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Utilizing Automation and Ontologies to Design, Deploy, and Sustain an Effective Model Governance Program

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Approved for Public Release

Executive Summary

Model Governance Automation

Utilize automation and ontologies to design, deploy, and sustain an effective model governance program. Ensure veracity of artifacts, establish transparency, improve communication, increase trust.

FOUNDATION – Utilize elastic model governance guide for model governance system, digital engineering (DE) infrastructure, individual and composite models

AUTOMATION – Employ widget to scrape constituent models for information

INTEGRATION – Use ontology-first digital thread integration platform

LEVERAGE – Leverage extensive data governance practice

DELIVERY – Apply governance to aid DE to deliver results to fulfill mission needs

Agenda

Why Governance?

Organize the Digital Engineering ecosystem to execute efficiently and reduce the cost of confusion, churn, rework

- **Scope** – WHAT models/data are in the program DE ecosystem?
- **Roles** – WHO needs to interact with those models/data?
- **Purpose** - WHY are models/data needed for the mission?
- **Process** – HOW do WHAT actions happen WHEN?
- **Location** - WHERE do models/data reside in the infrastructure?

Why Governance?

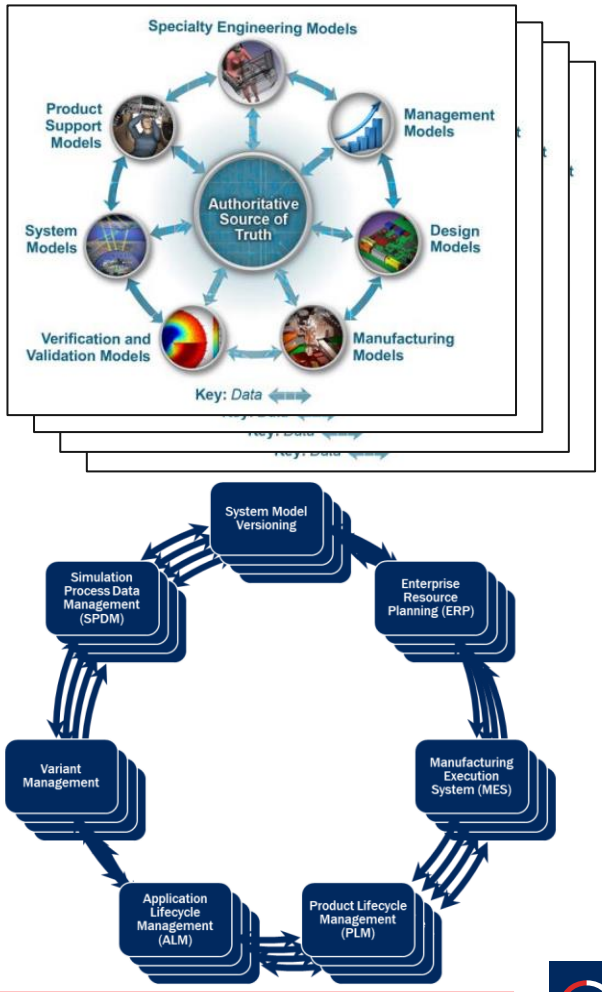
Digital Engineering (DE) is an integrated digital approach that uses authoritative sources of system data and models as a continuum across disciplines to support lifecycle activities from concept through disposal

Use models

Different domains

Distributed data management

Many organizations



Reality

Governance across a digital thread must address a set of data management tools to ensure quality for decision making

What is Model Governance?

- Documented decisions, rights, and accountabilities
- for model related processes,
- executed according to an agreed upon set of rules
- which describe:
  - who can take
  - what actions with
  - what models,
  - when, under
  - what circumstances, using
  - what methods.

Adapted from Pak, Rebekah, “A3 Data Governance: Data Governance Introduction and General Process,” May 2021

Governance vs. Management

Model Governance

Model Management

Model Governance ensures Model Management is happening

Adapted from Ladley, John, "Data Governance: How to Design, Deploy, and Sustain an Effective Data Governance Program, 2nd Edition, Academic Press, 2020.

Two Sides of the Same Coin

Primary Responsibilities

- Define accountability
- Enact policy into procedure
- Provide model and infrastructure transparency
- Monitor quality and compliance
- Report results

Transparent

Collaborative

Measurable

Adapted from Pak, Rebekah, “A3 Data Governance: Data Governance Introduction and General Process,” May 2021

Governance Guide Provides Structure to Organize DE Execution

Earlier Work

Model Governance Guide

As Digital Engineering (DE) employs a digital thread with a broad range of interconnected models, it can be difficult to govern linked models across disciplines and contractual boundaries. This approach includes:

GUIDANCE – Model-based guidance with in-model work instructions,

INTEGRATION – Integration of the overall model governance system, DE Ecosystem (DEE) infrastructure, individual models, and composite models,

PURPOSE – Traceability of model purpose and resolution of technical debt,

VALIDATION – Automated validation for insight on compliance,

FLEXIBILITY – Customization for flexibility and tailoring (fleX-engineering™).

Structure

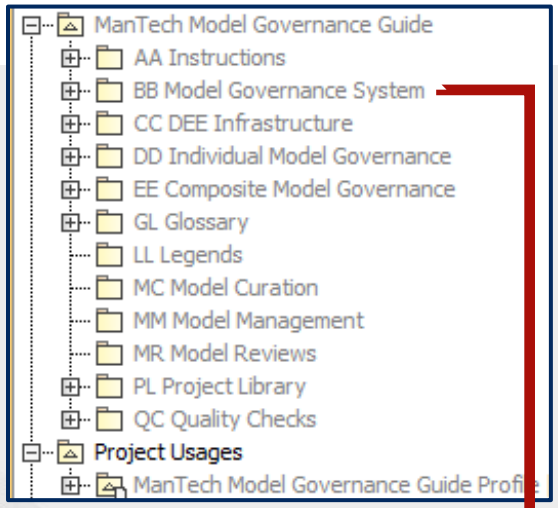
Design Model Governance System

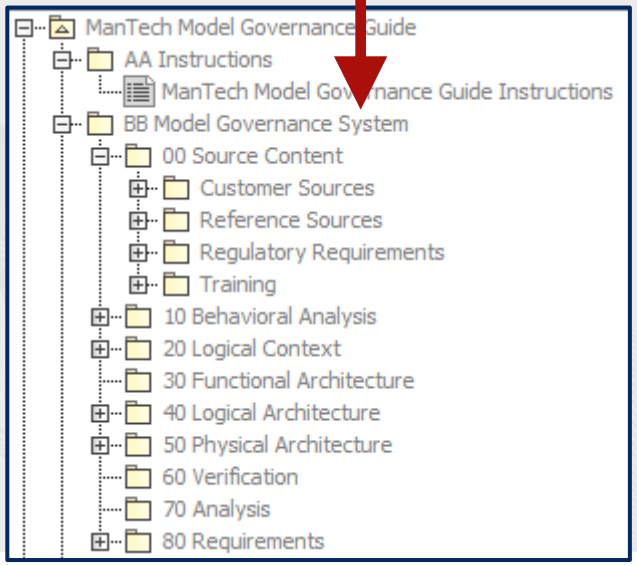
Design DEE Infrastructure

Model Governance Guide

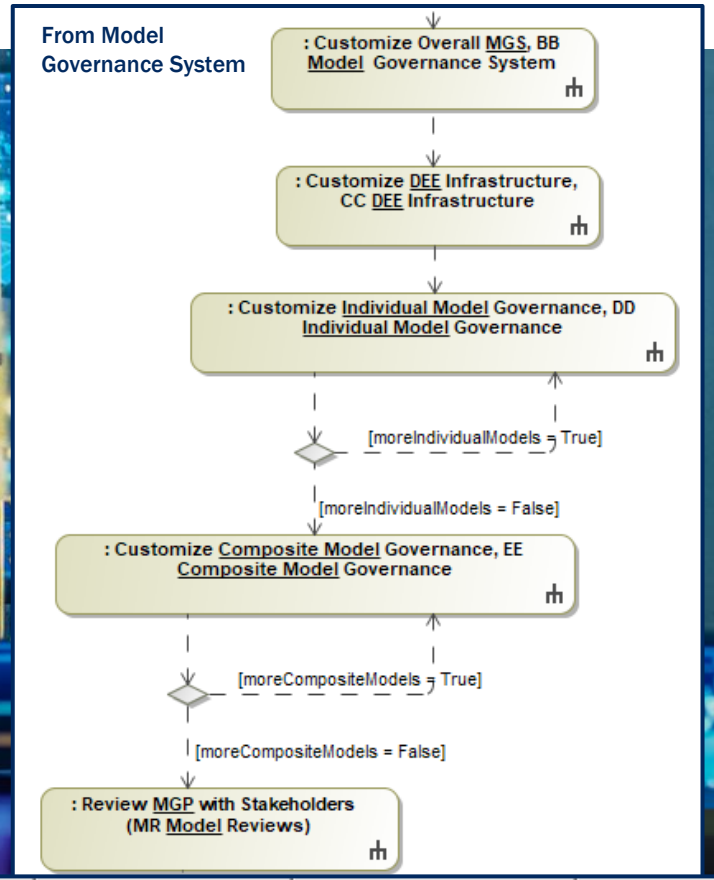
Govern Individual Models

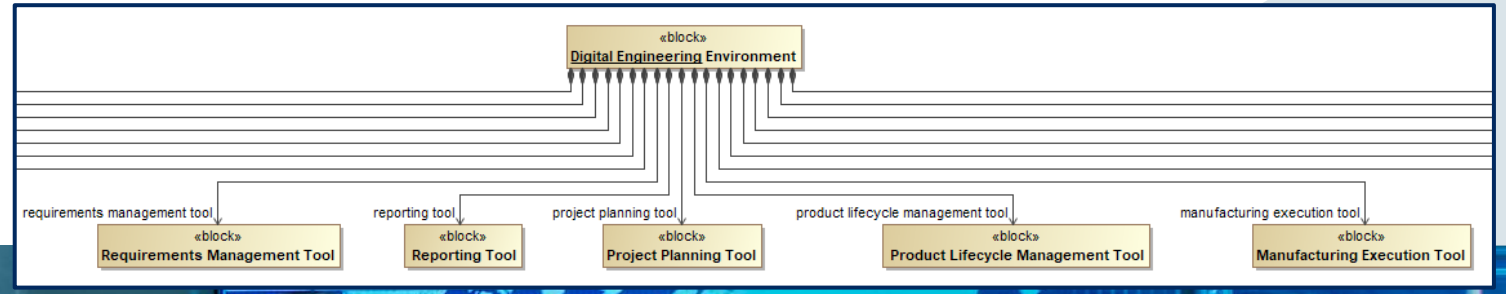
Govern Composite Models

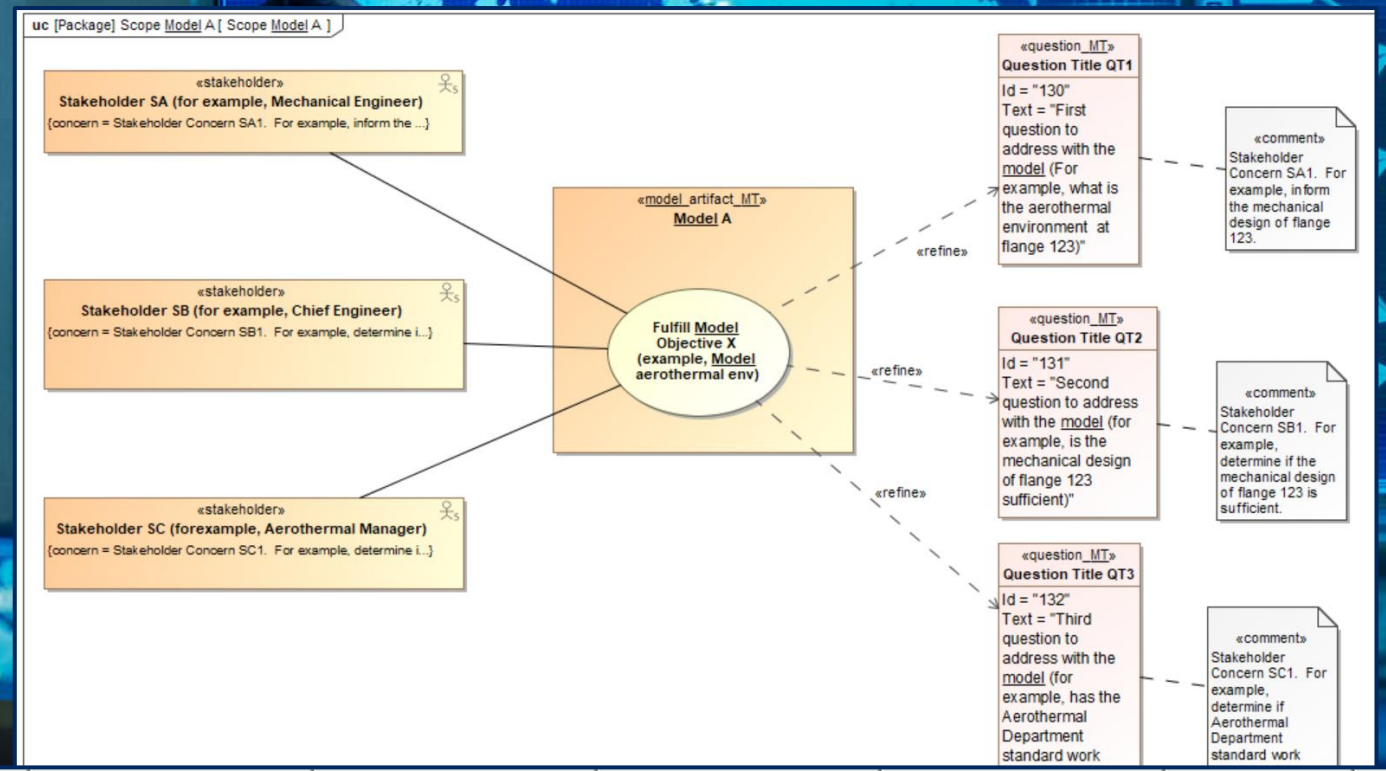




Model Snapshots







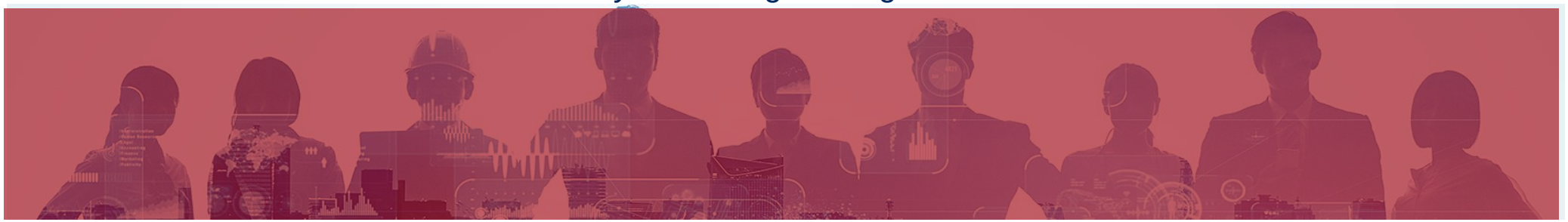
#	Name	Documentation	Associated Assumptions	Associated Risks	Traced to Standards	Use Cases	Questions2	Satisfies	Allocated To	Location
1	Model A	This is the description of Model A...	Assumption B Assumption A	Risk R1	Standard 1 (for example, I Best Practice 3 (for examp Standard 2 (for example, (	Fulfill Model Objective X (e	Question Title QT1 Question Title QT2 Question Title QT3	23 Modeling Questions MGSG-116 Risk MGSG-2 Model Name	ansys : ANSYS	AWS AppStream

Ensure Models and Infrastructure Address Program Needs

User Statement

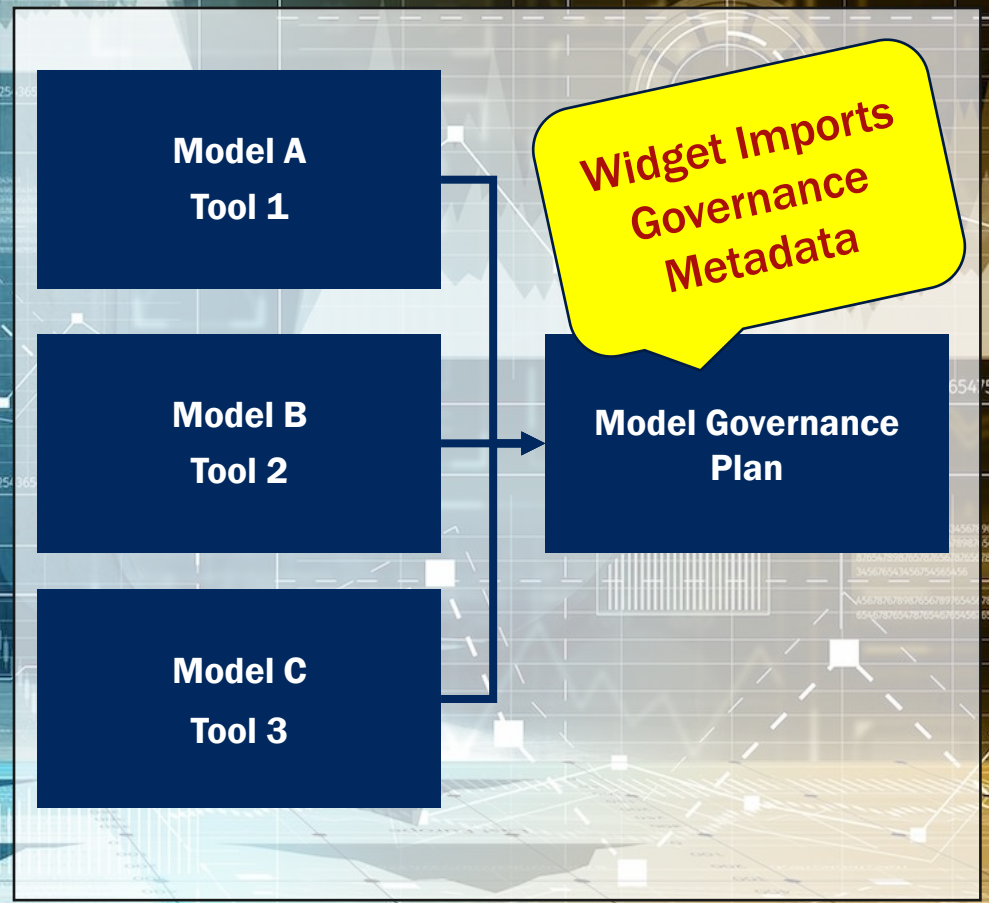
"The Model Governance Guide provided our team with a framework for developing data governance rules and techniques to execute a rigorous enterprise modeling program. Establishing a set of model controls is no different and just as important as establishing Security Controls in the Cybersecurity discipline. With this effort, our customer will improve their business process management, degree of data integrity, and communication and transparency among Stakeholders. Without Model Governance the desired degree of model and data integrity cannot be achieved."

Mark Stimeling and Rebecca Quintero
ManTech Marine Systems Engineering Directorate



Updates Add Automation

- Automation and ontologies utilized to reduce manual effort
- Widget automatically scrapes constituent models across an ecosystem to report governance information
- Automating ingestion of governance data reduces chance for error
- Where governance metadata are lacking, user interface guides input of missing information



Utilize Automation to Populate Governance Information

Semantic Integration Aids Governance

- Utilize semantic, ontology-first, hub-and-spoke digital thread integration platform for model governance purposes
- Enhances automation for aggregating metadata, tracking compliance, performing queries, and visualizing results
- Organizing governance using ontologies produces an agonistic approach, allowing use by customers regardless of current tools
- Capturing contextual governance information also supports appropriate model re-use
- Utilizing validation suites to ensure accuracy and completeness assists governance personnel and program office
- Approach allows dashboard views of model governance compliance status to aid program execution

Sustain an Effective Model Governance Program

- Tactical strategies to enhance effectiveness
- Sustain an effective program with buy-in and consistent participation from stakeholders
  - Build business case
  - Demonstrate return-on-investment
  - Utilize flexibility and scalability

CRITICAL SUCCESS FACTORS

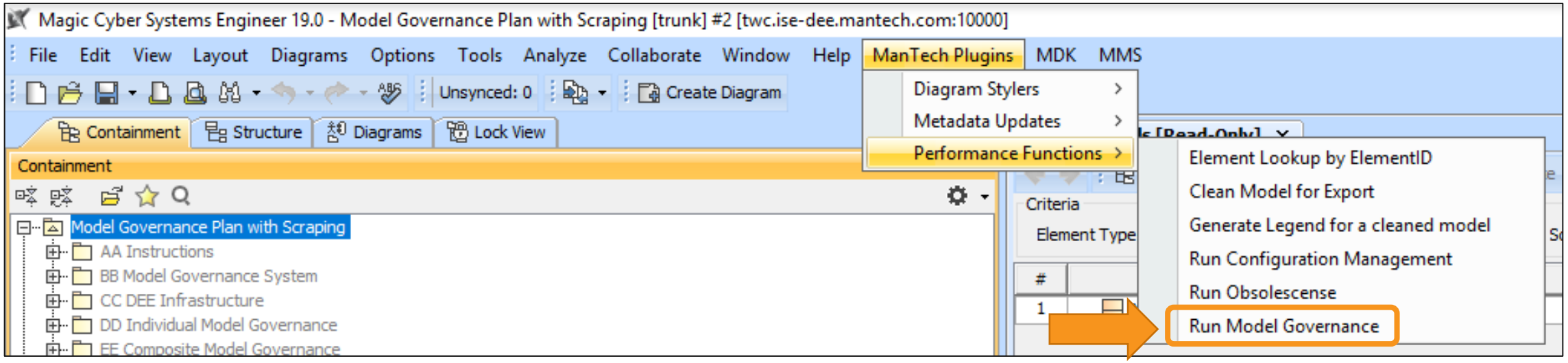
1. **Require as mandatory**
2. **Show value explicitly**
3. **Manage organizational change**
4. **View as enterprise effort**

Adapted from Ladley, John, "Data Governance: How to Design, Deploy, and Sustain an Effective Data Governance Program, 2nd Edition, Academic Press, 2020.

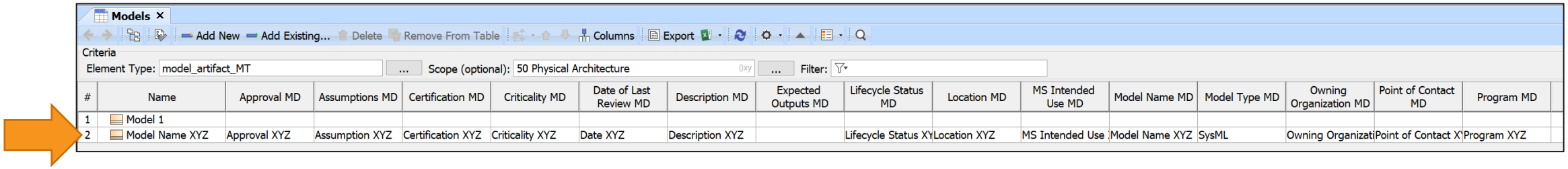
Demonstration

Widget to Scrape and Populate Governance Metadata (1)

Run custom governance plugin

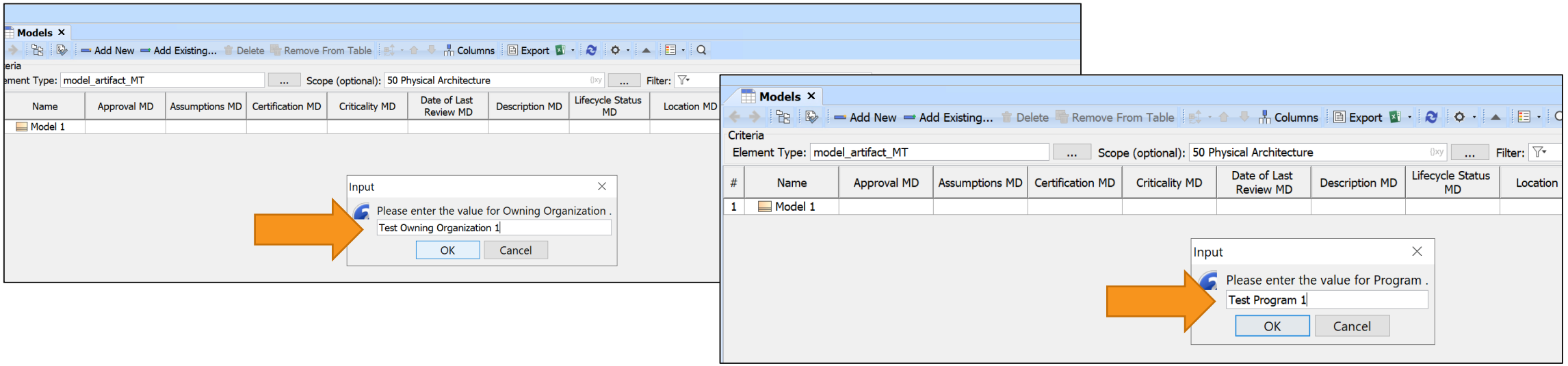


Scrape models and populate governance metadata

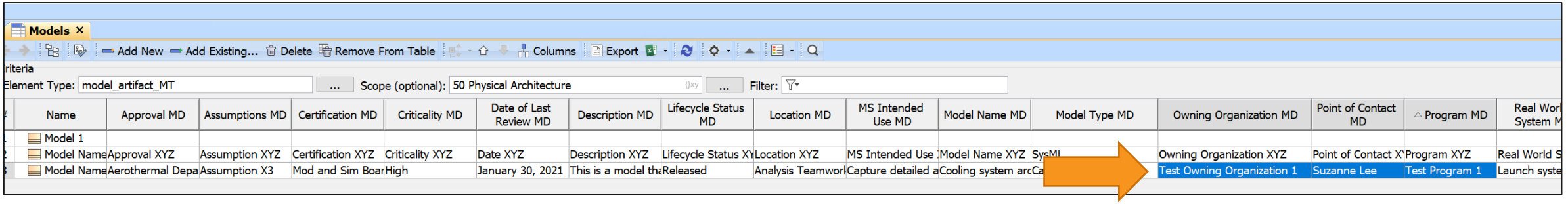


Widget to Scrape and Populate Governance Metadata (2)

Pop-up asks for missing governance metadata

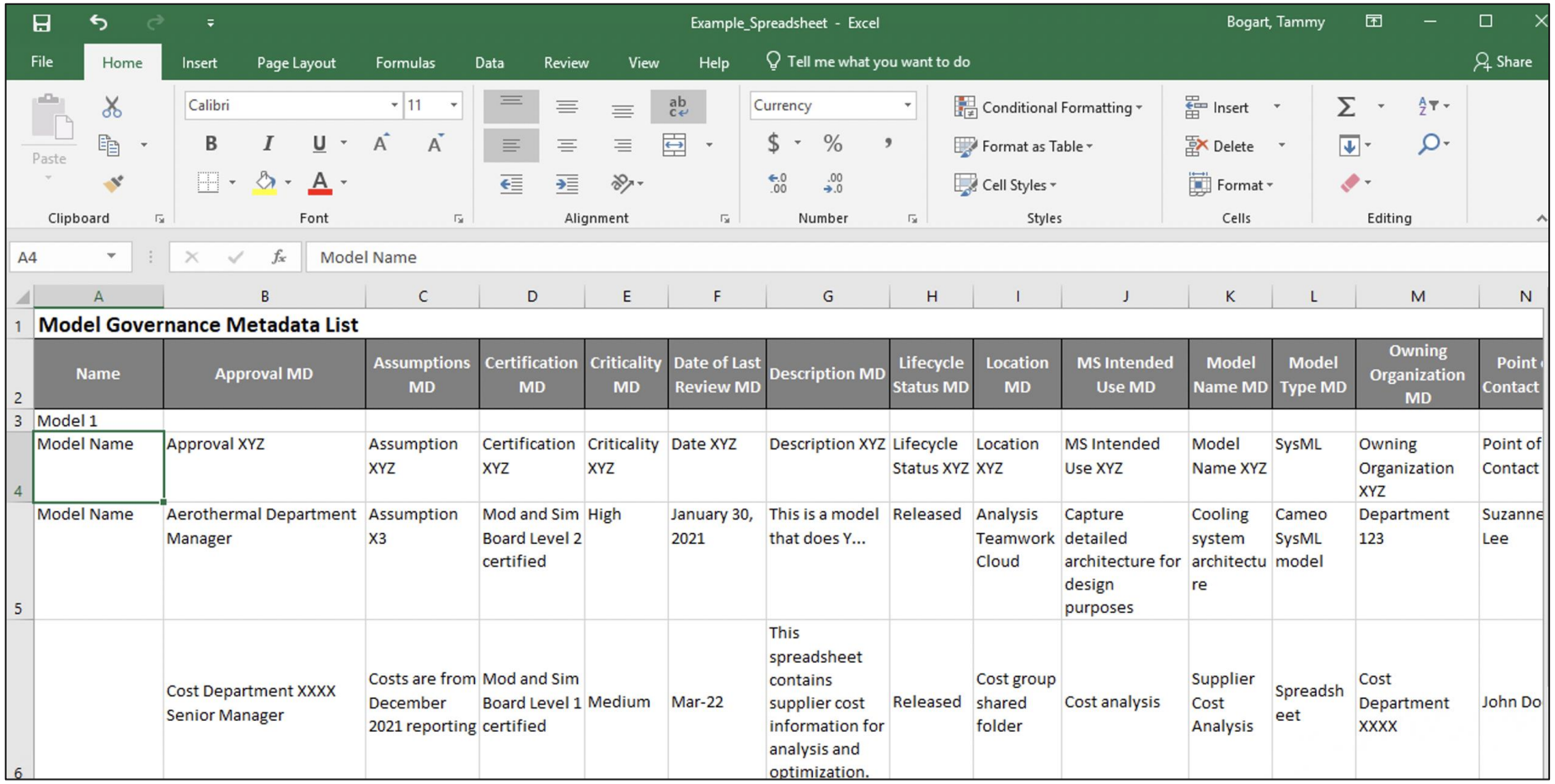


Information from pop-up added to governance metadata registry



Widget to Scrape and Populate Governance Metadata (3)

Initially developed to scrape Cameo SysML models and spreadsheets,
the concept will be expanded to scrape models/data connected to an ontology-based digital thread



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**Model Governance Metadata List**													
2	**Name**	**Approval MD**	**Assumptions MD**	**Certification MD**	**Criticality MD**	**Date of Last Review MD**	**Description MD**	**Lifecycle Status MD**	**Location MD**	**MS Intended Use MD**	**Model Name MD**	**Model Type MD**	**Owning Organization MD**	**Point Contact**
3	Model 1													
4	Model Name	Approval XYZ	Assumption XYZ	Certification XYZ	Criticality XYZ	Date XYZ	Description XYZ	Lifecycle Status XYZ	Location XYZ	MS Intended Use XYZ	Model Name XYZ	SysML	Owning Organization XYZ	Point of Contact
5	Model Name	Aerothermal Department Manager	Assumption X3	Mod and Sim Board Level 2 certified	High	January 30, 2021	This is a model that does Y...	Released	Analysis Teamwork Cloud	Capture detailed architecture for design purposes	Cooling system architecture	Cameo SysML model	Department 123	Suzanne Lee
6		Cost Department XXXX Senior Manager	Costs are from December 2021 reporting	Mod and Sim Board Level 1 certified	Medium	Mar-22	This spreadsheet contains supplier cost information for analysis and optimization.	Released	Cost group shared folder	Cost analysis	Supplier Cost Analysis	Spreadsheet	Cost Department XXXX	John Do

Next Steps

Evolve Governance Approach to Enhance Digital Fabric Solutions and Services for Customers

Additional Capabilities

- Implement program lessons learned
- Extend digital fabric reach
- Extend metadata scraping
- Evolve governance ontology
- Optimize strategy

References

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