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INCOSE Webinar Series

Wednesday 1st April 2020 – Webinar 135

Integrated Data as a Foundation of Systems Engineering

Louis Wheatcraft

With thanks to our Sponsor for 2020

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Choreography

1. Andy Pickard (your host) will introduce the Webinar and the speaker
2. Lou will speak for about 40 to 45 minutes
3. During his talk, participants can write questions using the Webex Q&A window
4. After Lou completes his talk, he will spend 10 minutes answering questions that Andy selects from those submitted by the audience
5. Andy Pickard will provide information about upcoming Webinars and then end this session
6. This Webinar is being recorded and will be made available on the INCOSE website to members and employees of CAB organizations

Requirements Working Group

Chair: Tami Katz; Sierra Nevada Corporation, USA
Co-Chair: Lou Wheatcraft, Wheatland Consulting, USA
Co-Chair: Rick Zinni, Harris Corp, USA
Co-Chair: Mike Ryan; University of New South Wales in Canberra, Australia
Co-Chair: Kevin Orr, Eaton, USA

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

Number of Members: 584, INCOSE's largest WG

Charter

1

Purpose

Advance the practices, education and theory of requirements engineering and its relationship to other systems engineering functions.

2

Goal

Expand and promote the body of knowledge of requirements engineering and its benefits within the systems engineering community

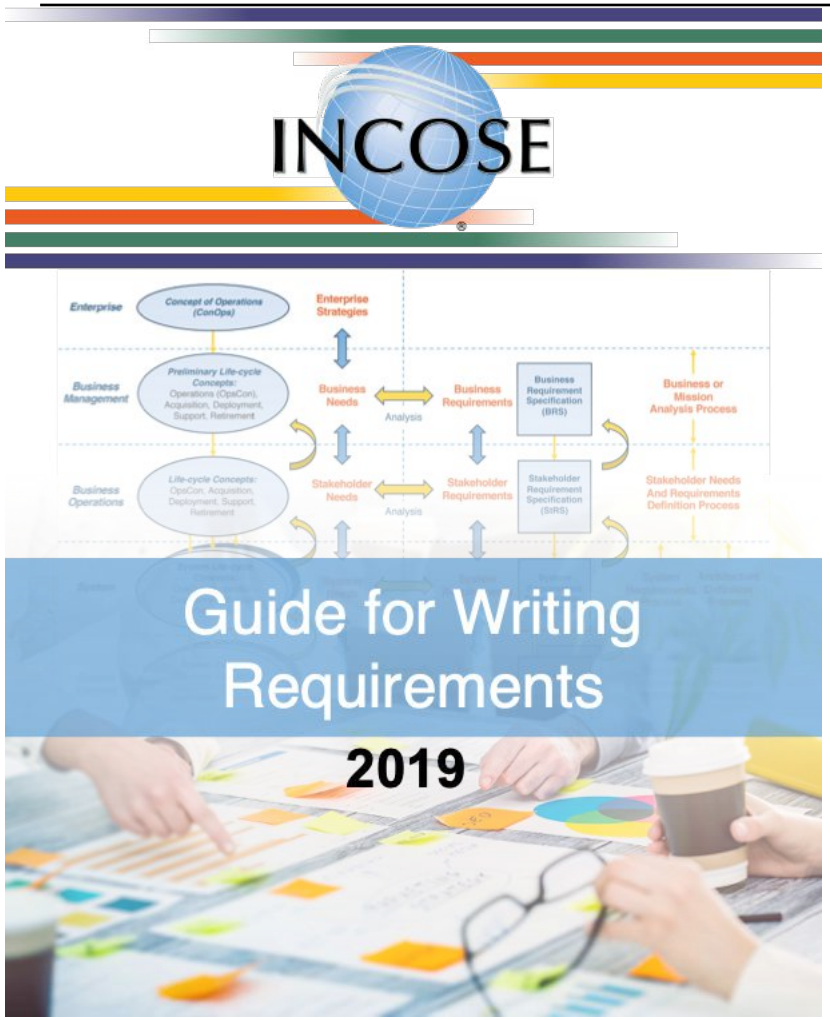
3

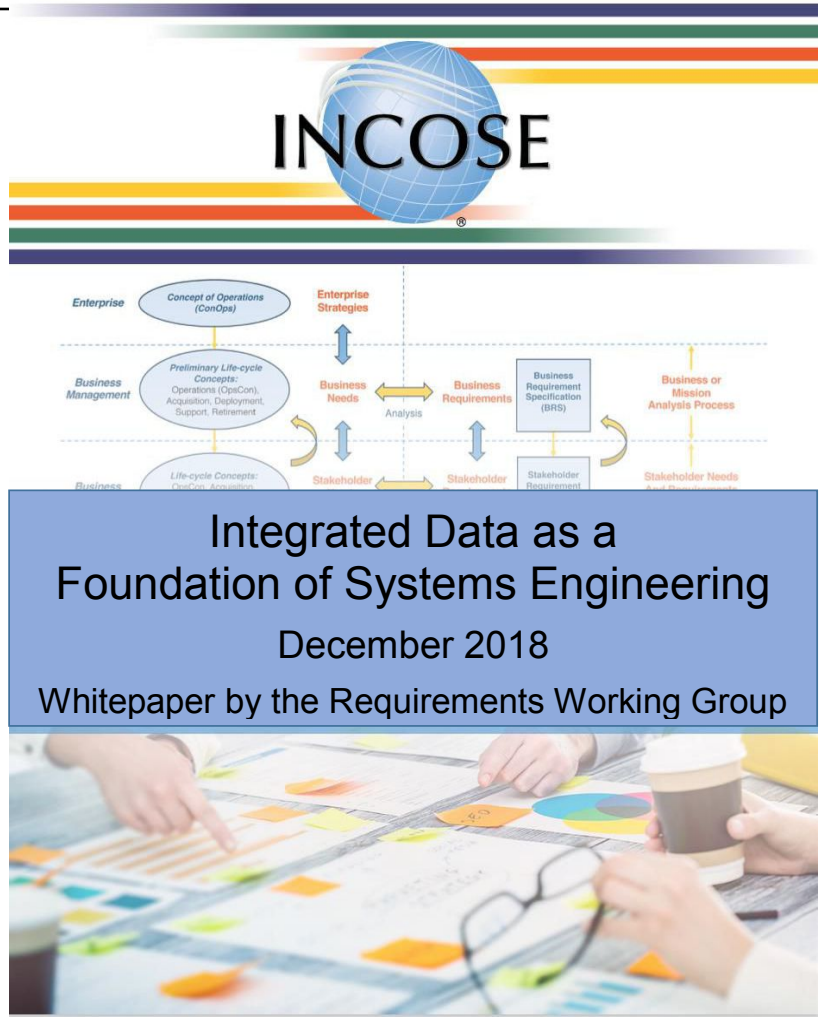
Scope

Activities relating to best practices for requirements engineering throughout the product lifecycle including:

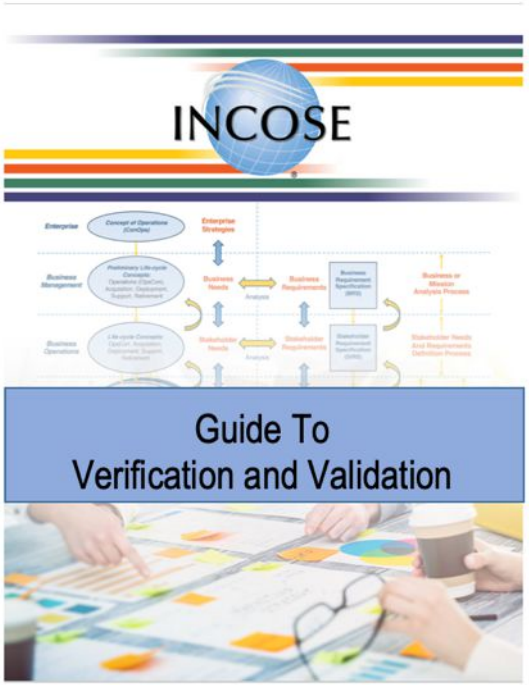
Elicitation	Analysis	Allocation	Traceability
Elaboration	Management	Change Management	
Expression	Verification	Validation	

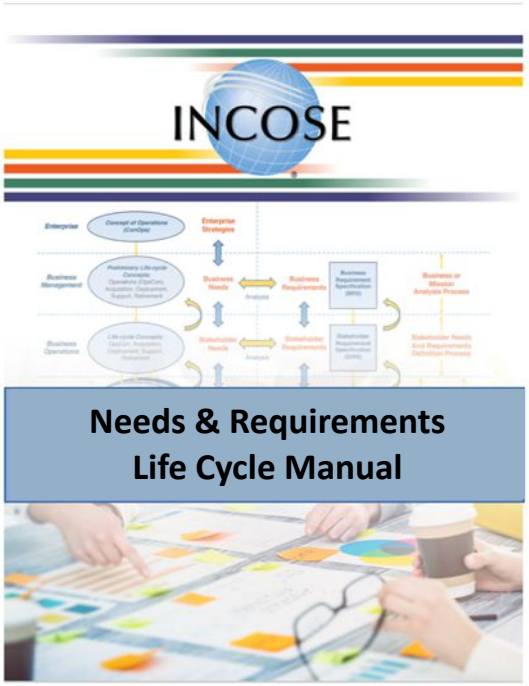
Released RWG Products – Available for download from the INCOSE Store

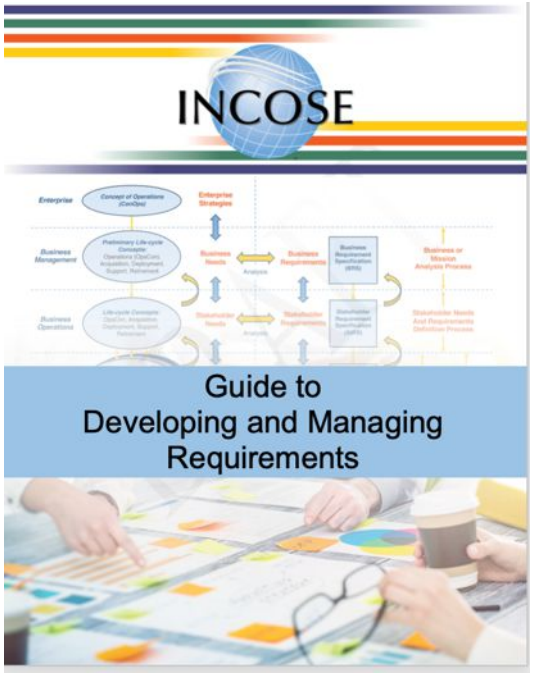




RWG Products in Work

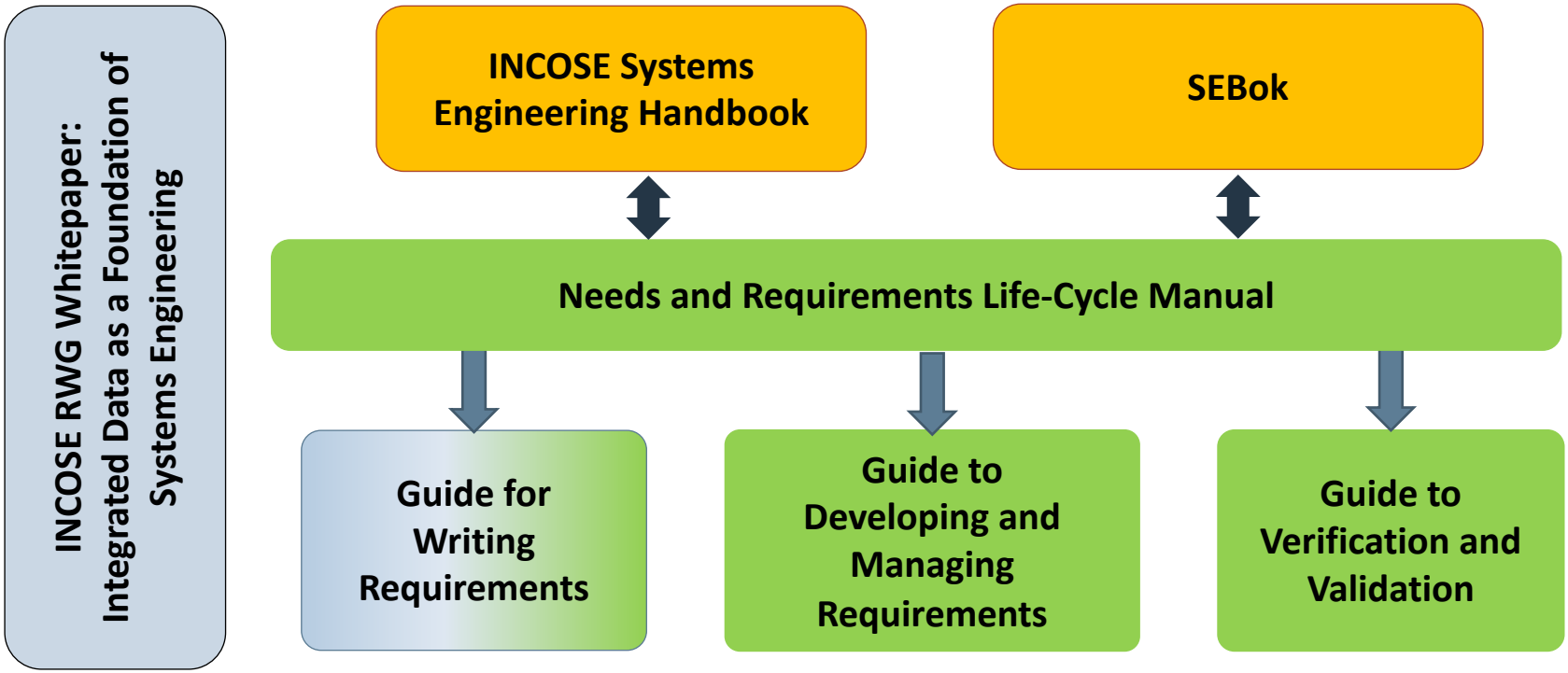




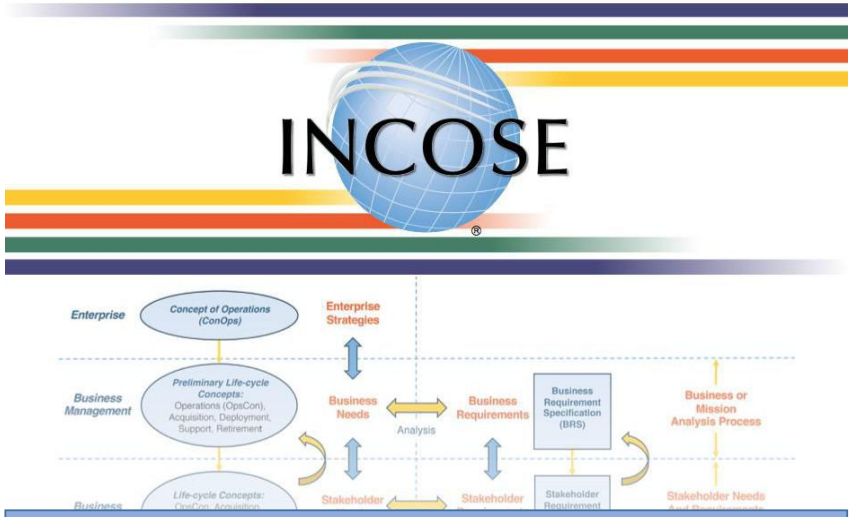


RWG Product Plan 2020

Generate products aligned to INCOSE SE Handbook and SEBok that address overall concepts and ontology, as well as provide specific guidance to the SE practitioner community.



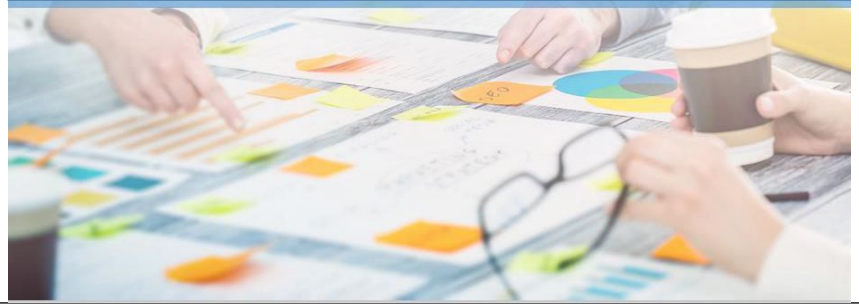
The focus of this presentation



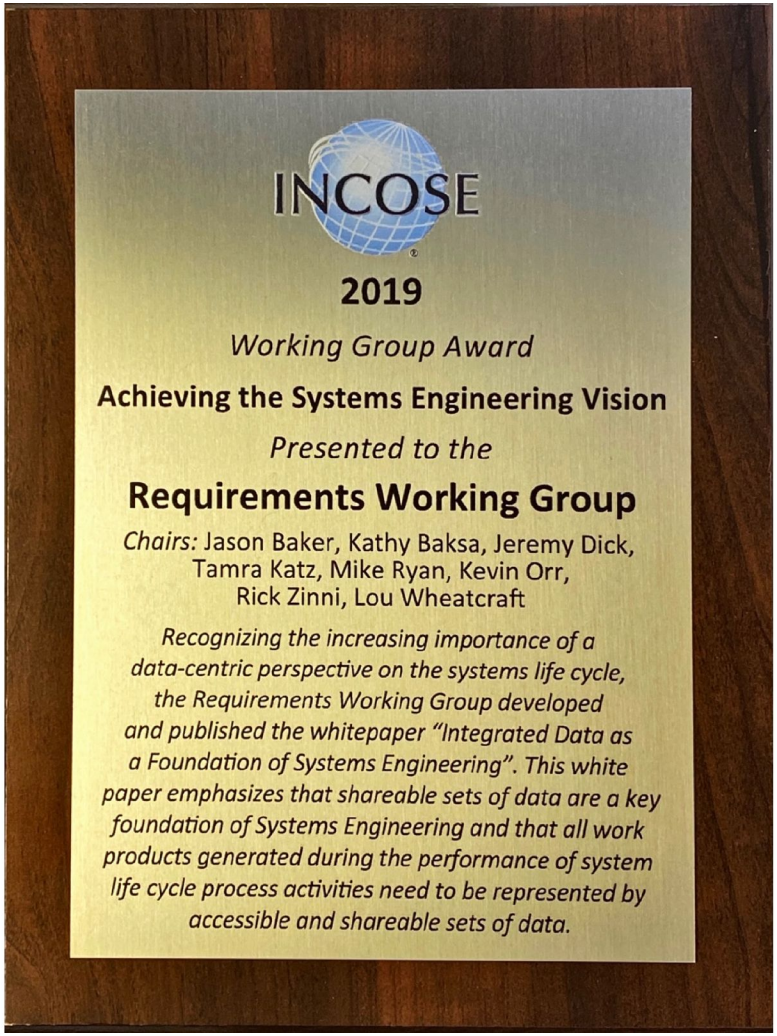
Integrated Data as a Foundation of Systems Engineering

December 2018

Whitepaper by the Requirements Working Group



IW2020 RWG Award



Preface

This whitepaper was an outgrowth from discussions concerning the RWG participation in and collaborating with the MBSE Initiative that occurred within the RWG sessions during INCOSE IW 2016 and IW2017 in Torrance, CA and subsequent communications between the authors, contributors, reviewers, members of the RWG, and members of other INCOSE Working Groups.

Goals

- Clarify that the data-centric approach to practicing SE advocated in this whitepaper is a major intent of MBSE.
- Outline the importance for an organization to keep track, manage, and share data and information across all the system life cycle process activities.
- Provide guidance regarding the management principles and decisions important to the implementation and management of SE from a data-centric perspective.
- Provide guidance & tools that can be used to measure & benchmark an organization's capability to practice SE from a data-centric perspective.
- Present a roadmap to help an organization move towards practicing SE from a data-centric perspective.

Goals

- Present a broader data-centric perspective of SE that is needed for increasingly complex, software-centric systems of the 21st century.
- Provide an integrated view of the various perspectives of MBSE which can be built upon and expanded on by the various INCOSE Working Groups, SE tool vendors, and practitioners of SE.

Provide a useful product to help organizations implement the level of SE capability that best meets their needs

Intended Audience

- Project, product managers, & systems engineers who are:
  - Stakeholders in activities defined by the SE discipline
  - Thinking about, or are in the process of, implementing SE within their organization
  - Wondering how to successfully implement the intent of the MBSE Initiative within their organization
  - Interested in maturing their current SE capabilities toward a more data-centric implementation of SE irrespective of the size and complexity of the system under development and the size and culture of the organization developing the system

This whitepaper is also targeted to those:

- From a requirements perspective,

  who have been, or are currently, focused on defining, documenting, and managing requirements as a distinct and separate, siloed activity from other system life-cycle process activities

- From a tool vendor perspective,

  whose tools do not currently provide the capability to integrate and share requirements and the other SE artifacts and their underlying data and information across all system life-cycle process activities

While these approaches may have worked in the past and may work for some present system development efforts, it is doubtful these approaches will allow organizations to meet the future challenges of increasingly complex, software-centric systems.

Shareability of Data & Information

- The RWG produced this whitepaper from the perspective that requirements, along with all work products and artifacts (models, designs, documents, diagrams, drawings, reports, etc.) generated during the performance of system life-cycle process activities are *visualizations represented by the underlying sets of data and information*
- These sets of data and information need be *accessible and shared* across all life cycle stages and between organizations and PM & SE tools used within an organization as well as external organizations
- Sharing data and information across all life-cycle stages will help to *ensure consistency, correctness, and completeness* of all work products and artifacts

Project/program management needs to manage projects such that these sets of data and information can be shared across all system life-cycle stages.

System Life-Cycle Artifacts & Work Products

LIFE CYCLE	PURPOSE (Activities)	EXAMPLES OF ACTIVITY OUTPUT WORK PRODUCTS	
CONCEPT	• Design inputs • Define problem space • Characterize solution space • Identify stakeholders' needs, goals, objectives, • Identify drivers and constraints • Explore concepts, ideas, & technologies • Develop initial concepts and models • Assess concept feasibility • Propose and baseline feasible concept/viable solution • Document stakeholder needs • Transform stakeholder needs into system requirements	• Need, Goals, Objectives • Measures: MOEs, MOPs, KPPs, TPMs. Leading indicators • Concepts of Operation, ConOps, OpsCons, Use Cases, User Stories, Operational scenarios • Voice of the Customer and other stakeholder expectations, • Functional architecture, • Product breakdown structure, Work breakdown structure • Mind maps, Power Point slide(s) • Sketches, diagrams, drawings • Proof of concept prototypes • Concept trade studies	• Scope document, budget, schedule • Descriptive models • Stakeholder needs • Interface diagrams and definitions, ICDs • Requirement attributes (rationale, trace, allocation, risk, priority, verification method, etc.) • Verification matrix • Allocation & trace matrices • Requirement verification and validation • Validated and baselined system design-input requirements
DEVELOPMENT	• Design outputs Refine system requirements, develop subsystem, assembly, component requirements • Verify and validate requirements • Refine models • Create solution description – architecture and system design • Document the design • Build engineering mockups • Integrate, verify, and validate design & system	• Analytical models, environment models, reliability prediction analysis, failure tree simulations used in development, etc. • Logical decomposition, logic diagrams • Subsystem, assembly, component requirements (document or database) • Design trade studies • Physical architecture, product breakdown structure	• Design documents, drawings, algorithms - at system, subsystem and component levels • Build-to/code-to specifications • Design verification and validation • Engineering mockups, prototypes • Source code, compiled applications • Test plans, procedures • System integration, verification, and validation plans, procedures
PRODUCTION	• Produce system • Inspect and test • Post production system validation in operational environment	• Manufacturing/coding plans • System being produced • As-built drawings, diagrams, algorithms, models	• Completed test, system verification & validation activities, data, and results; non-conformance reports
UTILIZATION	• Operate system to satisfy users' needs	• Updated models, • User, maintenance manuals/procedures	• Simulators for operator training • Surveillance test plans and data; customer feedback
SUPPORT	• Provide sustained system capability	• Sustaining Engineering • Upgrades and in-service modifications of the system.	• Updated drawings, diagrams, algorithms, models • Failure/finding reports
RETIREMENT	• Store, archive, or dispose	• End-of-life plan for retirement, disposal, recycle	

Lots of Artifacts and Work Products

(Derived from INCOSE SE HB Chapters 3, 4, & 5).

April 1, 2020

Table 1: Examples of system life cycle activities and work products

Different perspectives of MBSE:

- MBSE can mean different things to different people.
  - To some, MBSE is equated to the use of SysML and other language-based modeling tools
    - Practicing Model-based Design (MBD) starting with a set of design input requirements and ending with a set of design output specifications
    - Using models to better define needs and design input requirements
    - Using models across all life-cycle stages
  - **To others, the goal of MBSE is to move from a document-centric practice of SE toward a data-centric practice of SE**
- Using a data-centric approach, systems are developed and managed using shareable integrated/federated sets of data
- Within these sets of data are all the artifacts generated across all life cycle stages, all linked together

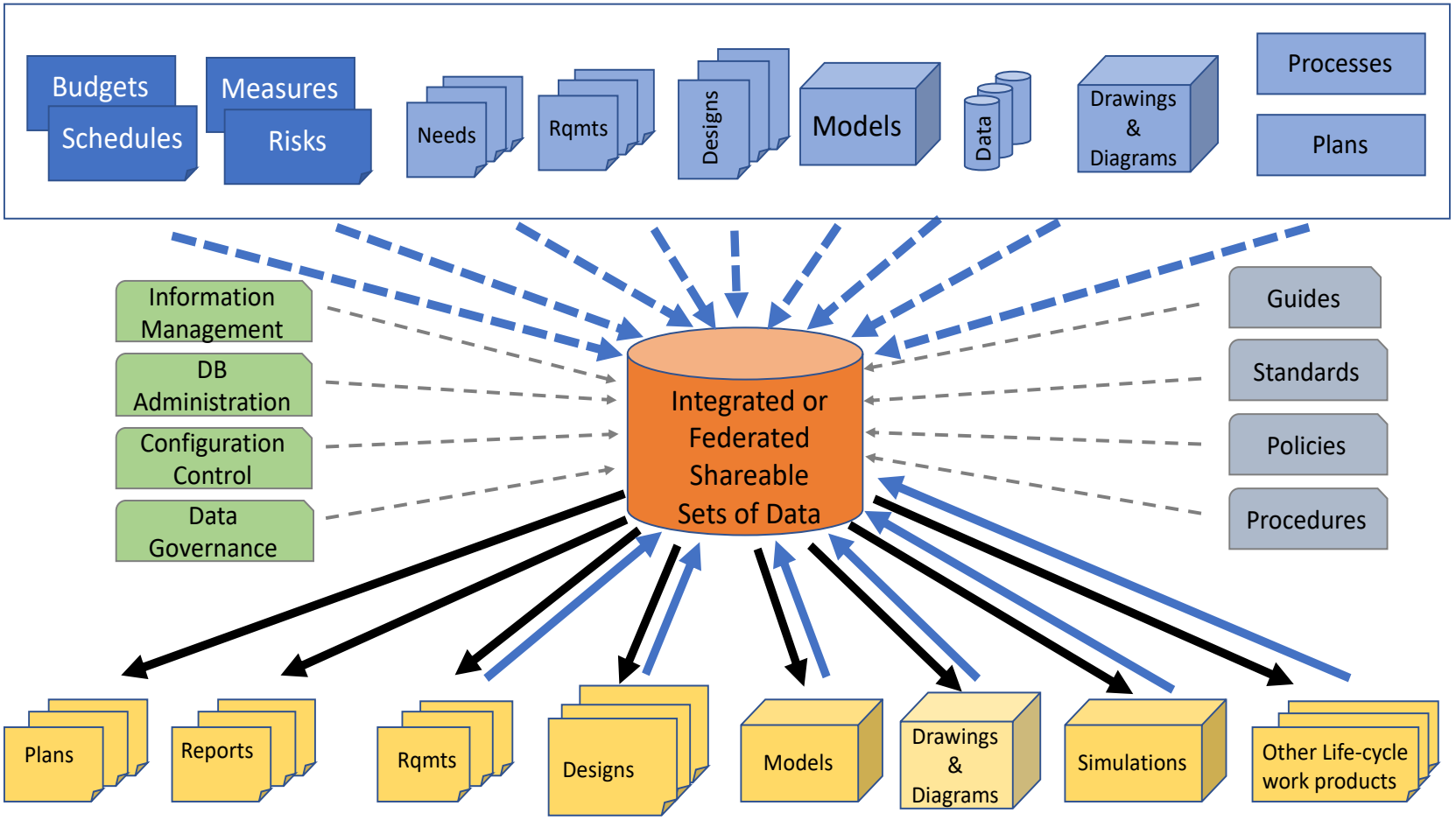
The result is a data and information model of both the SOI under development as well as the SE processes.

SE from a data-centric perspective:

"SE, from a data-centric perspective, involves the formalized application of shareable sets of data to represent the SE work products and underlying data and information generated to support concept maturation, requirements development, design, analysis, and verification and validation activities throughout the system life cycle, from conceptual design to retirement."

Using this perspective, **integrated (or federated), shareable sets of data can be viewed as a foundation of Systems Engineering**.

Integrated data as a foundation of SE



Original Developed by INCOSE RWG at IW 2017

Table of Contents

Table of Contents

How to use this whitepaper:

- To meet the future challenges of increasingly complex, software-centric systems, organizations must recognize
  - The need to move to a data-centric practice of SE
  - Understand the level of SE capably most appropriate for their organization, culture, and product line
  - Develop a road map to achieving this level of capability

This white paper has tools built in to help organizations assess their current status concerning challenges & issues they may currently be experiencing due to their current level of SE capability from a data-centric perspective and identify the SE capability level (SCL) they would like to be at.

Road Map to Data Centricity

1. Get management buy in	Success starts at the top! (Section 5.3)
2. Understand the need	Challenges & Benefits (Section 2, App D)
3. Access your organization's current SE Capability Level (SCL)	Current State (Section 5.1)
4. Determine the SCL your organization's needs to be	Future State (Section 5.1)
5. Identify the Gaps	What changes need to be made
6. Develop Action Plans	Define actions to make the changes (Section 4, Section 5.2, App C)
7. Implement the Action Plans	Perform the actions!

Road Map to Data Centricity:

Step 1: **Get Management Buy in**

Read Section 5.3 “Integrating SE from a data-centric perspective into your organization”

- Changing culture is often met with opposition
- Use a pilot project

Provides practical guidance to help management understand the need to transition their organization to practice SE from a data-centric perspective

Road Map to Data Centricity

Step 2: **Understand the need**

Read Section 2 “The Need for Systems Engineering”

- Meeting the challenges of increasingly complex systems
- Benefits of practicing SE from a data-centric perspective

Fill out the questionnaire that is contained in Appendix D: “Systems Engineering Issues Questionnaire”

- Addresses common issues organizations face because of increasingly complex, software centric systems and the issues associated with not of practicing SE from a data-centric perspective
- Survey monkey: https://www.surveymonkey.com/r/N6FLMBL

To be successful, organizations must recognize the need for SE from a data-centric perspective

APPENDIX D: SYSTEMS ENGINEERING ISSUES QUESTIONNAIRE

Instructions: The statements below are worded such that they represent the current state of an organization. Check the column that most closely reflects the perspective of the organization's current state: True, Mostly True, Neutral, Mostly False, False. If most of the responses are either "True" or "Mostly True", that is a good indication the organization needs to adopt Systems Engineering (SE) or mature their current SE processes, moving toward SE with a data/information-centric perspective.

	Issue/Challenge	T	MT	N	MF	F
1.	We develop very complex systems with a large number of work products and sets of data. Many of our work products are managed as printed, standalone documents. We are having problems managing this complex system with our current approach to documentation of work products.					
2.	Our current organization is divided into "silos" for each system life cycle stage. This makes it difficult share data across organizational elements to holistically integrate with coherence and consistency work products and their underlying data and information across disciplines, organizations, and system life cycle stages.					
3.	Our current system life cycle capabilities do not allow us to capture, integrate, manage, and access increasingly large sets of system engineering and program/project management data and information and their associated interrelationships.					
4.	Our current organization and SE process makes it very hard to identify and manage dependencies across not only the system architecture but dependencies across disciplines and system life cycle work products and entities.					
5.	Our current organization and SE process makes it difficult to identify, define, and manage interactions (interfaces) between parts of our complex system architecture and between the system and the macro-system of which it is a part. Because of this we often have costly integration problems resulting in costly and time-consuming rework.					
6.	Our current organization and SE process makes it difficult to track progress, identify at-risk activities, and take actions before these risks become problems that could impact cost, schedule, or the ability to deliver a product that meets stakeholder needs in the operational environment. The result is we spend a lot of time being firefighters to put out fires rather than being able to prevent the fires from starting in the first place.					
7.	Our current decision-making culture is based on a "gut" feel mainly because of a lack of easy and timely access to data and information needed to make informed decisions. Once a decision is made, frequently the decision is not documented nor is the supporting information as to why the decision was made documented.					
8.	Currently, PM activities and resulting work products and underlying data and information are segregated from the SE activities and resulting work products and underlying data and information, making it difficult to manage cost, schedule, and risk.					
9.	Consistency of work products and their underlying data is problematic. Work products and their underlying data and information are spread across multiple databases and servers. These sets of data are not compatible (schemas are not consistent) making it difficult to share data. The result is that there is no single source of design data and information that can be expressed authoritatively in order to be referred to by others for decisions, derivations, or formation of other work products.					
10.	We have poor visibility into the principle characteristics of our whole system preventing us from creating multiple views from integrated, shareable sets of data that succinctly address specific stakeholder concerns and interests.					
11.	Our current processes result in poor congruence and configuration management between documentation and reality. Many of our SE work products must be generated manually to obtain differing views of the system under development. The labor and associated costs are expensive to generate, configuration manage, and keep these work products and their underlying data and information up to date. Frequently many work products and their underlying data and information are out-of-date and do not match the best available, current data and information.					
12.	Because our data and information are distributed across many databases and servers there is no "single source of truth". Because of this we are at the mercy of what someone says or thinks, what they "remember", or what perspective they have concerning what is being done or built or a decision that was made. Truth is in the eye of the beholder.					
13.	With our current SE toolset, it is very difficult to navigate, trace, or interrogate system engineering data and information across all system life cycle stage activities. Managers and engineers do not have ready access to correct and consistent information on an as-needed basis. Meaningful reports take a lot of labor to produce manually, having to search individual databases and integrate the data for the desired reports.					
14.	Currently we are not able to reuse SE and PM work products. The result is considerable time and expense because each brown field project must start from scratch resulting in wasted funds and increased time to manage our product line.					
15.	Because of stove piping and a lack of traceability, we are unable to adequately manage stakeholder needs, requirement definition, design, build/code, and system verification and validation activities in an integrated, consistent manner. Our current processes make it difficult to monitor the status of verification and validation activities in order to show compliance with stakeholder needs and drivers and constraints (e.g., regulations, customer requirements).					
16.	Because of our current SE processes, the costs associated with erroneous design and resulting rework is very high. Lack of an integrated or federated, shareable sets of data makes analysis of the SE work products and underlying data and information difficult to identify a flaw or inconsistency as soon as it is created, preventing us to take corrective action before downstream work is done, making that work invalid, and increasing costs and time to correct because the upstream mistake was not identified and corrected immediately. One result of this is huge expenses associated with recalls, returns, warranty work, and negative comments on social media.					
17.	Our current, siloed organization and lack of an integrated or federated, shareable sets of data directly impacts the identification, management, interoperability, and integration of work products and underlying data and information across business or organizational elements. This makes it difficult to support program budget and schedule goals.					
18.	Our current distributed organization of data and information makes it difficult to metatag data, information, and work products. Because of this, we cannot currently tie these things directly to our WBS, budget, schedule, and risk management systems.					
19.	Data and information needed by programs and projects (e.g., for milestones, reviews, mission operations, risk mitigation, and anomalies or investigations, decisions, and outcomes) are not identified and managed. Because of this, there is currently no way to provide traceability of the data used in decision-making.					
20.	It is difficult to establish, maintain, and track key measures needed to monitor trends, assess progress, and identify issues. Because of this, tend monitoring of leading indicators is not possible resulting major issues popping up with little or no warning, actual progress is hard to determine. This makes it difficult to ensure the system being developed will meet stakeholder needs and expectations.					

Road Map to Data Centricity

Step 3: **Access your organization's current SCL**

- Read Section 5.1, *Levels of SE Capability*, which define SE Capability Levels (SCLs) 0-5
  - SCLs are defined in context of an organization's current level of SE capability in terms of practicing SE from a data-centric perspective
  - There are 14 factors/attributes (areas of capability) included in the tables
- Use the tables in Section 5.1 to access your organization's current SCL

Your organization may be at different SCLs for each of the 14 areas of capability

SE Capability Levels (SCLs)
Example - SCL 0

Factor/Attribute - Area of Capability (14)	Current state
Organization	The system life cycle process activities are divided across organizational units operating in silos.
Enterprise Level Data & Governance Policy, Processes, & Procedures	The enterprise has no documented data and information governance policy, processes, and procedures.
Project level Data and Information Management	Projects have not included data management concepts in their PMP nor SEMP and have no IMP.
Master Ontology	There is no defined master ontology for the enterprise nor project.
Master Schema	The project does not store data in a database so there is no defined master schema for the project.
Systems Engineering (SE) Tool Set	The primary SE toolset used by the project is limited to common office applications: word-processing, spreadsheets, presentations, and basic drawing and diagraming tools.
Project Management (PM) Tool Set	The primary PM toolset used by the project is common office applications: word-processing, spreadsheets, and presentations.
Work Product Format	The primary focus of the project is on hardcopy, printed documents, design description documents, ICDs, CAD drawings, etc.
Shareability of data and information	While the files representing work products are stored electronically, they exist as independent files (vs. in a database containing underlying data) making it difficult to share information contained within the files other than with other office applications (copy/paste).
Linking (Traceability) between work products developed in different development life cycles	Few, if any, work products are linked together across system life cycle process activities making it is difficult to identify and manage dependencies between work products. Any traces between requirements is done manually, if at all.
Consistency of data across work products	There are often inconsistencies between and within work products.
Completeness of work products	It is difficult to assess completeness of data and information within work products.
Use of work product attributes and associated measures	Few, if any, SE work product attributes and measures are defined and used to help manage the project. PM measures focus on schedule and budget.
Configuration Management	The project baselines and configuration manages individual printed documents or electronic versions of the printed documents (e.g., pdf files). The single source of truth of project's data and information is represented by these baselined and configuration managed documents.

SCL 3:

Factor/Attribute	Current State
Organization	Silos within the project do not exist, or at least are minimized. The focus is on multidiscipline, collaborative, teams (e.g. Integrated product teams).
Enterprise Level Data & Governance Policy, Processes, & Procedures	The enterprise has documented and implemented a data and information governance policy, processes, and procedures.
Project level Data and Information Management	Most if not all of the of the projects within the enterprise have included data management concepts in their PMP and SEMP and have an IMP consistent with the enterprise level information governance policy, processes, and procedures.
Master Ontology	A master ontology for the enterprise and project has been developed. Project's develop a project level ontology consistent with the enterprise level ontology.
Master Schema	A master schema for the projects have been defined. Most SE & PM tool schemas are consistent with the project master schema.
Systems Engineering (SE) Tool Set	The project has transformed their SE process such that most of the SE work products are being developed using SE tools that are fully compliant with interoperability and data sharing standards. SE tool data and information is shareable with PM tool data and information.
Project Management (PM) Tool Set	The project has transformed their PM process such that most of the PM work products are being developed using PM tools that fully conform to interoperability and data sharing standards. PM data and information is shareable with SE tool data and information.
Work product Format	The project manages the various system life cycle process activities and work products and their underlying data and information from the project's integrated or federated, shareable sets of data. Most of the PM and SE tools store the data and information either as electronic files or in a database whose schema is consistent with the project master schema allowing the PM & SE tool databases to be included directly as part of the project's integrated, shareable sets of data.
Shareability of data and information	Because the Project's SE Tools adhere fully to interoperability and data sharing standards and consistent schemas, the data and information in these individual databases is compatible - enabling the SE & PM tools to share data and information both internally and with organizations external to the enterprise. Note: Even though most of the SE tools have compatible databases included in the integrated or federated, shareable sets of data, the enterprise may require the project to continue to use some legacy systems, whose schema is not compatible with the integrated, shareable sets of data. In this case, this data must go through an ETL process before the data can be included in the integrated, shareable sets of data and be accessible by other tools.

SCL 3:

Linking (Traceability) between work products developed in different development life cycles	Most of the PM and SE work products and underlying data and information are linked also across system life cycle stages. For example, requirements are linked to the stakeholder needs and higher-level requirements allocated to the system, requirements are linked to models, design is linked to requirements, system verification and system validation is linked to design and requirements. There is traceability between stakeholder needs, requirements, analysis, models, design, verification, validation.
Consistency of data across work products	Because the project has shareable sets of data and traceability between work products across all life cycle states, it is much easier to establish and maintain consistency between work products.
Completeness of work products	The project has shareable sets of data and traceability between work products across all life cycle states, making it easier to assess completeness of the data and information within work products. Requirement sets include both functional and performance requirements developed as part of the modeling effort, but also include non-functional requirements including quality, design and construction standards, regulations,
	and physical attributes of the system that are difficult to include in a logical model of the system.
Use of work product attributes and associated measures	The PMP and SEMP define work product attributes to be used to manage the overall SE effort across all system life cycle stages. The PMP and SEMP define measures like MOSs, MOEs, MOPs, KPPs, TPMs, LIs to be included in the integrated, shareable sets of data. Project data and information are linked with the SE process data and information. The data representing measures and work product attributes are accessible and used to generate reports, dashboards, etc. which are used to better manage the project and system engineering processes.
Configuration Management	There is only one single source of truth for the project - the data and information in the integrated or federated, shareable sets of data. The project's data and information in these sets of data is under strict configuration control and therefore represents the baseline state of the project at any given time. The work products and underlying data and information are developed, analyzed, and managed holistically as an integrated system made possible because of the existence of these shareable sets of data. Any "visualizations" of the data and information in the these sets of data represent the current state of the project. Even when these visualizations are extracted as reports, the single source of truth is still the data and information model from which they were generated. There may still be some use of common office applications, however the master, ground-truth, data and information are managed electronically with any paper-based documentation visualizations of the data and information considered as "reports" that only represent the electronic data and information at the time of printing.

Road Map to Data Centricity

Step 4: **Determine the SCL your organization needs to be**

- For each of the 14 factors/attributes (areas of capability),
  - Decide which SCL your organization needs to be at to address the issues indicated when filling out the questionnaire in step 1.
  - Your current level is your “as-is” present state (baseline)
  - The level you want to be at is your “to-be” future state

Step 5: **Identify the Gaps**

- Identify the gaps between your present and future states for each area of capability

Putting it all together

Factor/Attribute (area of capability)	SCL 0	SCL 1	SCL 2	SCL 3	SCL 4	SCL 5
Organization	P	Gap	F			
Enterprise Level Data & Governance Policy, Processes, & Procedures	P	Gap		F		
Project level Data and Information Management	P	Gap		F		
Master Ontology	P	Gap		F		
Master Schema	P	Gap		F		
Systems Engineering (SE) Tool Set			P	Gap	F	
Project Management (PM) Tool Set		P	Gap		F	
Work product Format	P	Gap			F	
Shareability of data and information	P	Gap			F	
Linking (Traceability) between work products developed in different development life cycles	P	Gap		F		
Consistency of data across work products	P	Gap		F		
Completeness of work products	P	Gap		F		
Use of work product attributes and associated measures	P	Gap		F		
Configuration Management	P	Gap			F	

Road Map to Data Centricity

Step 6: **Develop Action Plans**

- For each area, develop an action plan to identify the changes needed (people, procesess, tools) to close the gaps and achieve the future state based on your organization's specific needs.
- Read Section 4, "Practicing SE from a data-centric perspective"
  - Topics dealing with the enterprise level infrastructure considerations to successfully move to a data-centric practice of SE for projects.
    - Data governance
    - Information Technology (IT)
    - Information Management (IM)
    - Configuration Management (CM)
    - Defining and using measures to better manage projects
- Read Section 5.2 "Choosing an appropriate SE toolset" and Appendix C: "Features a SE Toolset should have"

Road Map to Data Centricity

Step 7: **Implement the Action Plans**

- For each area, perform the actions that result in the needed changes

  USE A PILOT PROJECT AT FIRST

- Identify and record metrics of success

  METRICS THAT RELATE TO THE ROI EXPECTED

- Document issues and lessons learned
- Update the processes as needed

  IMPLEMENT PROCESSES FOR OTHER PROJECTS

Following these 7 steps should result in your organization being able to practice data-centric SE at the capability level that meets your organizations specific needs.

Shareable, integrated data is the foundation of all SE lifecycle activities

The data-centric SE perspective focuses attention on the shareable, integrated datasets that underpins all SE activities, including

- A data & information model of the system being developed
- A data & information model of the SE lifecycle processes
- Generation, visualization, and management of all SE work artifacts and work products and their underlying data and information
- Use of measures to help better manage the project

A data-centric SE perspective is essential to:

- ✓ **Manage the system development efforts across all lifecycles,**
- ✓ **Address the challenges of increasingly complex, software-centric systems,**
- ✓ **Meet the intent of INCOSE's MBSE Initiative**
- ✓ **Move towards INCOSE's Vision 2025.**

Questions?

Upcoming Webinars (tentative schedule)

Who	What	When
Guy Andre Boy	Human Systems Integration	Wednesday 15th April 2020 at 11am EDT
Becky Reed and Ian Presland	How to Create a Value-Added SEMP	Wednesday 20th May 2020 at 11am EDT

Invitations will be emailed in advance and informational updates will be placed on www.incose.org
Go to http://www.incose.org/products-and-publications/webinars for more info on the webinar series, including a way to view the last 134 Webinars and soon – this one!

Information on the webinars is now being posted in INCOSE Connect, in the INCOSE Library area, at https://connect.incose.org/Library/Webinars/Pages/INCOSE-Webinars.aspx . Joining instructions will added around two weeks before the webinar is scheduled to take place.

INCOSE Systems Engineering Professional PDU Credit

Please note that you can claim 1PDU credit towards your Systems Engineering Professional re-certification by attending this webinar. INCOSE webinars may also apply to the PDU requirements of other organizations, depending on the subject matter

To qualify, you must have attended through at least 75% of the webinar for webinars that last less than one hour, or through 45 minutes of the webinar for webinars that last for 1 hour or longer.

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