Digital Engineering Information Exchange Working Group (DEIXWG):
Product Descriptions & Next Steps

John H. Coleman, Ph.D.
DEIX WG Chair
John.Coleman@Engiilty.com
Engility Corporation

Chris Schreiber
DEIX WG Co-Chair
Chris.Schrieber@LMCO.com
Lockheed Martin Corporation

Frank J. Salvatore
DEIX WG Co-Chair
Frank.Salvatore@sEngility.com
Engility Corporation

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Digital Engineering Information Exchange Encyclopedia (DEIXPedia)

The project, the need, and the product

John H. Coleman, Ph.D.

DEIX WG Chair

John.Coleman@Engiilty.com

Engility Corporation

The Product Development Project:
Digital Engineering Information Exchange Encyclopedia (DEIXPedia)
Project Lead: John Coleman

- **The Effort**: Develop DEIX Encyclopedia
  - *IDENTIFY*: Based on usage in digital engineering /MBSE literature
  - *DESCRIBE*: Sufficiently describe thematic topics, NOT words or phrases
  - *ACCEPT*: Achieve community acceptance
  - *EVOLVE*: Improve thematic topics as community's thinking evolves
  - *ADOPT*: Monitor adoption of thematic topics

- **Need Volunteers for** Encyclopedia Products:
  - *EXPERTS/WRITERS* to provide content and write encyclopedia entries
  - *TECH-EDITORS* to ensure consistency of formatting, grammar, and structure
  - *PEER-REVIEWERS* to agree that the entries accurately reflect current thinking & use

For More Information Go To OMG MBSE Wiki:
http://www.omgwiki.org/mbse/doku.php

The Need for DEIXPedia

- No majority agreement on common concepts in the digital engineering community

- Challenges with current concepts
  - *TOO MANY* variations of DEIX thematic topics in use
  - *UNOFFICIAL* descriptions of DEIX thematic topics
  - *CONFUSION* with thematic topics borrowed from other fields
  - *DISAGREEMENT* on proper application thematic topic names

Product Description:
The DEIXPedia

- Think "Wikipedia" or Online Encyclopedia

- Entries are 500 to 1,000 words – 1 to 2 pages

- Description of Encyclopedia Article
  - Provides in-depth explanation of thematic topics
  - Extensive explanation of Digital engineering topics
  - A place for community critiques & consensus of topics as they evolve

- Notional Outline for Encyclopedic Entry

  - Concise Definition
  - The Concept Details
  - Common Usage

  - Examples
  - Similar Concepts
  - Related Terminology
  - References

Digital Artifact

Concise Definition
A digital artifact is any combination of professional data, information, knowledge, and wisdom (DIKW) expressed in digital form and exchanged within a digital ecosystem.

The Concept
A digital artifact is any combination of professional data, information, knowledge, and wisdom (DIKW) expressed in digital form and exchanged within a digital ecosystem. During an exchange, the originator's digital form of DIKW remains intact and is interpretable by the recipient. Professionals and tradespersons create digital artifacts when they produce DIKW in, or convert items to, digital forms with the aid of digital technologies. The digital artifact encodes data, behaviors, attributes, or properties that software applications use to retrieve and display the digital forms of professional DIKW.

Explanation
Many professional disciplines create, store, and display a variety of their DIKW to share with large numbers of stakeholders by way of numerous digital technologies. Thus, there are uncountable ways to express the unique combinations of multidisciplinary DIKW, stakeholders' information needs, and digital technologies. To classify the digital expressions of professional DIKW, the Digital Engineering Community develop the concept of a Digital Artifact as the universal set of digital forms that practitioners use to express their thoughts. As a subset, there are engineering digital artifacts that are relevant and useful in conveying engineering DIKW in digital forms. Therefore, a unique combination of engineering DIKW expressed in digital form is an engineering digital artifact.

Characteristics
To distinguish the digital artifact from raw digital data with no context, the Digital Engineering Community established a set of characteristics to classify digital data as a digital artifact. The characteristics of a digital artifact are as follows:

- Resides in a digital device or system
- Human interpretable
- ...able and computational

Finite Set of Digital Viewpoint Models (DVM)

The project, the need, and the product

Frank J. Salvatore

DEIX WG Co-Chair

Frank.Salvatore@sEngility.com

Engility Corporation

The Product Development Project:
Define a Finite Set of Digital Viewpoint Models (DVM)
Project Lead: Frank Salvatore

- **The Effort**: Decide on formalisms and conventions for a generic digital viewpoint model that stakeholders can use to offer or requests for any ISO 15288.2 Review

  - *DEFINE*: The finite set of 15288.2 reviews and the critical stakeholders for those reviews

  - *DESCRIBE*: A generic digital viewpoint model with agreed formalisms and conventions

  - *MODEL*: 1 or 2 examples of digital viewpoints required for ISO 15288.2 reviews

  - *EVALUATE*: Seek comments and inputs from the broader community

  - *ADOPT*: Solicit and catalog any Digital Viewpoint Models the community creates

- **Need Volunteers for** Digital Viewpoint Models:

  - *INFORMATION & DATA MODELERS* to develop information flow models for digital viewpoints

  - *SYSTEMS ENGINEERS* to define typical sources, models, and data for MBE digital artifacts

  - *REQUIREMENTS ANALYSTS* to elicit stakeholders' requirements for ISO 15288 digital views

For More Information Go To OMG MBSE Wiki:
http://www.omgwiki.org/mbse/doku.php

The Need for DVM

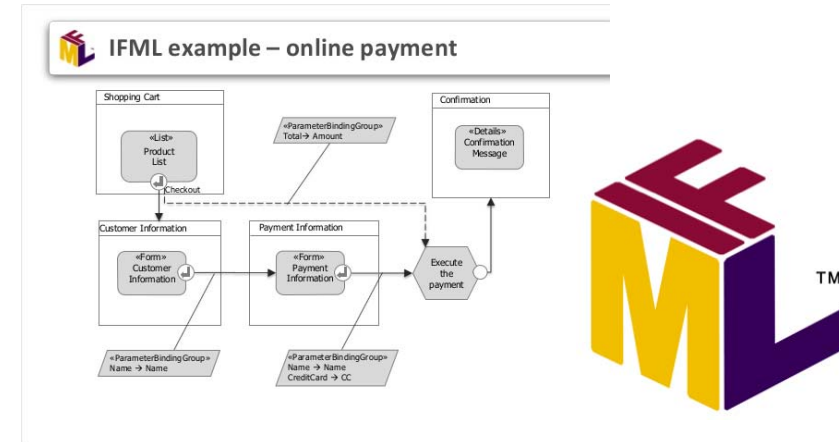- No finite set of digital viewpoints for reviews in ISO 15288 systems engineering lifecycle standards

- Challenges:

  - *NONCOMPLIANCE:* Entities can not definitively define digital artifacts that satisfy the letter and intent of contractual obligations

  - *MISSUNDERSTANDINGS*: Non-standard descriptions of digital artifacts inhibit mutual understandings of acquirer and suppliers' needs

  - *INSUFFICIENT*: Descriptions of digital artifacts are insufficient to leverage the interactivity and collaborative capabilities of digital technology

  - *INEFFICIENT*: Cyclical conversion of digital artifacts to e-documents adds costs

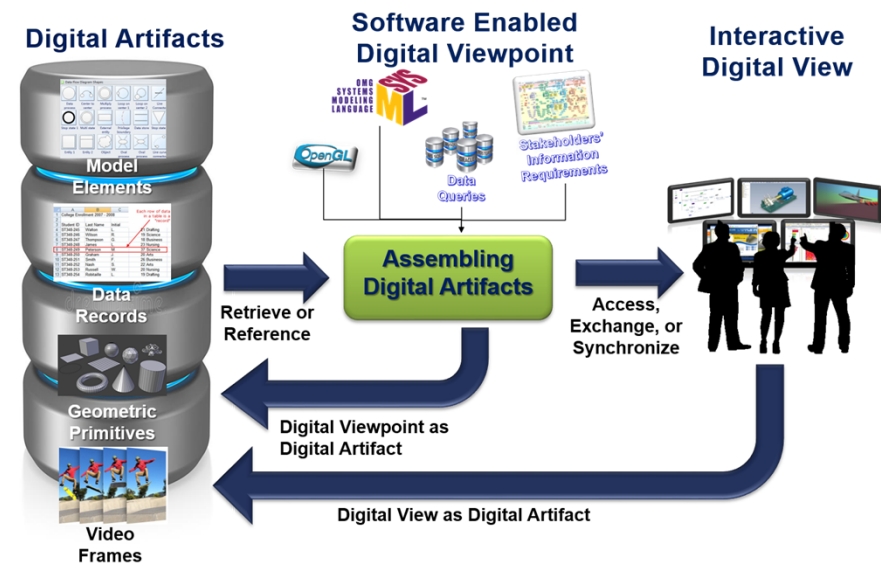 - *DISATISFACTION*: Static e-documents do no satisfy all stakeholders' diverse needs

Product Description:
The Digital Viewpoint Model

Information Flow Modeling Language (IFML) - Notional

Digital Artifact Conversion Process

- Think Information Flow Models for Digital Views
- Description of Generic Digital Viewpoint Model (DVM)
  - Provides Platform independent description of generic digital viewpoint model
  - Defines formalisms and conventions for DVM
  - Serves as means to define SW Controller for Digital Views
  - For the Digital View, the DVM expresses
    - Content
    - User Interaction
    - Control Behavior
- Includes 1 or 2 Examples of Digital Viewpoint Model for 15288.2 Review(s)
- Notional Components
  - IFML Meta model
  - Interaction Flow Model
  - Domain Model
  - Viewpoints

Model-centric Digital Engineering Information Exchange Model (DEIXM)

The project, the need, and the product

Chris Schreiber

DEIX WG Co-Chair

Chris.Schrieber@LMCO.com

Lockheed Martin Corporation

INCOSE
International Council on Systems Engineering

The Product Development Project:

Model-Centric Digital Engineering Information Exchange Models (DEIXM)

Project Lead: Chris Schreiber

NDIA — National Defense Industrial Association

- **The Effort**: Create a reference model for exchanging information in a model-centric engineering ecosystem
  - *DESCRIBE*: The formalisms and conventions for exchanging model-centric digital artifacts
  - *IDENTIFY*: The models commonly or universally exchanged between entities and roles within the digital engineering ecosystem
  - *DEFINE*: The characteristics and attributes of models commonly or universally exchanged
  - *MODEL*: The exchange of model-centric digital artifacts that supports a generic engineering ecosystem
  - *SHARE*: The models with the broader community

- **Need Volunteers for** Encyclopedia Products:
  - *ENTERPRISE SYSTEM MODELERS* to develop information exchange in an enterprise of enterprises model
  - *INFORMATON & DATA MODELERS* to define typical sources and types digital artifact exchanges
  - *REQUIREMENTS ANALYST* to elicit and model top-level requirements for information exchanges

For More Information Go To OMG MBSE Wiki:
http://www.omgwiki.org/mbse/doku.php

The Need for Model-Centric DEIXM

- No industry wide ability to develop, maintain, identify and discover, or reuse engineering models between parties in an digital engineering ecosystem

- Challenges:

  - *UNORGANIZED*: No governance, rules, or criteria that define how to seamlessly exchange engineering models in an engineering ecosystem

  - *ADHOC PROCESSES*: No systematic procedures to exchange engineering information with diverse roles in a digital engineering ecosystem

  - *STRUCTURELESS*: No architecture to facilitate the creation of a digital engineering environment or ecosystems to exchange engineering information

  - *NO STANDARDS*: No agreed conventions for entities that want to participate in a digital engineering ecosystem to share or exchange their engineering information

Product Description:
The Model-Centric DEIXM

Information Exchange Reference Model for Digital Engineering Ecosystem

Engineering Enterprise System Models

Information Exchange Models

- Think of National Information Exchange Model (NIEM)
- Describes an information exchange model for model-centric digital artifacts in an engineering ecosystem
  - Models of commonly exchanged model-centric digital artifacts
  - Models of Roles and Entities
  - Models of Associations & Relationships
  - Models of processes for exchanging
  - Proposed conformance rules to participate
- Notional Components
  - Meta-data and Meta-models
  - Information Exchange Requirements Model
  - Engineering Enterprise Systems Models
  - Model-centric Digital artifacts Data Models
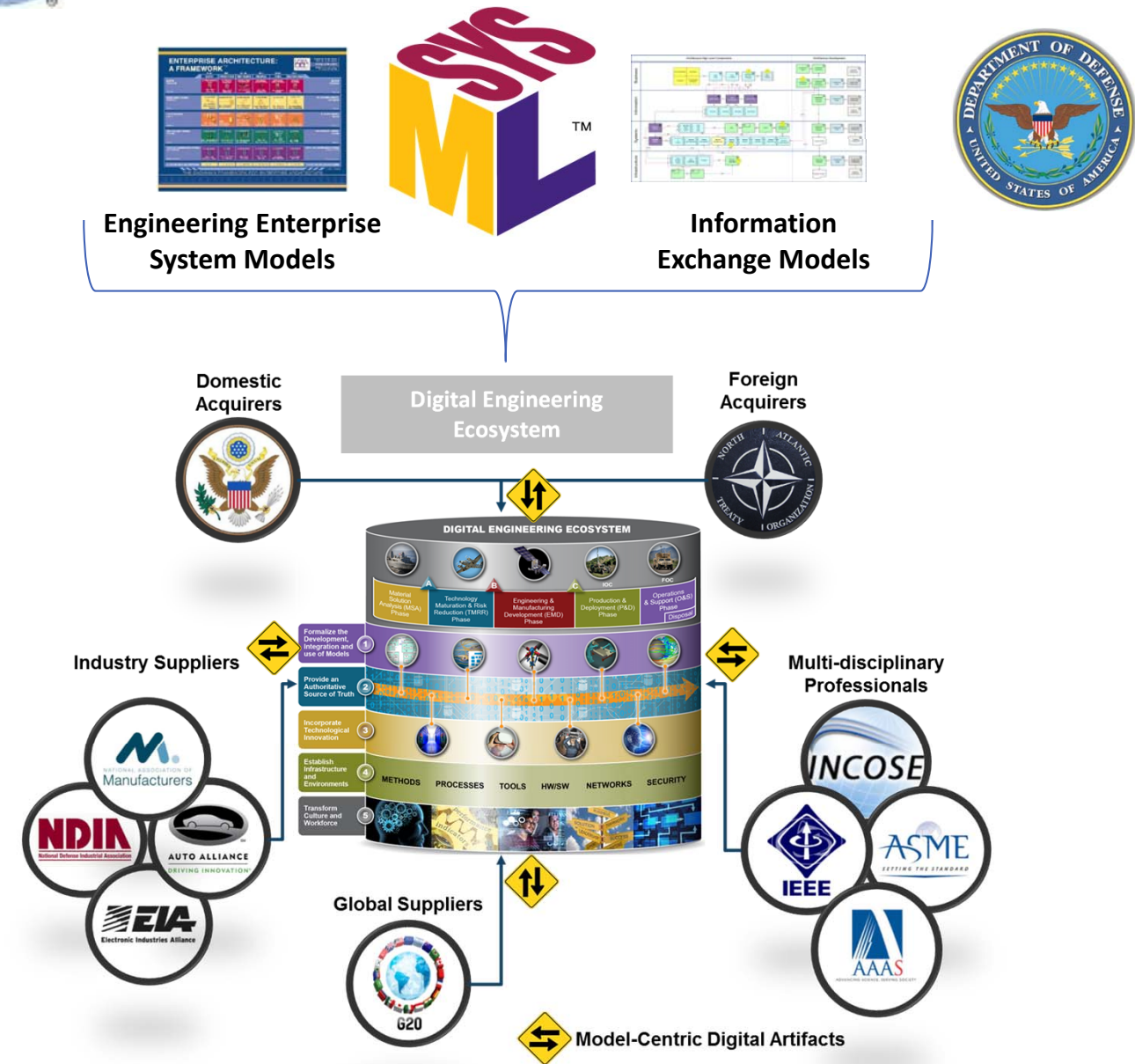
Digital Engineering Information Exchange (DEIX) Standards Framework

The project, the need, and the product

Celia Tseng
Project Lead for DEIX-SF
celiastseng@gmail.com

INCOSE
International Council on Systems Engineering

The Product Development Project:
Develop Digital Engineering Information Exchange Standards Framework (DEIX-SF)
Project Lead: Celia Tseng

NDIA — National Defense Industrial Association

- **The Effort**: Create a framework for official standards related to Model-Centric Information Exchanges
  - *SEARCH sources and repositories* for information exchange standards
  - *IDENTIFY needs for standards* to facilitate seamless exchanges of model-centric digital artifacts
  - *REVIEW existing standards* for content for relevance to needs for standards.
  - *ANALYZE relevant standards* to determine acceptability, overlaps, and gaps
  - *CREATE a standards hierarchical framework* and references to acceptable standards
  - *RECOMMEND to INCOSE Standards Committee* modifications or new standards to fill gaps or meet needs

- **Need Volunteers for** Encyclopedia Products:
  - *RESEARCHERS* to search and identify relevant standards
  - *ANALYSTS* to analyze relevant standards for relevance, applicability, and needs
  - *STANDARDS AND POLICY EXPERTS* to advise product team and broker information & relationships

For More Information Go To OMG MBSE Wiki:
http://www.omgwiki.org/mbse/doku.php

The Need for DEIX-SF

- No industry-wide agreement on standards or conventions to enable a universal exchange of digital artifacts between buyers and suppliers in a global supply chain

- Challenges:

  - *NO STANDARDS*: No agreed conventions for entities that want to participate in a digital engineering ecosystem to share or exchange their engineering information

  - *COMPETING STANDARDS*: Many related industries, professional disciplines, and open communities have competing, duplicative, or inconsistent standards for information exchange

  - *COMPLEXITY*: Difficulty in achieving dominant standards naturally with the degree of diversity among model information, stakeholders, and interrelationships

Product Description:
The DEIX-SF

- Think of National Building Information Model Standard (NBIMS)

- Hierarchal expression of engineering information exchange standardization
  - Needs Analysis for Standards
  - Subset of Standards Organizations' repositories
  - Summarize Literature review of relevant standards
  - Results of Gap Analysis
  - Recommendations
- Notional Outline
  - Hierarchy of Needed Standards
  - Catalog of Relevant Standards
  - Requirements to fill Gaps
  - Recommendations to INCOSE Standards Committee
  - Proposed Engagement Plan for Standards Organizations

The Standards Framework
Document Tree
Related to Exchanging Digital Artifacts

Propose Standards

Reference Standards

Influence Standards

Adopt Standards

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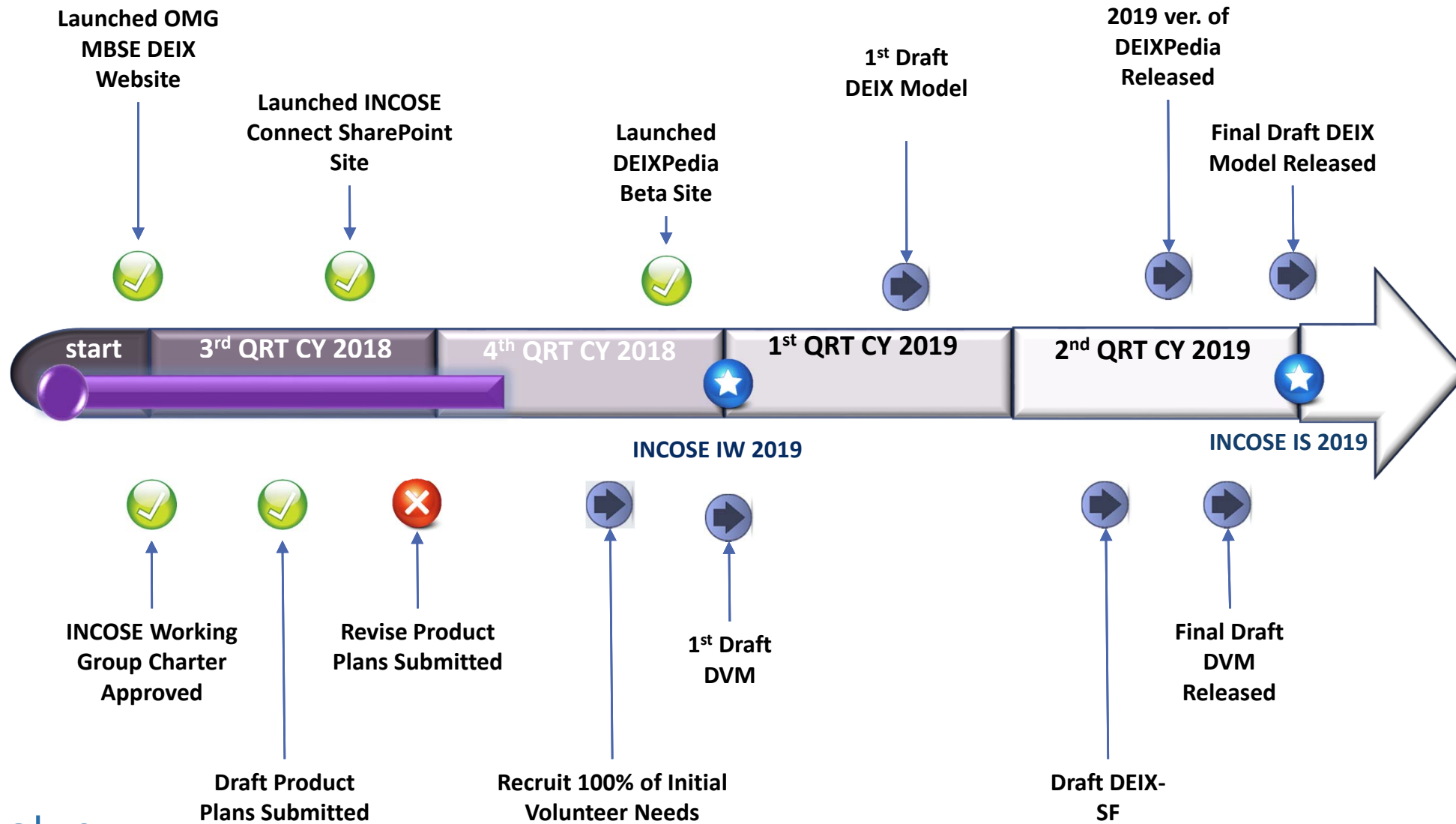
DEIX Working Group's NEXT STEPS

The project, the need, and the product

John H. Coleman, Ph.D.
DEIX WG Chair
John.Coleman@Engiilty.com
Engility Corporation

Current Status

INCOSE
International Council on Systems Engineering

NDIA
National Defense Industrial Association

Launched OMG MBSE DEIX Website

Launched INCOSE Connect SharePoint Site

Launched DEIXPedia Beta Site

1st Draft DEIX Model

2019 ver. of DEIXPedia Released

Final Draft DEIX Model Released

start | 3rd QRT CY 2018 | 4th QRT CY 2018 | 1st QRT CY 2019 | 2nd QRT CY 2019

INCOSE IW 2019

INCOSE IS 2019

INCOSE Working Group Charter Approved

Draft Product Plans Submitted

Revise Product Plans Submitted

Recruit 100% of Initial Volunteer Needs

1st Draft DVM

Draft DEIX-SF

Final Draft DVM Released

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Seeking a More Diverse DEIX WG Stakeholder Community that use Model-Centric Digital Artifacts

Diverse International Business Representation	Diverse Industrial Representation	Diverse International Governments Representation
Seeking Engineers and Product Development Businesses from the Global market place	*Seeking representatives from all types of product based and science & engineering services industries*	*Seeking representatives from any international government organizations*

DEIX WG Stakeholder Engagement & Collaboration

International Engineering Community Liaison and Advocate	U.S Industrial Base Liaison and Advocate	U.S. Government Interdepartmental Liaison and Advisor
Mr. Troy A. Peterson *SSI* *Assistant Director, Transformational,* tpeterson@systemxi.com **INCOSE Website** *https://www.incose.org/*	**Mr. David Allsop** *The Boeing Company* *NDIA Co-Chair,, Modeling & Simulation Committee* david.allsop@boeing.com **NDIA M&S Website** *http://www.ndia.org/divisions/systems-engineering/committees/modeling-simulation-committee*	**Ms. Philomena Zimmerman** *Deputy Director, Engineering Tools & Environments* Philomena.M.Zimmerman.civ@mail.mil **Defense Innovation Marketplace** *https://defenseinnovationmarketplace.dtic.mil/* **DASD, Systems Engineering** *https://www.acq.osd.mil/se*

BACKUP