

INCOSE ASELCM Impact Roadmap: An Assessment and Planning Aid

(Adapted from ISO/IEC 15288:2015)

INCOSE Agile Systems Engineering Impact Roadmap:
An Assessment and Planning Dashboard Summary

What has agility already impacted? What future opportunities?
– Use this instrument to assess the industry, your segment, or your company, and to make and summarize future plans.

Directions:

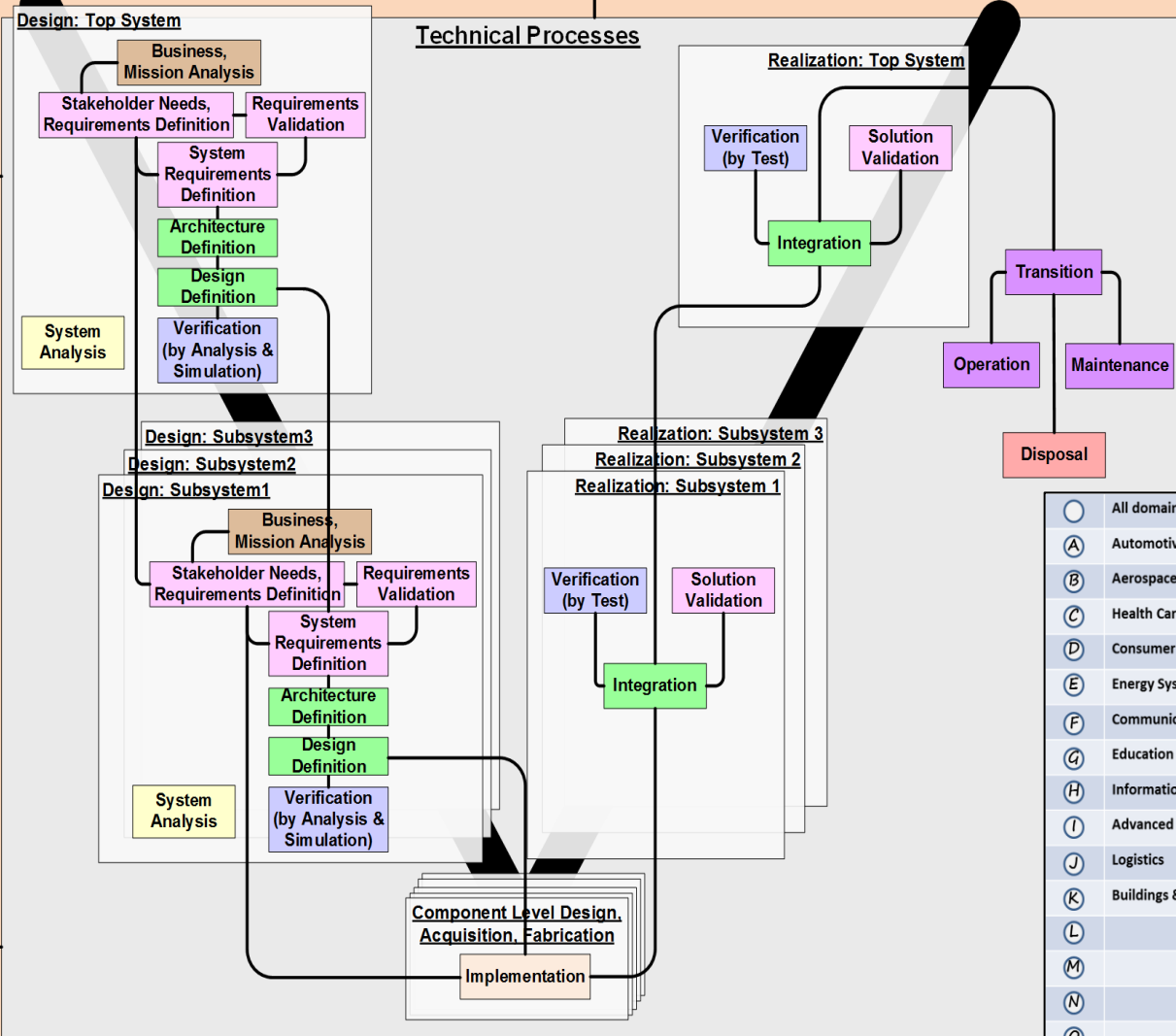
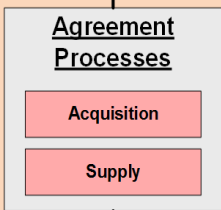
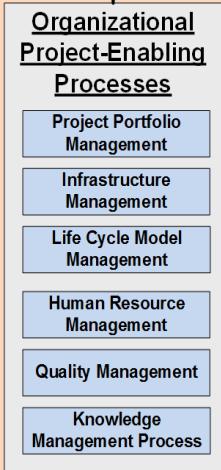
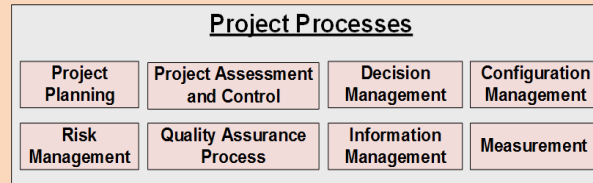
Please attach “Sticky Dots” on the 15288 “Vee” Diagram, to mark:

- Needs for improved future agility use (even if most difficult)
- Opportunities for improved future agility use (low-hanging fruit)
- Already accomplished cases of agility-aided progress

Please mark your “Sticky Dots” with letters to indicate specific domain of interest to you (Aero, Auto, Health Care, etc.)

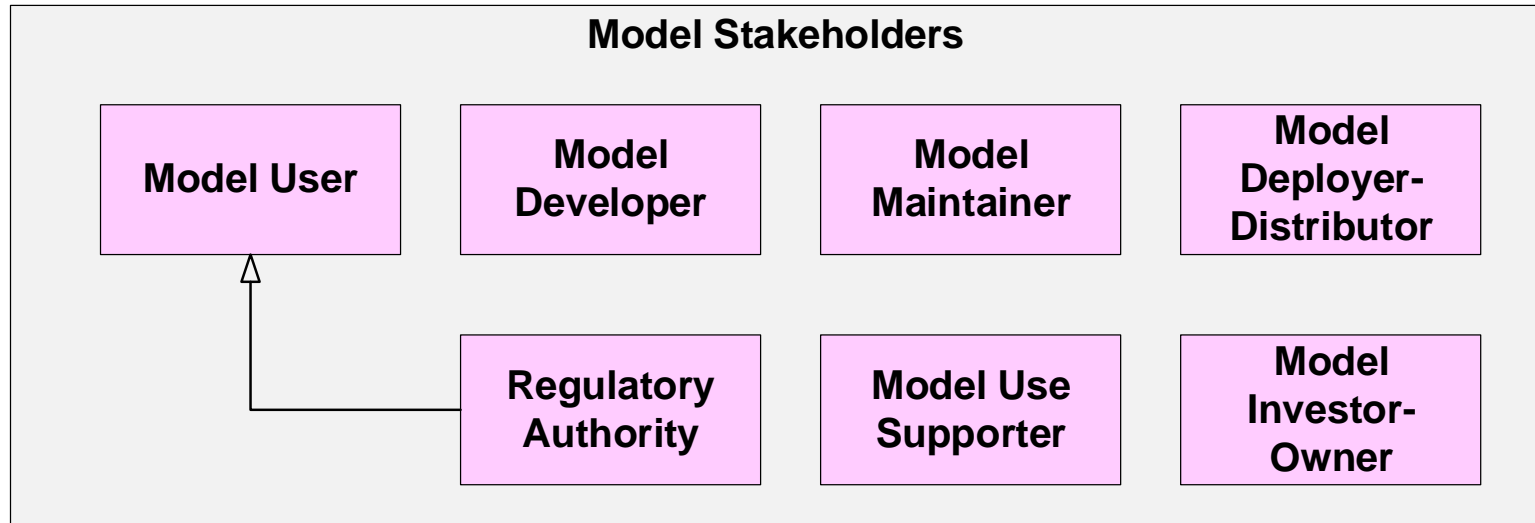
Please add “Sticky Notes” to make additional observations.

To obtain your own copy for local use, contact:
Bill Schindel schindel@ictt.com



○	All domains (general)
A	Automotive
B	Aerospace
C	Health Care / Medicine
D	Consumer Products
E	Energy Systems
F	Communications
G	Education
H	Information Systems
I	Advanced Manufacturing
J	Logistics
K	Buildings & Facilities
L	
M	
N	
○	

Stakeholders for Models



Model Stakeholder Type	Definition
Model User	A person, group, or organization that directly uses a model for its agreed upon purpose. May include technical specialists, non-technical decision-makers, customers, supply chain members, regulatory authorities, or others.
Model Developer	A person who initially creates a model, from conceptualization through implementation, validation, and verification, including any related model documentation. Such a person may or may not be the same as one who subsequently maintains the model.
Model Maintainer	A person who maintains and updates a model after its initial development. In effect, the model maintainer is a model developer after the initial release of a model.
Model Deployer-Distributor	A person or organization that distributes and deploys a model into its intended usage environment, including transport and installation, through readiness for use.
Model Use Supporter	A person who supports or assists a Model User in applying a model for its intended use. This may include answering questions, providing advice, addressing problems, or other forms of support.
Regulatory Authority	An organization that is responsible for generating or enforcing regulations governing a domain.
Model Investor-Owner	A person or organization that invests in a model, whether through development, purchase, licenses, or otherwise, expecting a benefit from that investment.

Computational Model Feature Groups: Configurable for Specific Models

Model Identity and Focus

Identifies the main subject or focus of the model.

Model Utility

Describes the intended use, utility, and value of the model.

Model Scope and Content

Describes the scope of content of the model.

Model Fidelity

Describes the fidelity of the model.

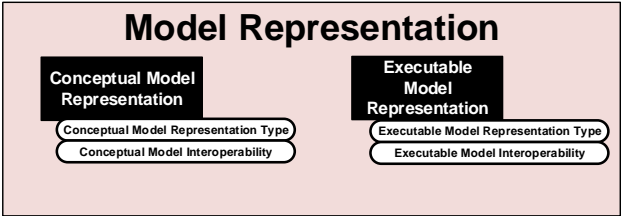
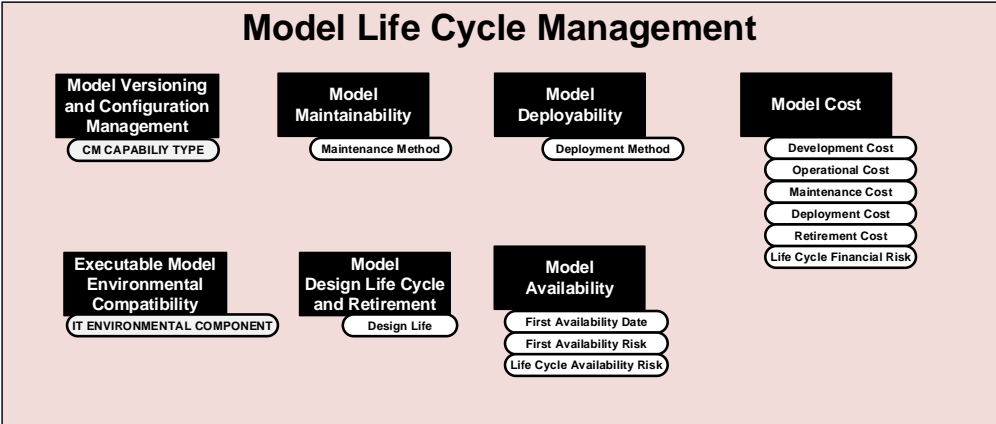
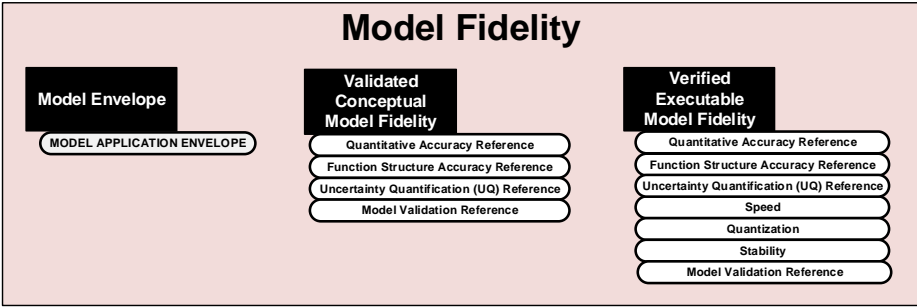
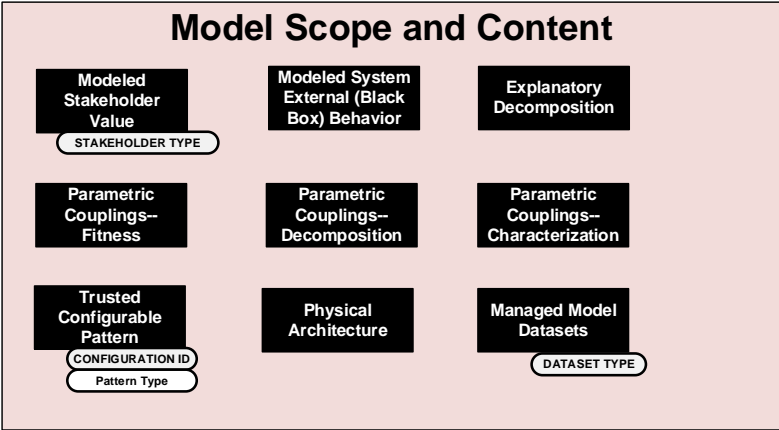
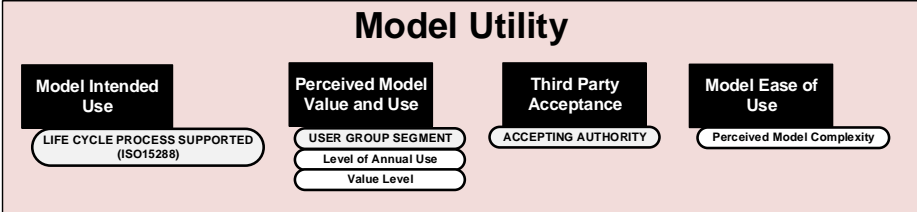
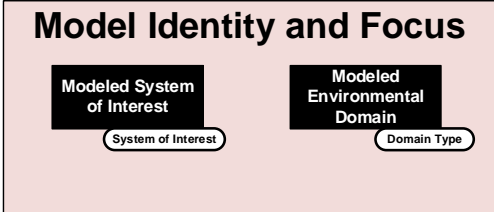
Model Life Cycle Management

Describes the related model life cycle management capabilities.

Model Representation

Describes the representation used by the model.

Computational Model Feature Groups: 27 Features, in 6 Feature Groups, Configurable for Specific Models



Model Identity and Focus

**Modeled System
of Interest**

System of Interest

**Modeled
Environmental
Domain**

Domain Type

Feature Group	Feature Name	Feature Definition	Feature Attribute	Attribute Definition	Feature Stakeholder						Model Type		
					Model User	Model Developer	Model Maintainer	Mdl Deployer-Distributor	Model Use Supporter	Regulatory Authority	Mdl Investor-Owner	Physics Based	Data Driven
Identifies the main subject or focus of the model													
Model Identity and Focus	Modeled System of Interest	Identifies the type of system this model describes.	System of Interest	Name of system of interest, or class of systems of interest	X					X	X	X	X
	Modeled Environmental Domain	Identifies the type of external environmental domain(s) that this model includes.	Domain Type(s)	Name(s) of modeled domains (manufacturing, distribution, use, etc.)	X					X	X	X	X

Model Utility

Model Intended Use

LIFE CYCLE PROCESS SUPPORTED
(ISO15288)

Perceived Model Value and Use

USER GROUP SEGMENT

Level of Annual Use

Value Level

Third Party Acceptance

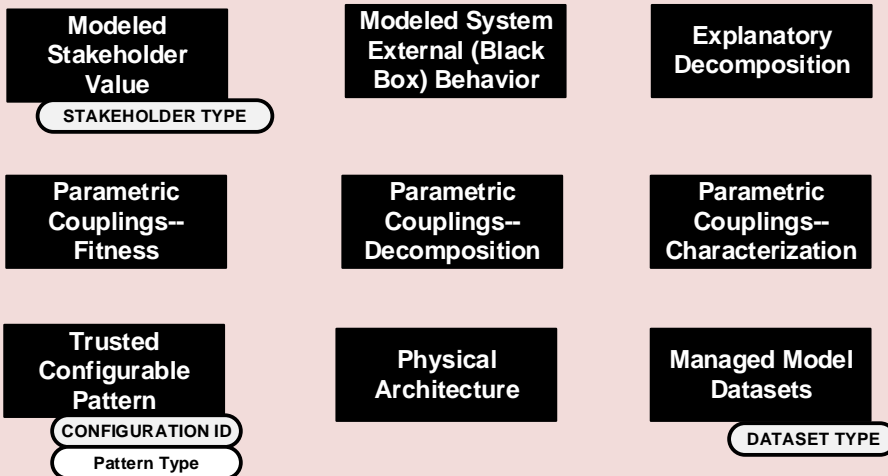
ACCEPTING AUTHORITY

Model Ease of Use

Perceived Model Complexity

Feature Group	Feature Name	Feature Definition	Feature Attribute	Attribute Definition	Feature Stakeholder							Model Type	
					Model User	Model Developer	Model Maintainer	Mdl Deployer-Distributor	Model Use Supporter	Regulatory Authority	Mdl Investor-Owner	Physics Based	Data Driven
Describes the intended use, utility, and value of the model													
Model Utility	Model Intended Use	The intended purpose(s) or use(s) of the model.	Life Cycle Process Supported	The intended life cycle management process to be supported by the model, from the ISO 15288 process list. More than one value may be listed.	X					X	X	X	X
	Perceived Model Value and Use	The relative level of value ascribed to the model, by those who use it for its stated purpose.	User Group Segment	The identify of using group segment (multiple)	X					X	X	X	X
			Level of Annual Use	The relative level of annual use by the segment	X					X	X	X	X
			Value Level	The value class associated with the model by that segment	X					X	X	X	X
	Third Party Acceptance	The degree to which the model is accepted as authoritative, by third party regulators, customers, supply chains, and other entities, for its stated purpose.	Accepting Authority	The identity (may be multiple) of regulators, agencies, customers, supply chains, accepting the model	X					X	X	X	X
Model Ease of Use	The perceived ease with which the model can be used, as experienced by its intended users	Perceived Model Complexity	High, Medium Low	X					X		X	X	

Model Scope and Content



Feature Group	Feature Name	Feature Definition	Feature Attribute	Attribute Definition	Feature Stakeholder							Model Type						
					Model User	Model Developer	Model Maintainer	Mdl Deployer-Distributor	Model Use Supporter	Regulatory Authority	Mdl Investor-Owner	Physics Based	Data Driven					
Describes the scope of content of the model																		
Model Scope of Content	Modeled Stakeholder Value	The capability of the model to describe fitness or value of the System of Interest, by identifying its stakeholders and modeling the related Stakeholder Features.	Stakeholder Type	Classes of covered stakeholders (may be multiple)	X					X	X	X	X					
	Modeled System External (Black Box) Behavior	The capability of the model to represent the objective external ("black box") technical behavior of the system, through significant interactions with its environment, based on modeled input-output exchanges through external interfaces, quantified by technical performance measures, and varying behavioral modes.			X					X		X	X					
	Explanatory Decomposition	The capability of the model to represent the decomposition of its external technical behavior, as explanatory internal ("white box") internal interactions of decomposed roles, further quantified by internal technical performance measures, and varying internal behavioral modes.			X					X		X						
	Physical Architecture	The capability of the model to represent the physical architecture of the system of interest. This includes identification of its major physical components and their architectural relationships.			X					X		X						

Model Scope and Content

Modeled Stakeholder Value

STAKEHOLDER TYPE

Modeled System External (Black Box) Behavior

Explanatory Decomposition

Parametric Couplings-- Fitness

Parametric Couplings-- Decomposition

Parametric Couplings-- Characterization

Trusted Configurable Pattern

CONFIGURATION ID

Pattern Type

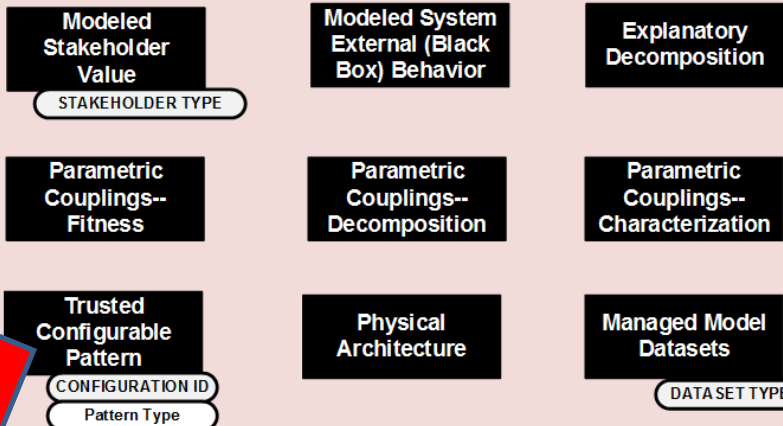
Physical Architecture

Managed Model Datasets

DATA SET TYPE

Feature Group	Feature Name	Feature Definition	Feature Attribute	Attribute Definition	Feature Stakeholder							Model Type	
					Model User	Model Developer	Model Maintainer	Mdl Deployer-Distributor	Model Use Supporter	Regulatory Authority	Mdl Investor-Owner	Physics Based	Data Driven
Describes the scope of content of the model													
	Parametric Couplings-- Fitness	The capability of the model to represent quantitative (parametric) couplings between stakeholder-valued measures of effectiveness and objective external black box behavior performance measures.			X					X		X	X
	Parametric Couplings-- Decomposition	The capability of the model to represent quantitative (parametric) couplings between objective external black box behavior variables and objective internal white box behavior variables.			X					X		X	X
	Parametric Couplings-- Characterization	The capability of the model to represent quantitative (parametric) couplings between objective behavior variables and physical identity (material of construction, part or model number).			X					X		X	
	Managed Model Datasets	The capability of the model to include managed datasets for use as inputs, parametric characterizations, or outputs	Dataset Type	The type(s) of data sets (may be multiple)	X		X			X		X	X
	Trusted Configurable Pattern	The capability of the model to serve as a configurable pattern, representing different modeled system configurations across a common domain, spreading the cost of establishing trusted model frameworks across a community of applications and configurations.	Configuration ID	A specific system of interest configuration within the family that the pattern framework can represent.	X		X			X	X	X	X
			Pattern ID	The identifier of the trusted configurable pattern.	X		X			X	X	X	X

Model Scope and Content



Of special importance to the economics of trust and VVUQ

	Feature Definition	Feature Attribute	Attribute Definition	Feature Stakeholder							Model Type		
				Model User	Model Developer	Model Maintainer	Mdl Deployer-Distributor	Model Use Supporter	Regulatory Authority	Mdl Investor-Owner	Physics Based	Data Driven	
Describes the scope of content of the model													
	Parametric Couplings--Fitness	The capability of the model to represent quantitative (parametric) couplings between stakeholder-valued measures of effectiveness and objective external black box behavior performance measures.			X					X		X	X
	Parametric Couplings--Decomposition	The capability of the model to represent quantitative (parametric) couplings between objective external black box behavior variables and objective internal white box behavior variables.			X					X		X	X
	Parametric Couplings--Characterization	The capability of the model to represent quantitative (parametric) couplings between objective behavior variables and physical identity (material of construction, part or model number).			X					X		X	
	Managed Model Datasets	The capability of the model to include managed datasets for use as inputs, parametric characterizations, or outputs	Dataset Type	The type(s) of data sets (may be multiple)	X		X			X		X	X
	Trusted Configurable Pattern	The capability of the model to serve as a configurable pattern, representing different modeled system configurations across a common domain, spreading the cost of establishing trusted model frameworks across a community of applications and configurations.	Configuration ID	A specific system of interest configuration within the family that the pattern framework can represent.	X		X			X	X	X	X
			Pattern ID	The identifier of the trusted configurable pattern.	X		X				X	X	X



Model Fidelity

Model Envelope

MODEL APPLICATION ENVELOPE

Validated Conceptual Model Fidelity

Quantitative Accuracy Reference

Function Structure Accuracy Reference

Uncertainty Quantification (UQ) Reference

Model Validation Reference

Verified Executable Model Fidelity

Quantitative Accuracy Reference

Function Structure Accuracy Reference

Uncertainty Quantification (UQ) Reference

Speed

Quantization

Stability

Model Validation Reference

Feature Group	Feature Name	Feature Definition	Feature Attribute	Attribute Definition	Feature Stakeholder							Model Type					
					Model User	Model Developer	Model Maintainer	Mdl Deployer-Distributor	Model Use Supporter	Regulatory Authority	Mdl Investor-Owner	Physics Based	Data Driven				
Describes the fidelity of the model																	
Model Fidelity	Model Envelope	The capability of the model to meet its Model Fidelity requirements over a stated range (envelope) of dynamical inputs, outputs, and parameter values.	Model Application Envelope	The range over which the model is intended for use.	X		X			X	X	X	X				
	Validated Conceptual Model Fidelity	The validated capability of the conceptual portion of the model to represent the System of Interest, with acceptable fidelity.	Quantitative Accuracy Reference	The specification reference describing the quantitative accuracy of the conceptual model compared to the system of interest.	X					X	X	X	X				
			Function Structure Accuracy Reference	The specification reference describing the structural (presence or absence of behaviors) accuracy of the conceptual model compared to the system of interest.	X		X			X	X	X	X				
			Uncertainty Quantification (UQ) Reference	The specification reference describing the degree of uncertainty of the fidelity of the conceptual model to the system of interest.	X		X			X	X	X	X				
			Model Validation Reference	The reference documenting the validation of the conceptual model's fidelity to the system of interest.	X		X			X	X ¹	X	X				

Model Fidelity

Verified Executable Model Fidelity

Model Envelope

MODEL APPLICATION ENVELOPE

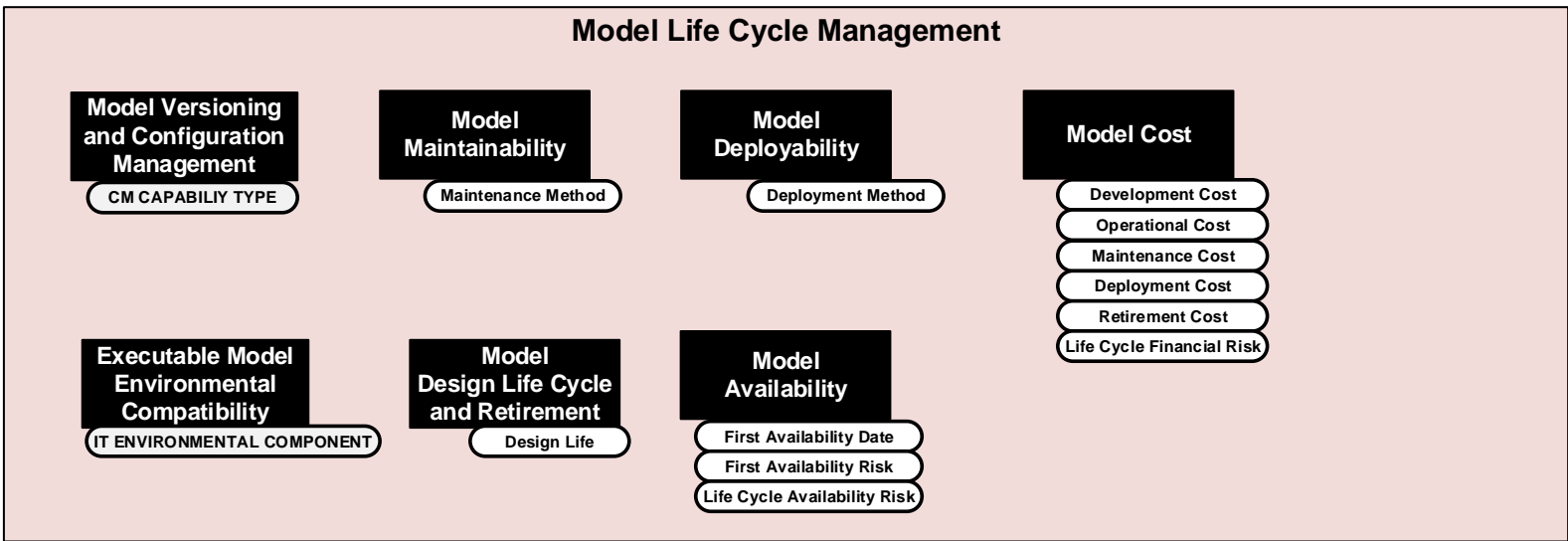
Validated Conceptual Model Fidelity

- Quantitative Accuracy Reference
- Function Structure Accuracy Reference
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- Model Validation Reference

- Quantitative Accuracy Reference
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- Speed
- Quantization
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- Model Validation Reference

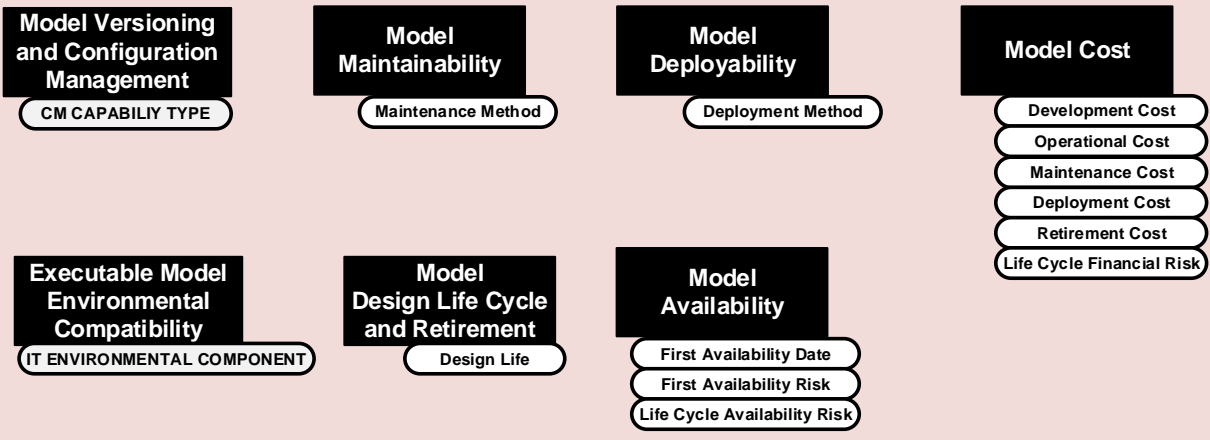
Feature Group	Feature Name	Feature Definition	Feature Attribute	Attribute Definition	Feature Stakeholder							Model Type	
					Model User	Model Developer	Model Maintainer	Mdl Deployer-Distributor	Model Use Supporter	Regulatory Authority	Mdl Investor-Owner	Physics Based	Data Driven
Describes the fidelity of the model													
Model Fidelity	Verified Executable Model Fidelity	The verified capability of the executable portion of the model to represent the System of Interest, with acceptable fidelity.	Quantitative Accuracy Reference	The specification reference describing the quantitative accuracy of the executable model to the conceptual model.	X		X			X	X	X	X
			Structural Accuracy Reference	The specification reference describing the structural (presence or absence of elements) accuracy of the executable model to the conceptual model.	X		X			X	X	X	X
			Uncertainty Quantification (UQ) Reference	The specification reference describing the degree of uncertainty of the fidelity of the executable model to the conceptual model.	X		X			X		X	X
			Speed	The specification reference describing the execution run time (speed) for the executable model.	X		X			X	X	X	X
			Quantization	The specification reference describing the quantization error of the executable model.	X		X			X	X	X	X
			Stability	The specification reference describing the level of stability of the accuracy and uncertainty of the executable model error characteristics.	X		X			X	X	X	X
			Model Validation Reference	The reference documenting the verification of the executable model's fidelity to the conceptual model.	X		X			X	X	X	X

Model Life Cycle Management



Feature Group	Feature Name	Feature Definition	Feature Attribute	Attribute Definition	Feature Stakeholder							Model Type						
					Model User	Model Developer	Model Maintainer	Mdl Deployer-Distributor	Model Use Supporter	Regulatory Authority	Mdl Investor-Owner	Physics Based	Data Driven					
Describes related model life cycle management capabilities																		
Model Life Cycle Management	Model Versioning and Configuration Management	The capability of the model to provide for version and configuration management.	CM Capability Type	The type(s) of CM capabilities included (may be multiple)	X		X			X			X	X				
	Executable Model Environmental Compatibility	The capability of the model to be compatibly supported by specified information technology environment(s), indicating compatibility, portability, and interoperability.	IT Environmental Component	The type(s) of IT environments or standards supported	X		X			X			X	X				
	Model Design Life and Retirement	The capability of the model to be sustained over an indicated design life, and retired on a planned basis.	Design Life	The planned retirement date	X		X			X			X	X				
	Model Maintainability	The relative ease with which the model can be maintained over its intended life cycle and use, based on capable maintainers, availability of effective model documentation, and degree of complexity of the model	Maintenance Method	The type of maintenance methodology used to maintain the model's capability and availability for the intended purposes over the intended life cycle.	X		X			X	X		X	X				
	Model Deployability	The capability of the model to support deployment into service on behalf of intended users, in its original or subsequent updated versions	Deployment Method	The type of method used to deploy (possibly in repeating cycles) the model into its intended use environment.	X			X			X		2X	X				

Model Life Cycle Management



Feature Group	Feature Name	Feature Definition	Feature Attribute	Attribute Definition	Feature Stakeholder						Model Type		
					Model User	Model Developer	Model Maintainer	Mdl Deployer-Distributor	Model Use Supporter	Regulatory Authority	Mdl Investor-Owner	Physics Based	Data Driven
Describes related model life cycle management capabilities													
Model Life Cycle Management	Model Cost	The financial cost of the model, including development, operating, and maintenance cost	Development Cost	The cost to develop the model, including its validation and verification, to its first availability for service date		X					X	X	
			Operational Cost	The cost to execute and otherwise operate the model, in standardized execution load units	X						X	X	X
			Maintenance Cost	The cost to maintain the model			X				X	X	X
			Deployment Cost	The cost to deploy, and redeploy updates, per cycle				X			X	X	X
			Retirement Cost	The cost to retire the model from service, in a planned fashion	X						X	X	X
			Life Cycle Financial Risk	Risk to the overall life cycle cost of the model							X	X	X
	Model Availability	The degree and timing of availability of the model for its intended use, including date of its first availability and the degree of ongoing availability thereafter.	First Availability Date	Date when version will first be available	X						X	X	X
			First Availability Risk	Risk to the scheduled date of first availability	X						X	X	X
			Life Cycle Availability Risk	Risk to ongoing availability after introduction	X						X	X	X

Model Representation

Conceptual Model Representation

Conceptual Model Representation Type

Conceptual Model Interoperability

Executable Model Representation

Executable Model Representation Type

Executable Model Interoperability

Feature Group	Feature Name	Feature Definition	Feature Attribute	Attribute Definition	Feature Stakeholder							Model Type						
					Model User	Model Developer	Model Maintainer	Mdl Deployer-Distributor	Model Use Supporter	Regulatory Authority	Mdl Investor-Owner	Physics Based	Data Driven					
Identifies the type of representation used by the model																		
Model Representation	Conceptual Model Representation	The capability of the conceptual portion of the model to represent the system of interest, using a specific type of representation.	Conceptual Model Representation Type	The type of conceptual modeling language or metamodel used.	X		X			X			X	X				
			Conceptual Model Interoperability	The degree of interoperability of the conceptual model, for exchange with other environments	X		X			X			X	X				
	Executable Model Representation	The capability of the executable portion of the model to represent the system of interest, using a specific type of representation	Executable Model Representation Type	The type of executable modeling language or metamodel used.	X		X			X			X	X				
			Executable Model Interoperability	The degree of interoperability of the executable model, for exchange with other environments	X		X			X			X	X				