



Data Analytics in the ASM Community: Bridging Materials Science and Data Science

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ASM
INTERNATIONAL

TOPICS

1. Strategic and Operational Landscape, 2019
2. ASM Renewal Goals and Accomplishments, 2017-2019
3. ASM Realization Goals and Strategies, 2020-2022
4. Challenges
5. Summary and Outlook

Industry 4.0

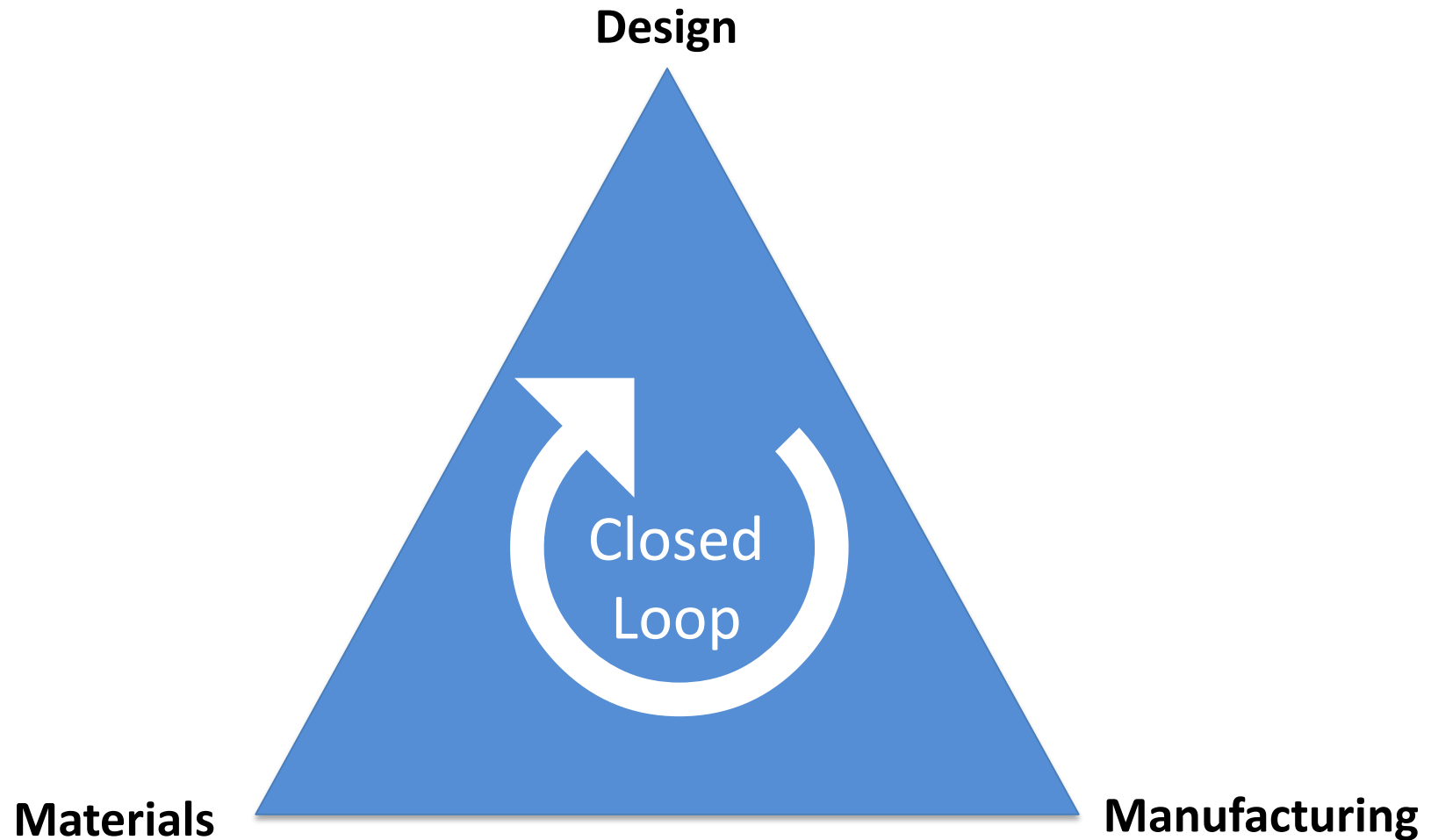
- ◆ Manufacturing 4.0
- ◆ Interconnection
- ◆ Information Transparency
- ◆ Assistance Systems for Humans
- ◆ Decentralized Decisions
- ◆ Net-Centric Processes

Materials Genome Initiative

- ◆ Reduce Cost & Development Time
- ◆ Discovery, Optimization, and Deployment
- ◆ Integration, Curation, Provisioning of Data and Models
- ◆ Data Exchange Protocols
- ◆ Interoperability of Computer Simulations
- ◆ Model and Data Quality

Common Underlying Technologies

- ◆ Connection (Sensors and Networks)
- ◆ Cloud (Computing and Data on Demand)
- ◆ Cyber (Model and Memory)
- ◆ Content/Context (Meaning & Correlation)
- ◆ Community (Sharing & Collaboration)
- ◆ Customization (Personalized Value)



ASM Renewal, 2017-2019

Goals and Accomplishments



Key Performance Initiatives

Results

1. Membership and Revenue Growth

- ~2,000 New Professional Members
- 9% Annual Revenue Growth

2. Improved Financial Health

- Operating Break-Even and Debt-Free
- 8-Figure Granta ROI

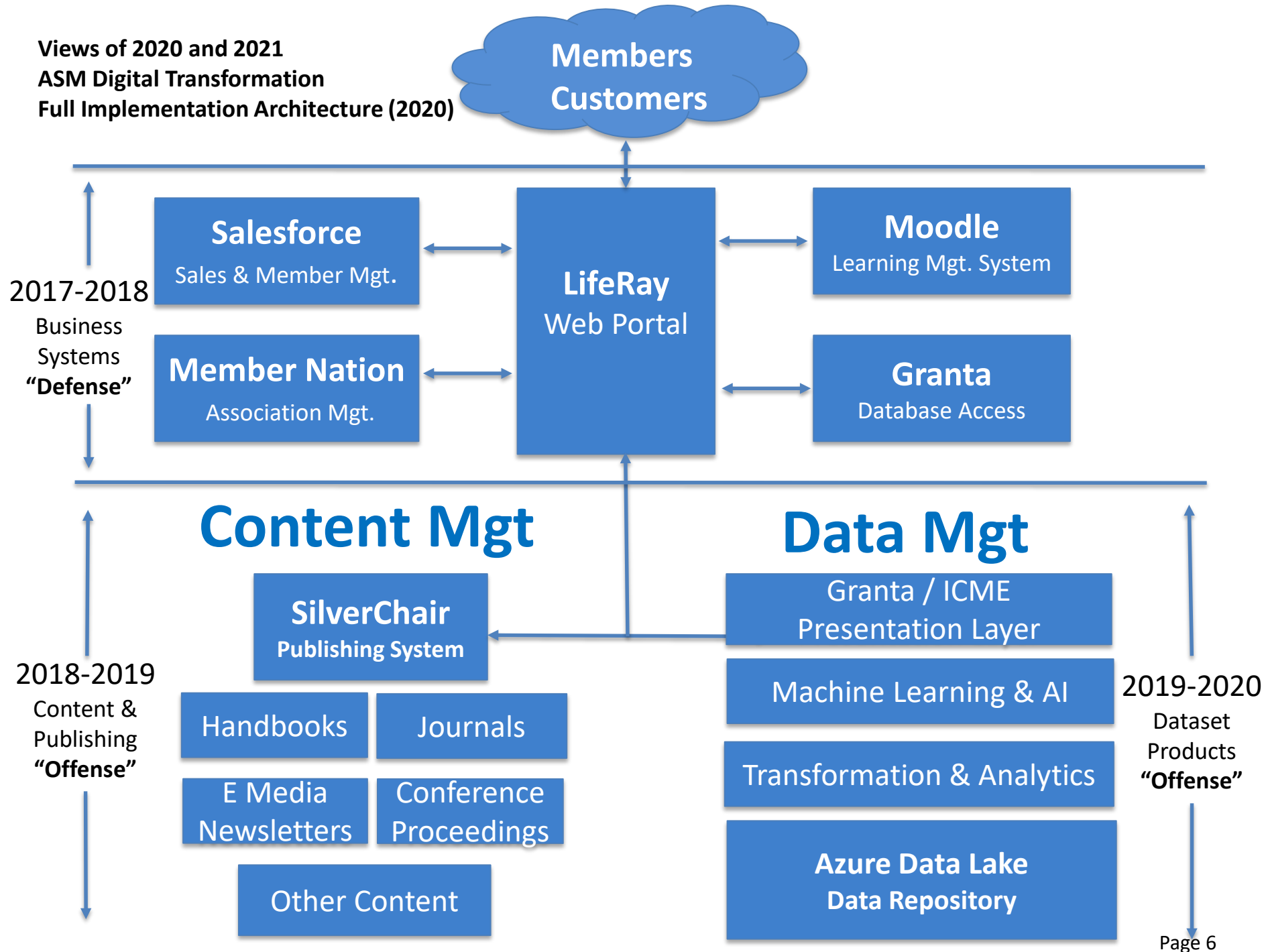
3. Improved Foundation Support

- \$400K + In Operations Support
- $\geq$ \$1M of Granta Proceeds Reserved

4. New Technological Competencies

- Digital Transformation
- Legacy Content Re-Engineering
- New Content and Data

**Views of 2020 and 2021
ASM Digital Transformation
Full Implementation Architecture (2020)**



2019 Experiments: New Technological Competencies



Projects

1. Private Label and Resell MPDS Database
2. Stand Up Center for Materials Processing Data (CMPD)
3. MGI Toolkit in ASM Cloud (Thermocalc and Calphad)
4. ATI and ORNL Data Management Services Subcontractor
5. ISO 10303 Compliance

Results

- Strength in Phase Diagram (and Meta Data) Segments
- Prove Processes and Methods to Aggregate, Validate, Curate, Disseminate Transient Data for Industry
- Deploy ASM SAAS Ecosystem (Data and Tools)
- As in 2. Above, but for DoD/DoE Markets
- Interoperability and Relevancy in Manufacturing

ASM SaaS Ecosystem - ICME



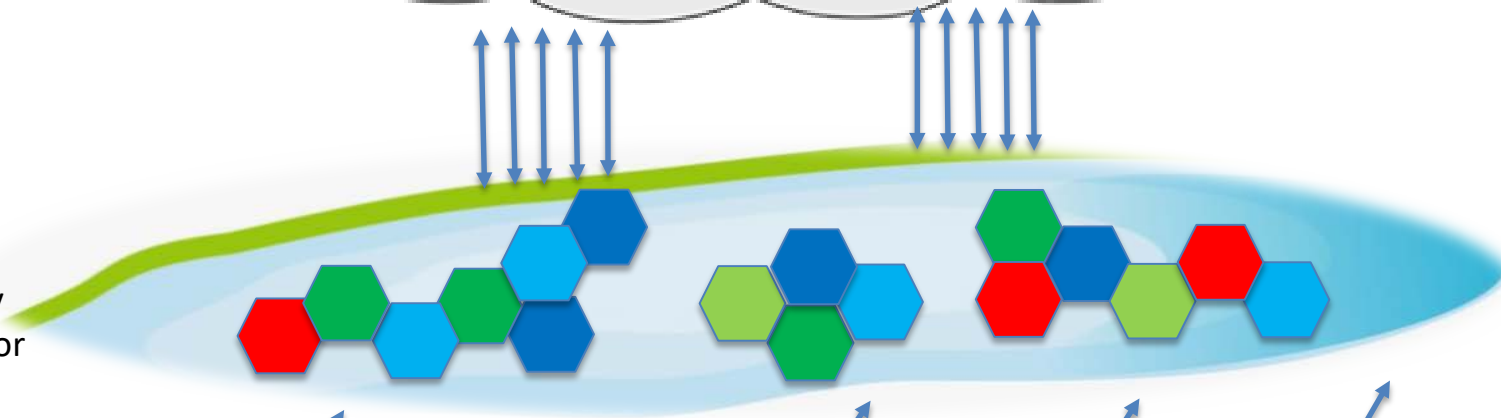
ASM Service Cloud

Customers can run their models against our datasets or subscribe to datasets directly. Generic results can be fed back to the Data Lake, proprietary results can be safeguarded



ASM Data Lake

Secure repository of ICME Data Indexed by Alloy, Topic, Industry or Process

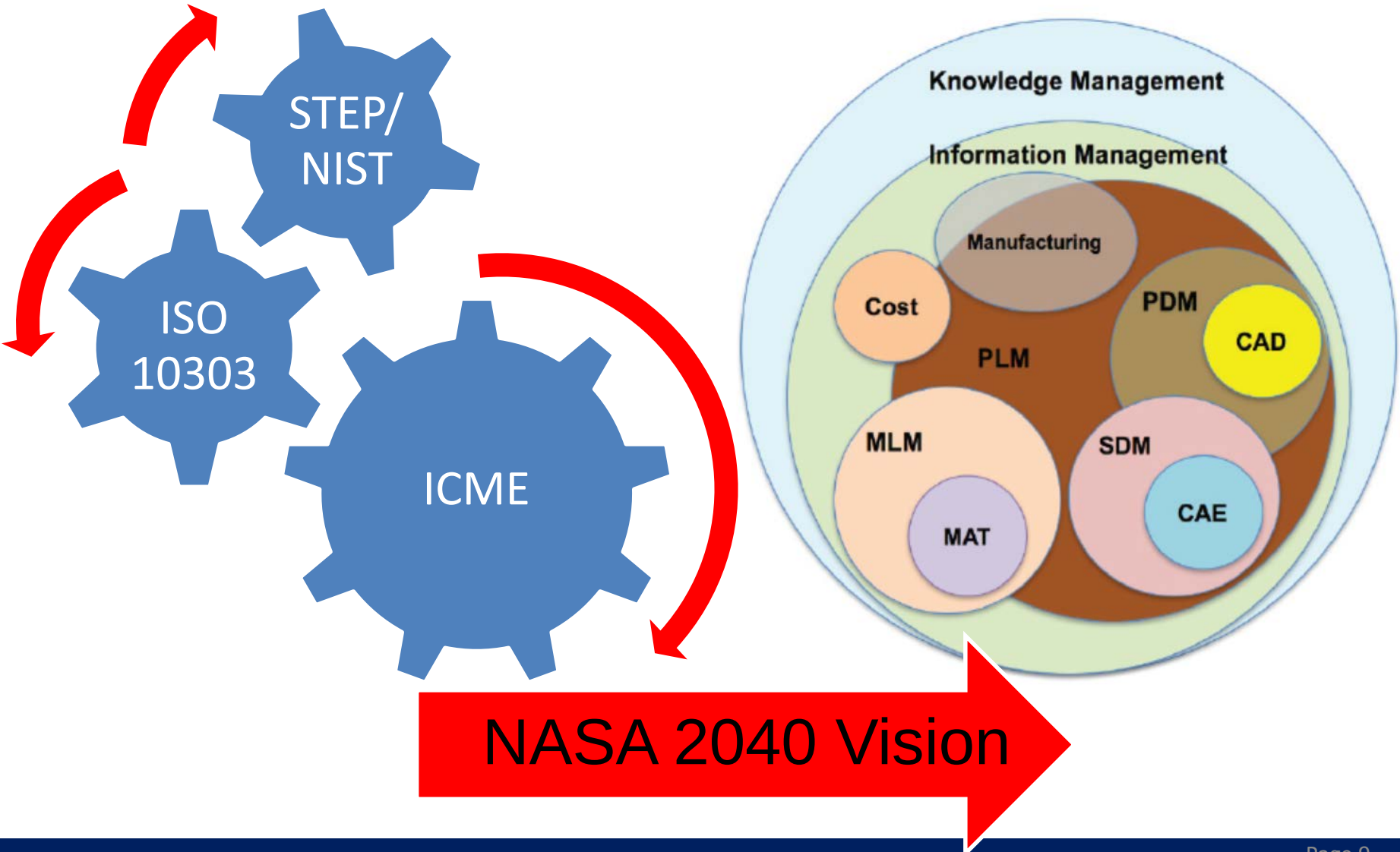


Data/Metadata

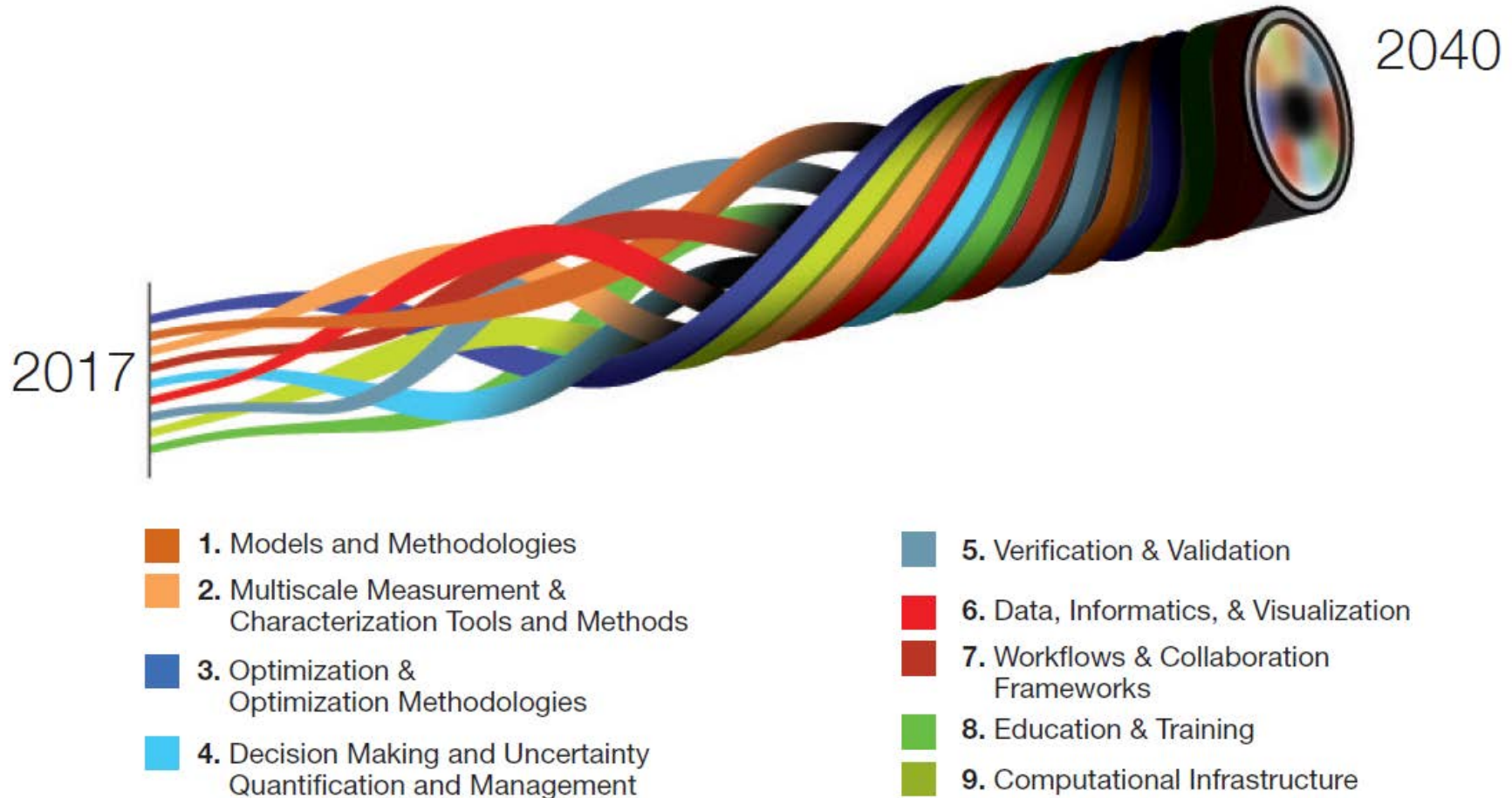
Experimental and Simulated data from many sources



ISO 10303 Concept Evolution



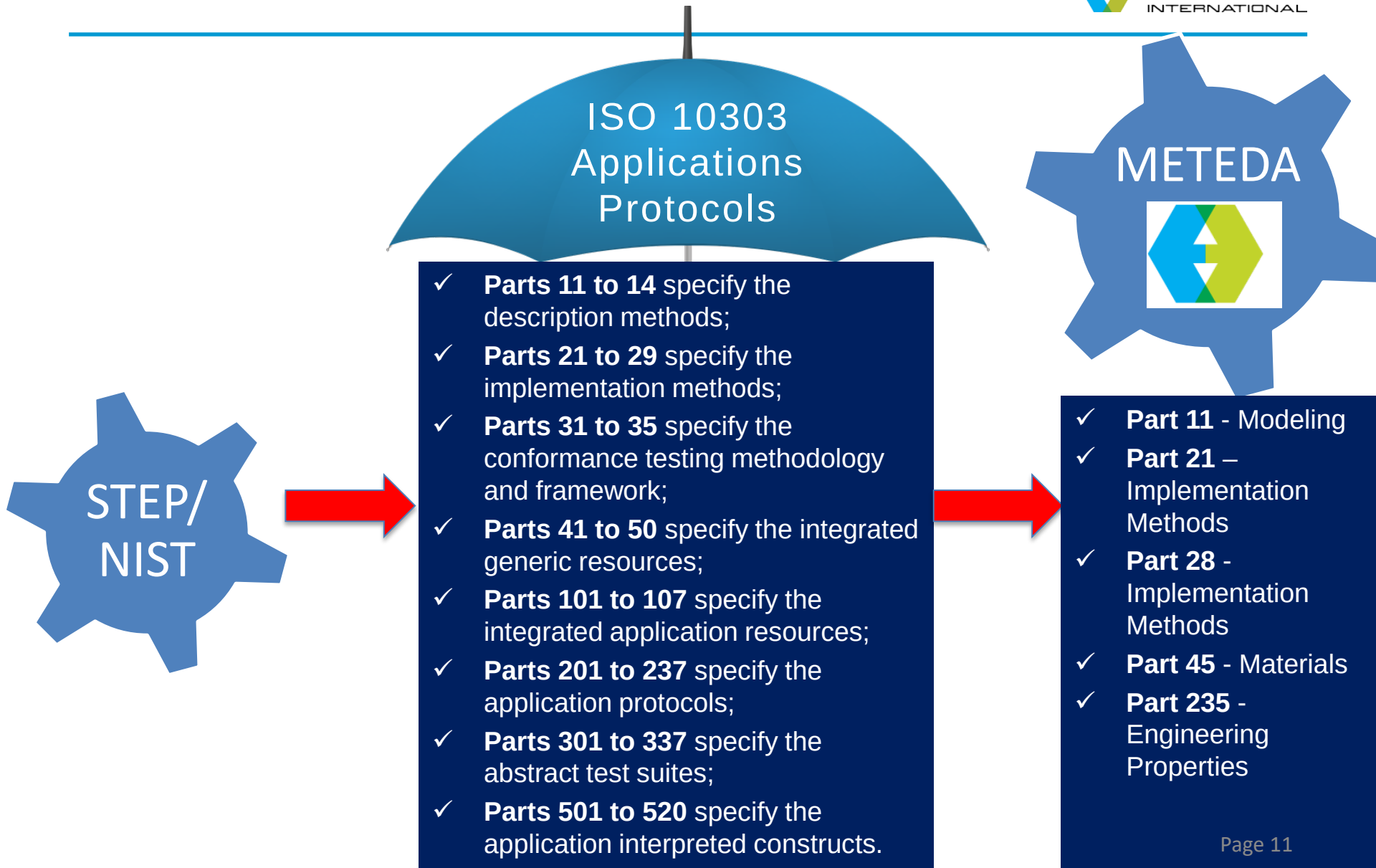
NASA Vision Evolution



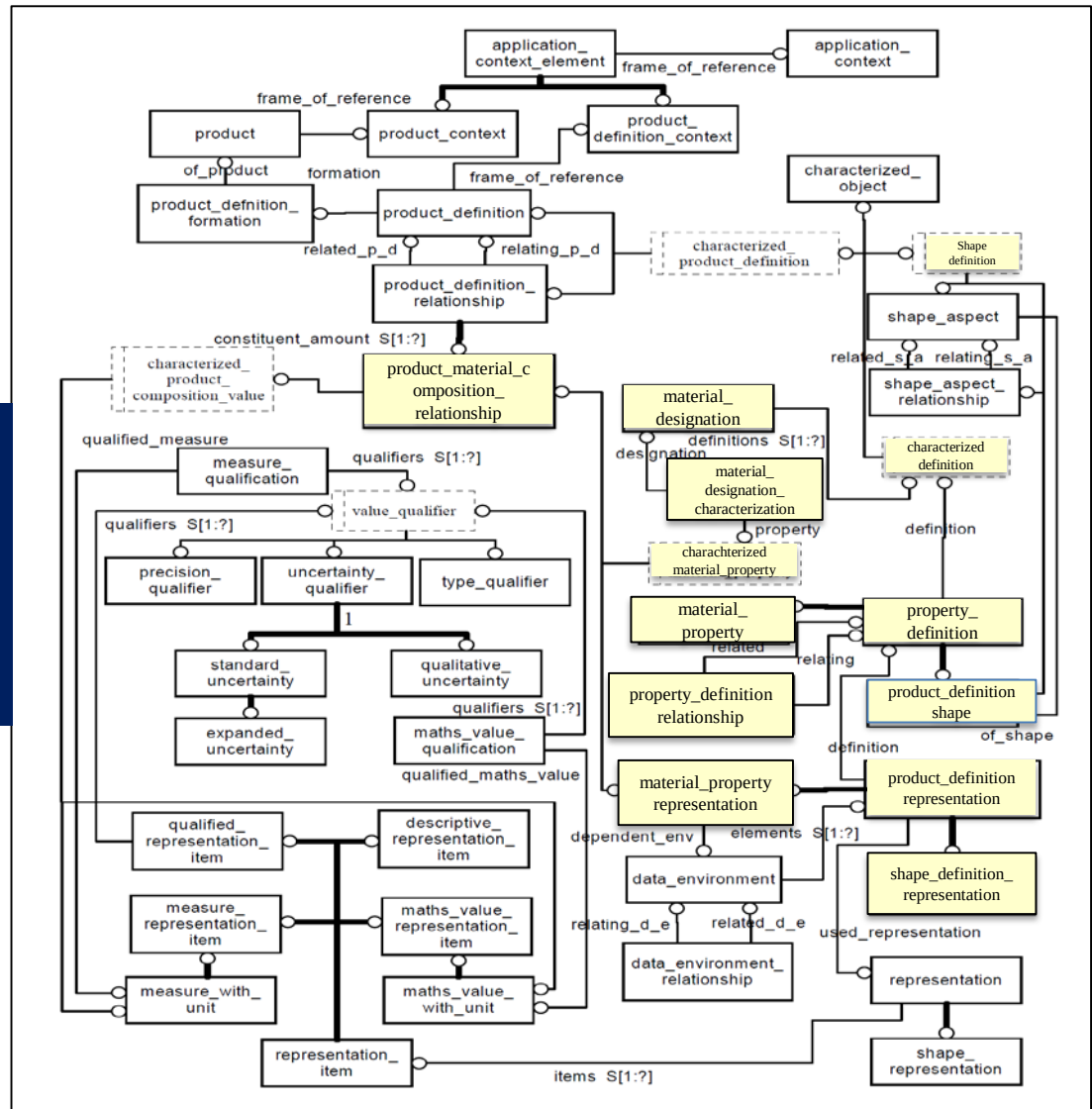
ISO STANDARDS ARE REFLECTED IN NASA 2040 VISION

METEDA – ASM Direct Connection

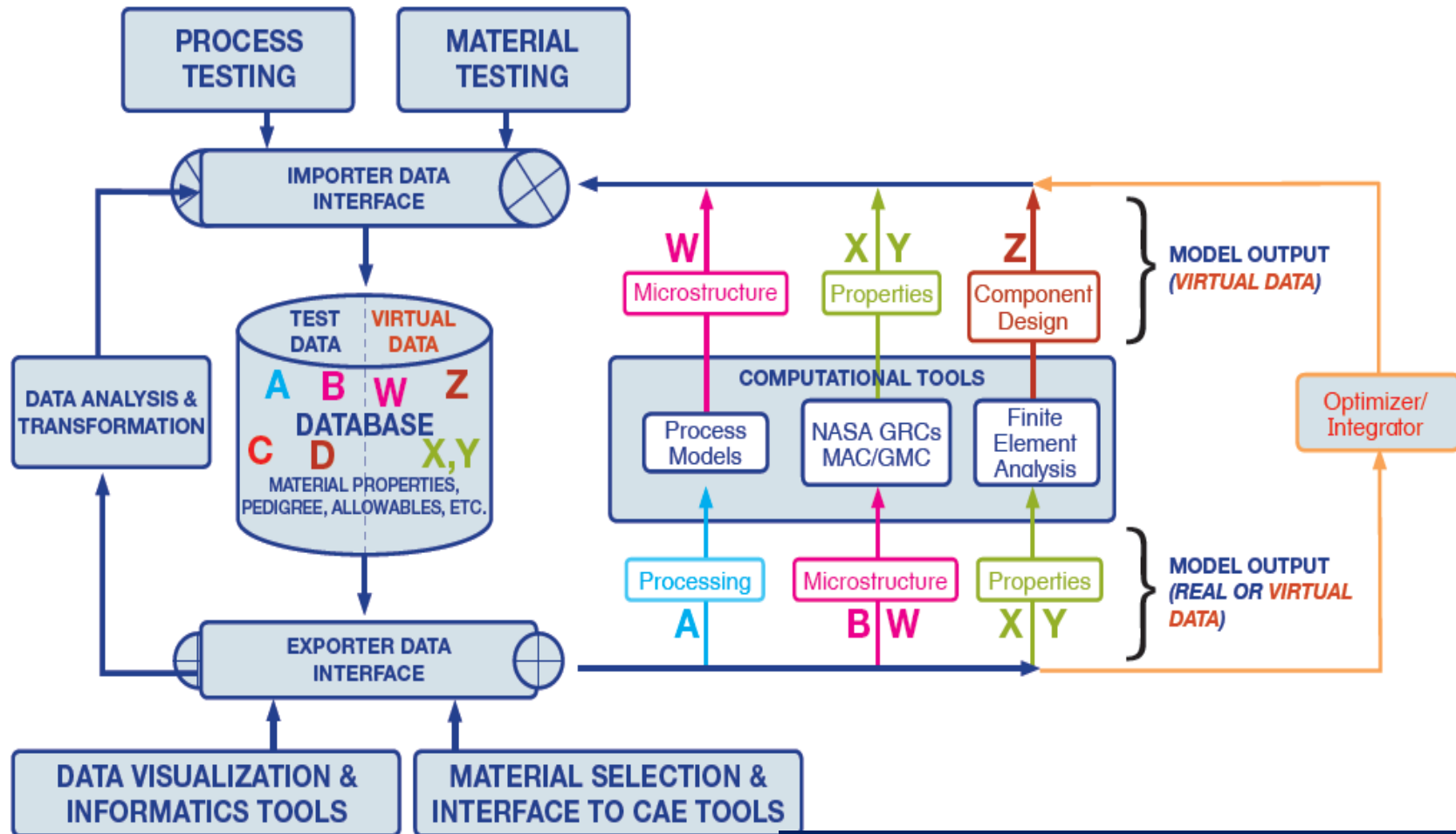
ASM/JRC/CEN/EPRI/ORNL - ISO 10303 Applications Protocols



Graphical Presentation of the Information Model for Presentation of the Property of a Product



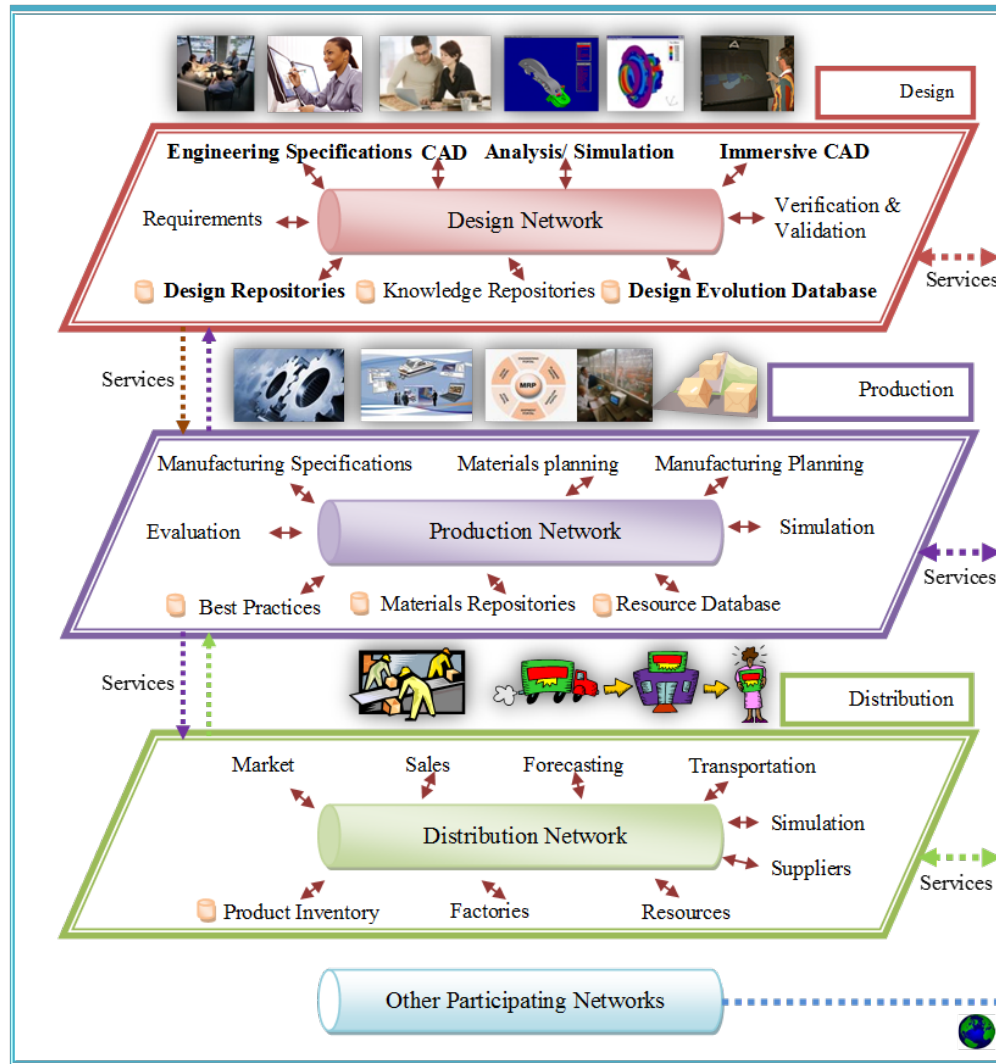
ICME Paradigm (NASA Vision 2040)



ASM PRODUCTS ARE
ALIGNED TO ICME/NASA VISION
APPROACH

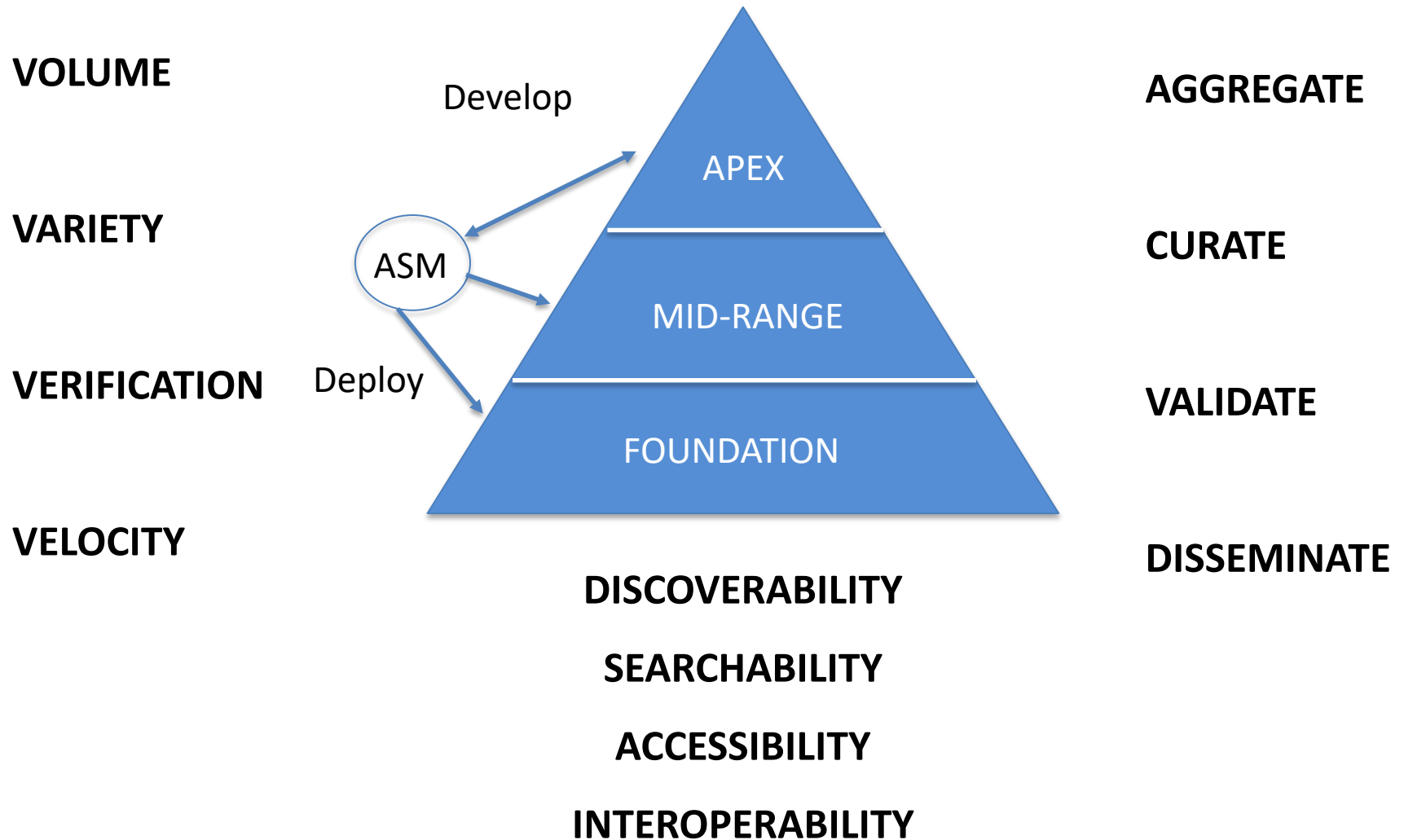
Networking Enterprises

CENTRIC
NETWORK -



**Network-centric
computer aided
product realization
(CAPR)**

Information and Data Services Strategy



Challenges

- Potentially Large, Emerging Market for Materials Data and Related Services
- Fragmented, Relatively Slow-Moving
- Complex Functional and Technical Requirements
 - Schema and Formats
 - Gateways
 - “Translation” Between Materials and Other Engineering Disciplines
- Scarcity (currently) of “Connective Tissue”
 - Trusted Consortia May Be Best for Future Market Development

Summary and Outlook



1. ASM is Transitioning to a Leadership Position: “The Materials Information Society for the 21st Century”
2. Major Role in Helping to Build the Bridge Between Materials Science and Data Science (with Partners and Collaborations)
3. Significant Opportunity to Gain Position as “Materials 4.0” Underneath Industry 4.0/Manufacturing 4.0
4. Market Challenges Will Require Patience, Persistence and Continued Investment
5. ASM Today has the Skillsets and Resources to Fulfill the Vision, Execute Its Strategy