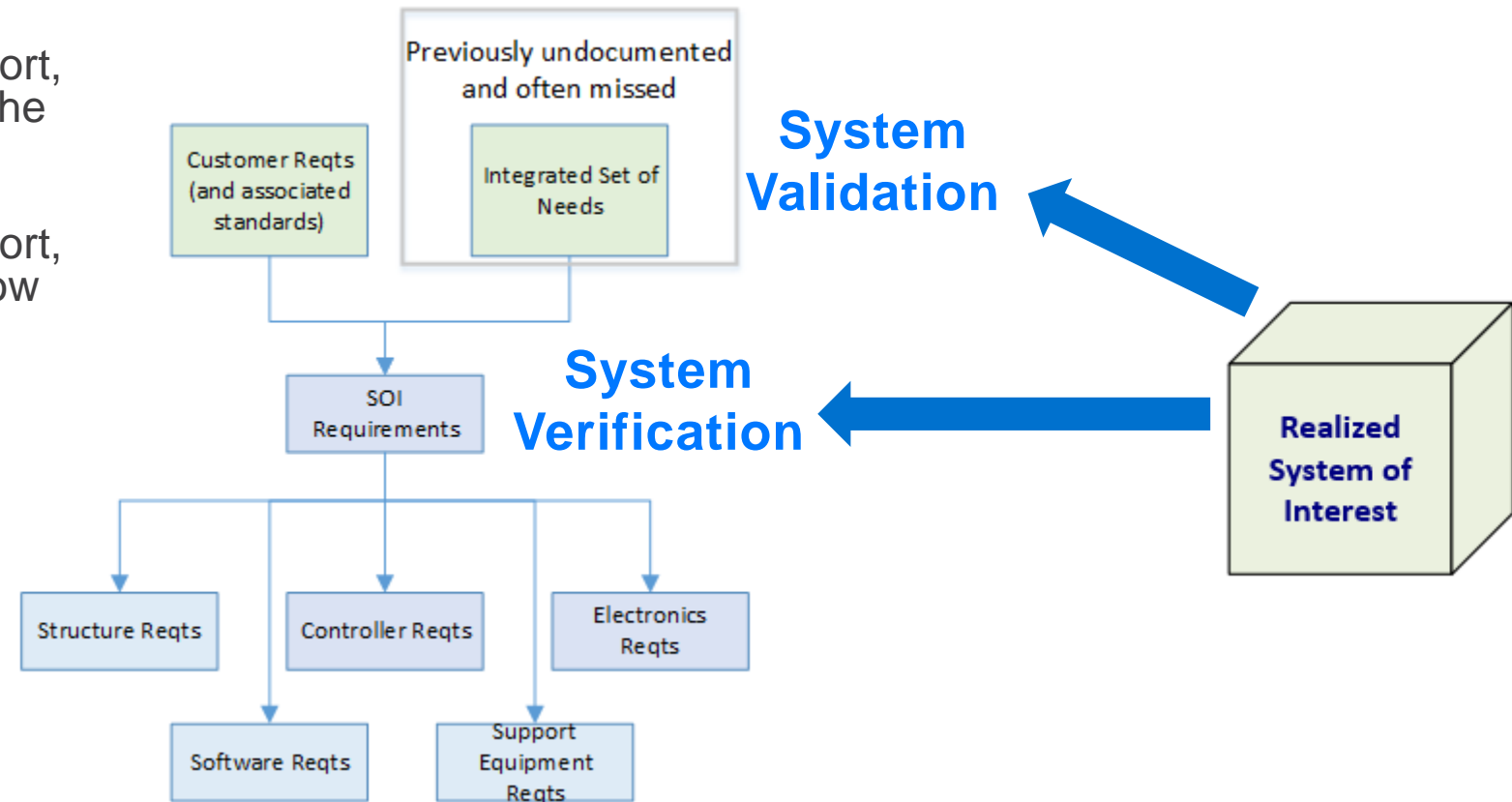
Validation that the Realized SOI addresses the Needs, achieving Stakeholder Expectations.
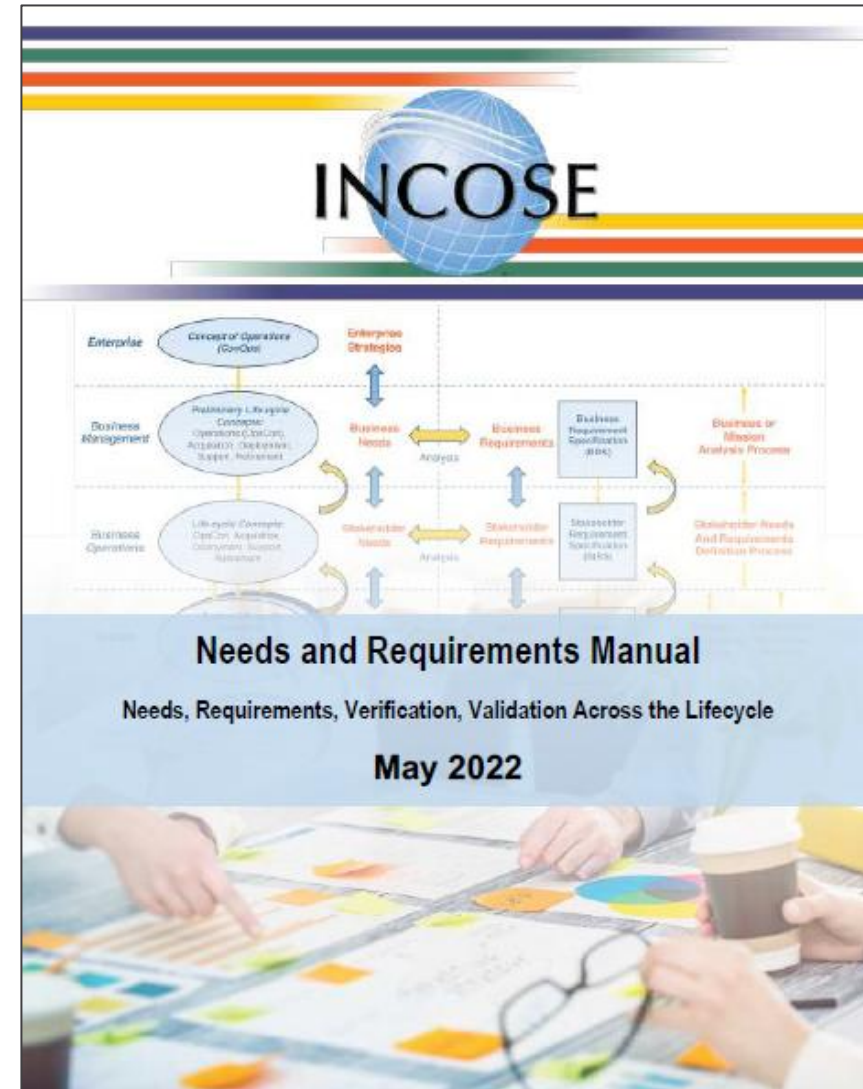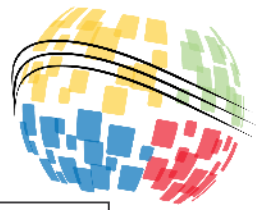
Where to Learn More

Needs and Requirements Manual (NRM)

- Concepts presented here are extracted from the INCOSE Needs and Requirements Manual (NRM).

- The NRM is the RWG flagship product, V1.1 released in May 2022

- Content from this aligns with, and expands, the INCOSE SE Handbook version 5 material (release 2023)

INCOSE RWG External Website

- The RWG maintains an external website (no INCOSE membership needed to view)

- Information on upcoming meetings and work in effort is provided.

- Anyone interested in participating in requirement working group data share is welcome to use this site to stay informed and obtain links to content.

Requirements Working Group

Link to INCOSE RWG YouTube Channel: INCOSE RWG - YouTube
Link to INCOSE RWG Connect Site for INCOSE members: https://connect.incose.org/WorkingGroups/Requirements/Pages/Home.aspx
Link to INCOSE Store: Pages - Store (incose.org)
List of INCOSE RWG Products:
- Needs and Requirements Manual (NRM) - Needs, Requirements, Verification, Validation Across the Lifecycle
- Guide to Needs and Requirements (GtNR) - a practical application guide for the NRM on developing, managing, and confirming needs and requirements
- Guide to Verification and Validation (GtVV) - a practical application guide for the NRM for the planning and implementation of verification and validation activities
- Guide to Writing Requirements (GtWR) - a practical application guide to generating needs and requirements statements
- Guide to Writing Requirements Summary Sheet - a two page sheet summarizing the GtWR rules and characteristics

RWG Products

Over the last several years, the RWG has been working on new products and supporting development of other INCOSE publications. A major effort is our contributions to the update to version 5 of the INCOSE Systems Engineering Handbook (SE HB) that is planned to be available in 2023.

Another major effort was the development of new products and updating existing products. The figure below shows our products and their relationship to each other and how they align with the INCOSE Systems Engineering Handbook and SEBok. We are pleased that these new products also support the INCOSE Corporate Advisory Board (CAB) needs as it is our aim to provide value to the future practice of System Engineering in support of industry, the academic community, and INCOSE's newly released SE Vision 2035 – Engineering Solutions for a Better World.

The first of our new products, Needs, Requirements, Verification and Validation Lifecycle Manual (NRVVLM), was first released in the INCOSE Store just prior to IW2022. An update to this manual with a shorter title, Needs and Requirements Manual (NRM) v1.1 was released the end of May 2022.

Our other new products, the Guide to Needs and Requirements (GtNR) and the Guide to Verification and Validation (GtVV) are now complete. These Guides will help the user with application of the NRM, giving guidance on practical application, examples, and checklists. This fits into our larger portfolio of working group products, which provide a rich body of knowledge for all things dealing with Needs and Requirements! As part of our product development activities, we have ensured that all our products are in alignment. As part of the alignment effort, we updated the Guide to Writing Requirements (GtWR) and the GtWR Summary Sheet to version 3.1. All our new and updated products are now available in the INCOSE Store, free for INCOSE members and a nominal charge for non-members.

RWG Events

The RWG holds regular RWG Exchange Cafes and also hosts guest speakers. We alternate between the RWG Exchange Cafes and guest speaker presentations. A preliminary schedule between now and IW2023 is shown below.
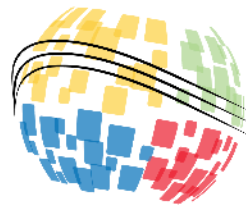
- June 25 – 30:IS2022 - We are planning a RWG Session for Tuesday, June 28 in the afternoon 1:30-2:55 pm EST. Zoom link: https://incose-org.zoom.us/j/98395272788?pwd=eEVidmxCc25SbFhwMEJ2b2d2dWpXQT09#success
- July 20: Presentation by Beth Wilson on Systems of Systems (SoS) challenges.
- August 24, 3 pm: RWG Exchange Café – Beth Wilson lead on SoS vs the NRM, GtNR, GtVV
- September 28: RWG Exchange Café – General discission focusing on interfaces
- October 26: Presentation by Beth Wilson – System Security Challenges
- November 16: RWG Exchange Café – Beth Wilson lead on System Security vs NRM, GtNR, GtVV
- December 14: Presentation by Henrik Mattfolk "Configuration Management Across the Digital Thread"
- January 2023:IW 2023 RWG prevent sessions - TBD

Notifications of our monthly meetings is via the RWG member mailing list, LinkedIn, Twitter, and the INCOSE Teams and Yammer sites. Both INCOSE members and non-members alike are welcome to attend and participate in our monthly meetings as well as view recordings of our meetings via the INCOSE RWG YouTube channel.

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https://www.incose.org/incose-member-resources/working-groups/process/requirements

INCOSE RWG YouTube Channel

- [YouTube](#) channel has recordings of meetings and presentations to the broader community.

- This resource is available to everyone to learn more about the RWG efforts and products.

- Also exists to attract interest in joining INCOSE and the RWG and share wisdom, experience and ideas with all that engage in needs and requirements efforts.

https://www.youtube.com/channel/UCadgYaqKWDckenP2SU8-cPw/playlists
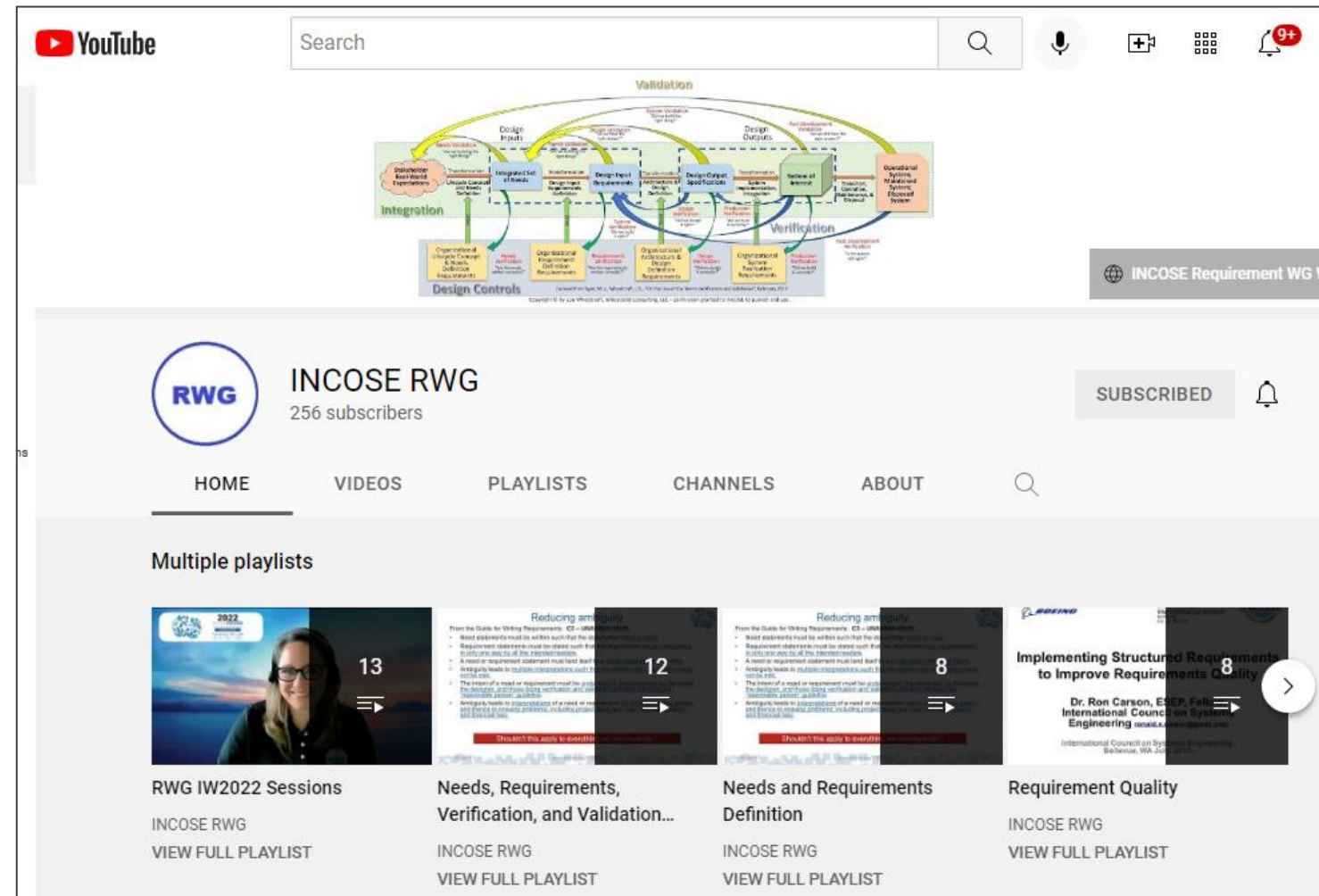
Concluding Thoughts

- A larger focus on the **Integrated Set of Needs** during the Stakeholder Needs and Requirements Definition technical process with the use of a **data-centric approach** towards development of Needs and Requirements enables a system development effort that satisfies stakeholder expectations.

- Systems engineers are encouraged to download and start using the INCOSE Needs and Requirements Manual, along with application guides, for additional resources on how to apply these recommendations in practice.

- Much of this content is also being included in the new INCOSE SE Handbook version 5, which is being released in 2023.

- Feedback on the INCOSE material is welcome, and can be sent to the RWG chair (Tami.Katz@incose.net).