Modeling the Digital System Model (DSM) Data Taxonomy

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Agenda

- DSM Data Taxonomy Overview
- Evolution of the DSM Data Taxonomy (Tabular, Mind Map, SysML)
- Modeling the DSM Data Taxonomy
- Benefits
- Path Forward

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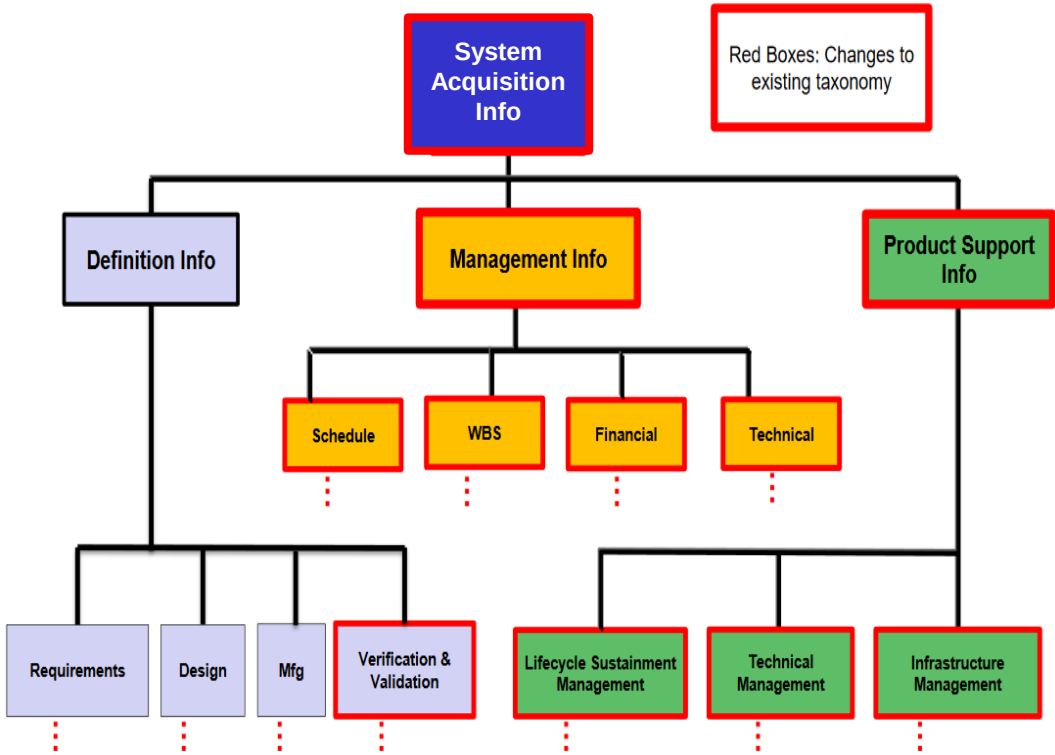
DSM Data Taxonomy Overview

- **Purpose**
  - Provides a model to aid programs in defining an authoritative source of truth
  - Builds an integrated taxonomy providing stakeholders an organized structure for the types of technical data to be considered across the life cycle
  - Establishes a Common Vocabulary that can be used by all programs



A change from document centric taxonomy in DAG CH 3–4.1.7 Technical Data Management Process.

Use as a basis to drive the community towards Digital Engineering across disciplines, systems and enterprises to support life cycle activities from concept to disposal.

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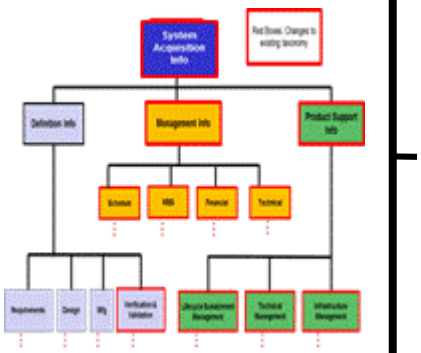
DSM Intended Use

Defines the broad categories of data

DSM Data Taxonomy



Component of the DE Infrastructure

Provides the program's DE ecosystem

DE Ecosystem

Identifies the data and data rights

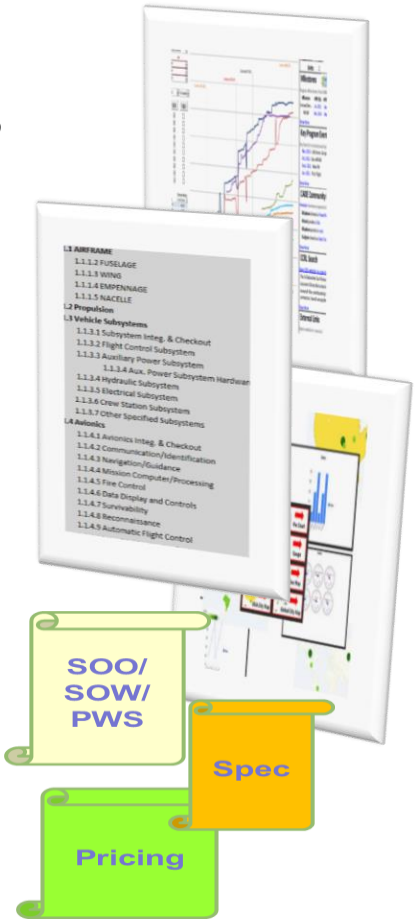
Document Views

*Provides multiple views to support **decisions***

Data Views

Acquisition Views

Other Views



DSM Data Taxonomy provides the broad categories of data that should be considered across the lifecycle

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Data Taxonomy Uses

- The taxonomy serves as a common vocabulary for enterprise and program consideration.
- Use it to define the data the program will need to create and manage.
- Use it to determine what tools will use or produce the data.
- Use it to determine who owns and controls the data at any point in time in a programs life.
- Use it to identify what data will be delivered on contract, what format the data should be received in.
- Use it to identify what data has associated data restrictions.
- Use it to identify what data needs to be protected and handled.
- Use it to define the data that belongs in views, digital and or other artifacts.

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Evolution to Modeling the DSM Data Taxonomy

Tabular Tool

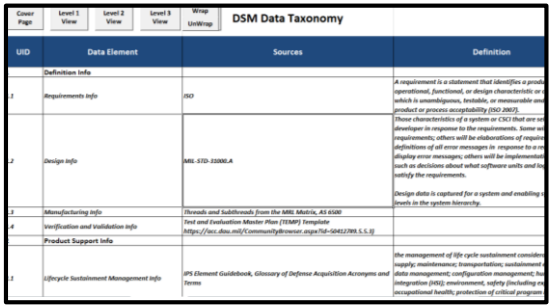
- Initial attempt to organize and construct a hierarchical structure for technical data in a system from documents and guidelines (e.g., DAG, ICD, CDD, SEP, TEMP, MIL-STD, SME, etc.)

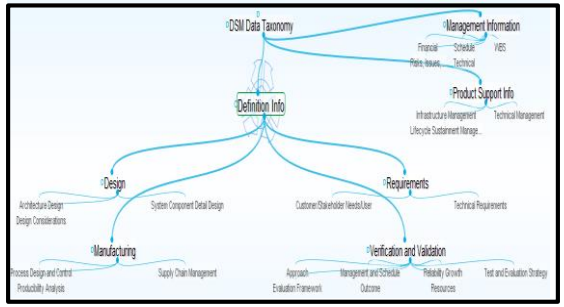
Mind Mapping Tool

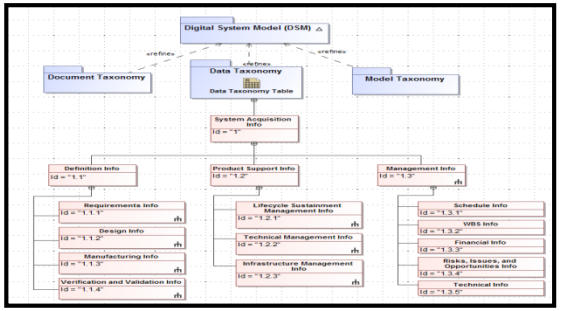
- Prototype testing using a mind mapping tool to visualize hierarchical relationships between system components and their respective digital artifacts

SysML Modeling Tool

- Utilized a System Modeling Language (SysML) modeling tool to construct a hierarchical structure and enable the capture of digital technical data for use and reuse in a model







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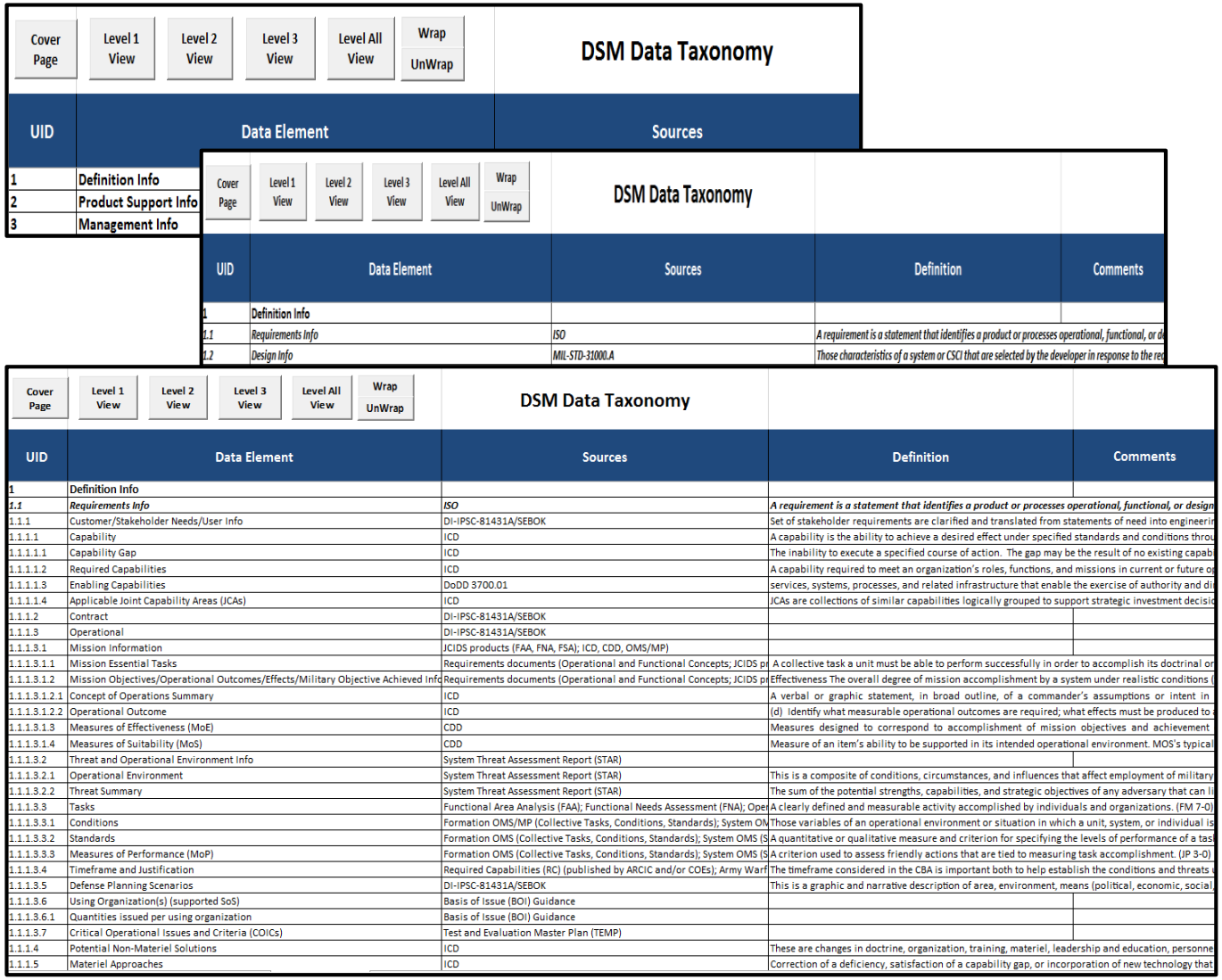
DSM Data Taxonomy in Excel



Cover Page | Level 1 View | Level 2 View | Level 3 View | Level All View | Wrap | UnWrap

DSM Data Taxonomy

UID	Data Element	Sources	Definition	Comments
1	Definition Info			
1.1	*Requirements Info*	*ISO*	*A requirement is a statement that identifies a product or processes operational, functional, or design*	
1.1.1	Customer/Stakeholder Needs/User Info	DI-IPSC-81431A/SEBOK	Set of stakeholder requirements are clarified and translated from statements of need into engineerin	
1.1.1.1	Capability	ICD	A capability is the ability to achieve a desired effect under specified standards and conditions throu	
1.1.1.1.1	Capability Gap	ICD	The inability to execute a specified course of action. The gap may be the result of no existing capab	
1.1.1.1.2	Required Capabilities	ICD	A capability required to meet an organization's roles, functions, and missions in current or future op	
1.1.1.1.3	Enabling Capabilities	DoDD 3700.01	services, systems, processes, and related infrastructure that enable the exercise of authority and di	
1.1.1.1.4	Applicable Joint Capability Areas (JCAs)	ICD	JCAs are collections of similar capabilities logically grouped to support strategic investment decisio	
1.1.1.2	Contract	DI-IPSC-81431A/SEBOK		
1.1.1.3	Operational	DI-IPSC-81431A/SEBOK		
1.1.1.3.1	Mission Information	JCIDS products (FAA, FNA, FSA); ICD, CDD, OMS/MP)		
1.1.1.3.1.1	Mission Essential Tasks	Requirements documents (Operational and Functional Concepts; JCIDS p	A collective task a unit must be able to perform successfully in order to accomplish its doctrinal or	
1.1.1.3.1.2	Mission Objectives/Operational Outcomes/Effects/Military Objective Achieved Info	Requirements documents (Operational and Functional Concepts; JCIDS p	Effectiveness The overall degree of mission accomplishment by a system under realistic conditions (	
1.1.1.3.1.2.1	Concept of Operations Summary	ICD	A verbal or graphic statement, in broad outline, of a commander's assumptions or intent in	
1.1.1.3.1.2.2	Operational Outcome	ICD	(d) Identify what measurable operational outcomes are required; what effects must be produced to	
1.1.1.3.1.3	Measures of Effectiveness (MoE)	CDD	Measures designed to correspond to accomplishment of mission objectives and achievement	
1.1.1.3.1.4	Measures of Suitability (MoS)	CDD	Measure of an item's ability to be supported in its intended operational environment. MOS's typical	
1.1.1.3.2	Threat and Operational Environment Info	System Threat Assessment Report (STAR)		
1.1.1.3.2.1	Operational Environment	System Threat Assessment Report (STAR)	This is a composite of conditions, circumstances, and influences that affect employment of military	
1.1.1.3.2.2	Threat Summary	System Threat Assessment Report (STAR)	The sum of the potential strengths, capabilities, and strategic objectives of any adversary that can li	
1.1.1.3.3	Tasks	Functional Area Analysis (FAA); Functional Needs Assessment (FNA); Oper	A clearly defined and measurable activity accomplished by individuals and organizations. (FM 7-0)	
1.1.1.3.3.1	Conditions	Formation OMS/MP (Collective Tasks, Conditions, Standards); System ON	Those variables of an operational environment or situation in which a unit, system, or individual is	
1.1.1.3.3.2	Standards	Formation OMS (Collective Tasks, Conditions, Standards); System OMS (S	A quantitative or qualitative measure and criterion for specifying the levels of performance of a tas	
1.1.1.3.3.3	Measures of Performance (MoP)	Formation OMS (Collective Tasks, Conditions, Standards); System OMS (S	A criterion used to assess friendly actions that are tied to measuring task accomplishment. (JP 3-0)	
1.1.1.3.4	Timeframe and Justification	Required Capabilities (RC) (published by ARCIC and/or COEs); Army Warf	The timeframe considered in the CBA is important both to help establish the conditions and threats	
1.1.1.3.5	Defense Planning Scenarios	DI-IPSC-81431A/SEBOK	This is a graphic and narrative description of area, environment, means (political, economic, social	
1.1.1.3.6	Using Organization(s) (supported SoS)	Basis of Issue (BOI) Guidance		
1.1.1.3.6.1	Quantities issued per using organization	Basis of Issue (BOI) Guidance		
1.1.1.3.7	Critical Operational Issues and Criteria (COICs)	Test and Evaluation Master Plan (TEMP)		
1.1.1.4	Potential Non-Materiel Solutions	ICD	These are changes in doctrine, organization, training, materiel, leadership and education, personne	
1.1.1.5	Materiel Approaches	ICD	Correction of a deficiency, satisfaction of a capability gap, or incorporation of new technology that	

Challenges

- Extensive and complex view (The Excel file expands to over 400 line items)
- Difficulty discerning hierarchical relationship between data elements
- Very manual process to render diagrams and show relationships between elements.
- Cumbersome to track changes

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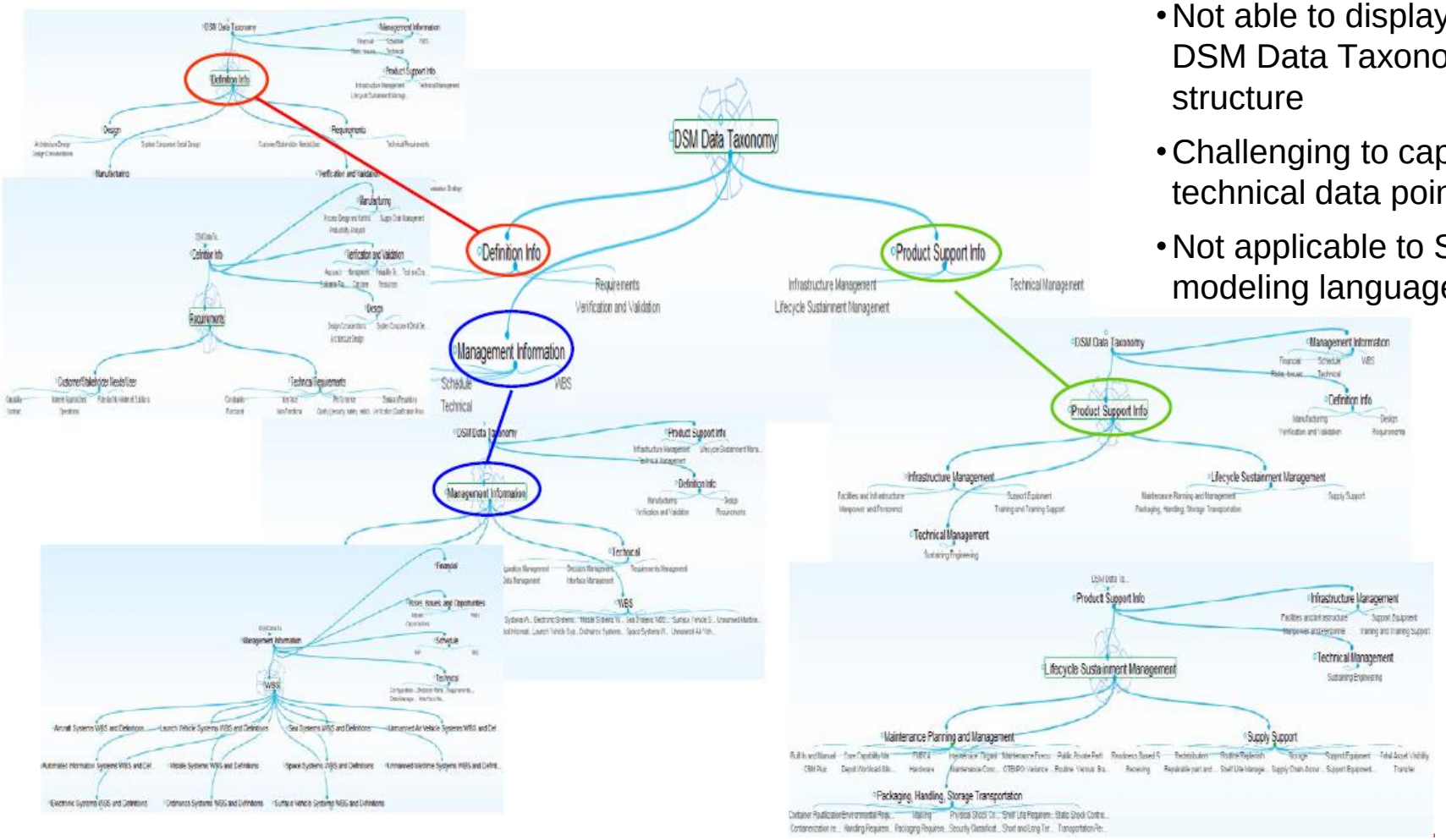
DSM Data Taxonomy in The Brain Mind Mapping Tool



Challenges

- Not able to display the entire DSM Data Taxonomy structure
- Challenging to capture technical data points
- Not applicable to SysML modeling language

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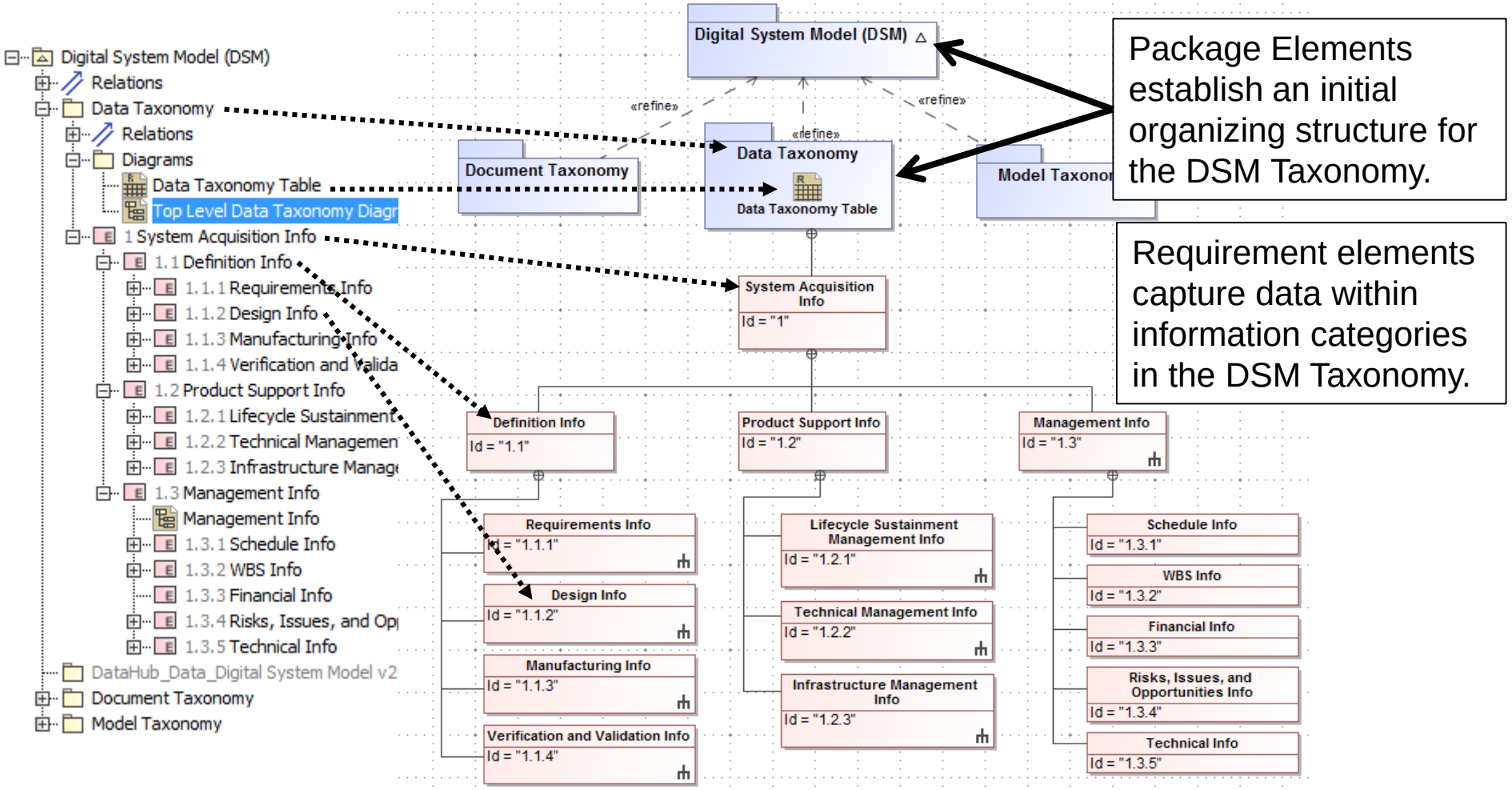
Modeling the DSM Data Taxonomy

- **The model is used to create a hierarchy diagram view.**



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Modeling the DSM Data Taxonomy (cont.)

- **The model is used to create a table View.**

#	△ Id	Name	Source	Text
1	1	System Acquisition Info		This taxonomy represents current knowledge about data classes and data types captured in todays defense acquisition systems programs. This taxonomy was built as an organizing construct that could be used by programs as an aid to managing their data and defining viewpoints that would need to be auto generated from the Digital System Model.
2	1.1	Definition Info	ISO	A requirement is a statement that identifies a product or processes operational, functional, or design characteristic or constraint, which is unambiguous, testable, or measurable and necessary for product or process acceptability (ISO 2007).
3	1.1.1	Requirements Info	ISO	A requirement is a statement that identifies a product or processes operational, functional, or design characteristic or constraint, which is unambiguous, testable, or measurable and necessary for product or process acceptability (ISO 2007).
4	1.1.1.4	Customer/Stakeholder Ne	DI-IPSC-81431A/S	Set of stakeholder requirements are clarified and translated from statements of need into engineering-oriented language in order to enable proper architecture definition, design, and verification activities that are needed as the basis for system requirements analysis. Stakeholder needs and requirements represent the views of those at the business or enterprise operations level—that is, of users, acquirers, customers, and other stakeholders as they relate to the problem (or opportunity), as a set of requirements for a solution that can provide the services needed by the stakeholders in a defined environment. Using enterprise-level life cycle concepts (see Business or Mission Analysis for details) as guidance, stakeholders are led through a structured process to elicit stakeholder needs (in the form of a refined set of system-level life-cycle concepts). Stakeholder needs are transformed into a defined set of Stakeholder Requirements, which may be documented in the form of a model, a document containing textual requirement statements or both.
5	1.1.1.4.4	Capability	ICD	A capability is the ability to achieve a desired effect under specified standards and conditions through combinations of means and ways to perform a set of tasks. (TRADOC Regulation 71-20)
6	1.1.1.4.4.4	Capability Gap	ICD	The inability to execute a specified course of action. The gap may be the result of no existing capability, lack of proficiency or sufficiency in an existing capability solution, or the need to replace an existing capability solution to prevent a future gap. See CJCSI 3170.01

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Modeling the DSM Data Taxonomy (Data Field Descriptions)

- **"#" is the number of the data element.**
- **"ID" indicates the hierarchical location of the data element in the Data Taxonomy.**
- **"Name" provides a unique name for each data element in the Data Taxonomy.**
- **"Source" provides one or more references that were used to derive the data element.**
- **"Text" provides a definition for each data element. Use this column to understand what data to captured for each of the associated data elements.**

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Benefits to Modeling the DSM Data Taxonomy

- **Manage Complexity**
  - Provides a method to use and navigate the DSM Data Taxonomy
  - Manages hierarchical data structure
- **Preserve and Enable Reuse of Heritage Knowledge**
  - Provides a method to capture, store, and use/reuse data
  - Offers accessible, shareable, and transparent data for current and future workforce
- **Outline Data Structure**
  - Provide an organized structure for the types of program data that should be considered across the life cycle

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Path Forward

- **Content Validation of DSM Data Taxonomy**
  - Work with Services to review and provide comment on the DSM Data Taxonomy
  - Incorporate into INCOSE Digital Artifact Challenge
- **Finalize and deploy DSM Data Taxonomy for Usage after Reviews and Revisions**
- **Model Document and Model Taxonomies**
- **Manage Changes**

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Systems Engineering: Critical to Defense Acquisition

Defense Innovation Marketplace
http://www.defenseinnovationmarketplace.mil

DASD, Systems Engineering
http://www.acq.osd.mil/se

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