

PLM Interoperability and the Untapped Value of 40 years in Standardization

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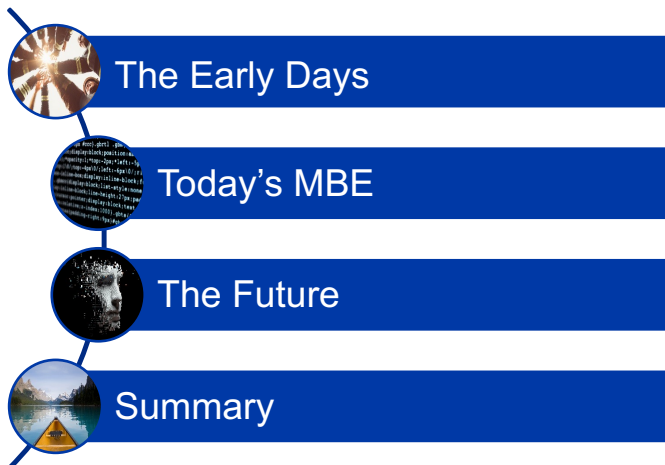
PLM Road Map™ & PDT Europe 2025
PLM's Integral Role in Digital Transformation From Strategy to Execution

 *Elevating PLM to an Enterprise Business Solution*
the PLM Professional's Road Map to Success 
5 & 6 November

PLM Interoperability & the untapped value of standardization

Digital & Systems Engineering

AGENDA



The Early Days

- “In the beginning... there was product data exchange” NIST 939 July 1999
- Going all the way back to 1970 with ANSI/X3/SPARC, sharing engineering design beyond the drawing has been an issue
- IGES demonstrated the value of file-based data exchange, many other formats followed
- ISO/TC 184/SC 4 – Industrial data formed in 1984
- Product Data Exchange Specification (PDES) was chartered in 1988

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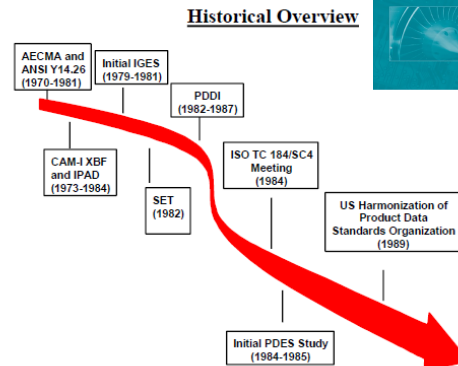


Figure 2-5: History of Product Data Standards

NIST Special Publication 939, July 1999



40 years of standardization!

Winner
2007 & 2021
Lawrence D. Eicher Leadership Award

The first SC 4 meeting was held in July 1984 at the National Bureau of Standards (now known as the National Institute of Standards and Technology) in Gaithersburg, Maryland USA.

The first version of the STEP standard was published in ~ 1990

RESOLUTION 1: (Gaithersburg - July 1984)

SC 4 recognizes the need for a new standard for the external representation of product model data. This standard will be based upon existing data exchange initiatives including the US IGES and PDDI, the French SET, the German VDA/BDMA-FS, and the UK NEDO.

RESOLUTION 2: (Gaithersburg - July 1984)

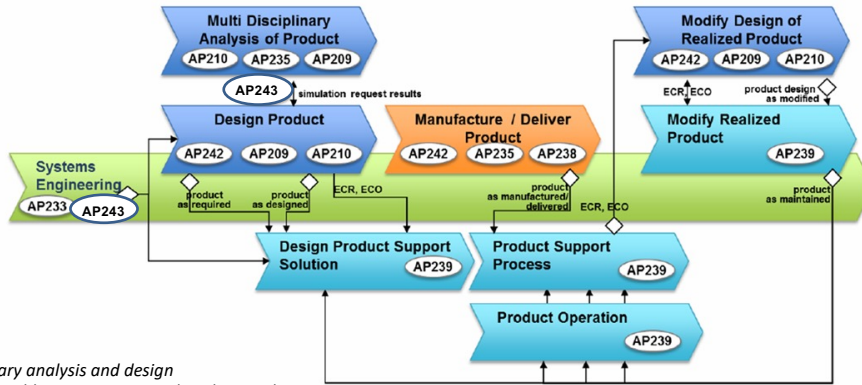
The SC adopts the following goal and objectives.

Goal: The creation of a standard which enables the capture of information comprising a computerized product model in a neutral form without loss of completeness and integrity, throughout the life cycle of the product.

Design Objectives: The standard must feature:

- Flexibility to permit expansion without invalidating existing portions of the standard.
- Efficiency for processing, communication and storage.
- Rigorous and formal documentation.
- The minimum possible set of data elements.
- Separation of data content from physical format.
- A logical classification of data elements.
- Compatibility with other existing relevant standards.

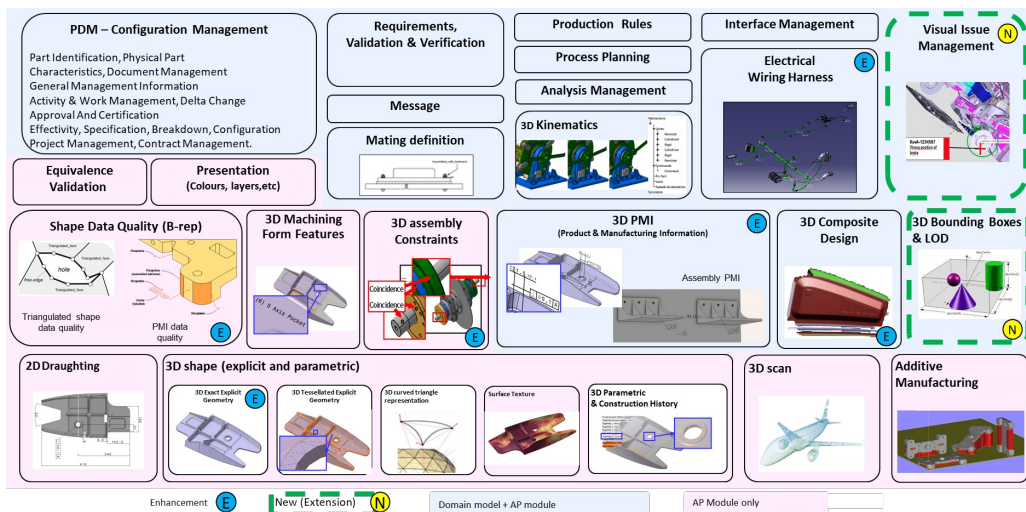
ISO 10303 - Product data representation and exchange



- AP209 Multidisciplinary analysis and design
- AP210 Electronic assembly, interconnect and packaging design
- AP233 Systems engineering
- AP235 Engineering properties for product design and verification
- AP238 Model based integrated Manufacturing
- AP239 Product life cycle support
- AP242* Managed model-based 3D engineering, replaces AP203 & AP214
- AP243 MoSSEC: modelling and simulation information in a collaborative systems engineering context

Source: <https://www.iso.org/committee/54158.html?view=documents>

ISO 10303 – 242 ed 4 Managed model-based 3D engineering



Source: <https://www.iso.org/committee/54158.html?view=documents>



Meeting industry needs

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AP201
AP202
AP203
AP204
AP214

AP242 ed1
2011 - 2014

Consolidation
Multiple industry sector
"flavors" consolidated
into one common 3D
MBE solution

AP242 ed2
2014 - 2020

Major Update
Modular Architecture
Composites
PMI
GD&T
Electrical
PDM
SysML Core Model

AP242 ed3
2020 - 2022

Enhancement
Electrical
Topology
Geometry

AP242 ed4
2022 - 2025

Enhancement
PMI
Composites
Electrical
Assembly
Kinematics

AP242 ed5
2025 - 2027

Enhancement
Fasteners
Composites
PMI
LOTAR
Ontology
Services

Standards operating at the pace of industry
Full Model Based 3D Engineering updates in two-year increments

Source: <https://www.iso.org/committee/54158.html?view=documents>



ISO Smart Manufacturing

"Manufacturing that improves its performance aspects with integrated and intelligent use of processes and resources in cyber, physical and human spheres to create and deliver products and services, which also collaborates with other domains within an enterprise's value chain"

Source: Definition (ISO SMCC resolution 114/2017)

Committees in Coordination

ISO/IEC JTC 1	Information technology
ISO/IEC JTC 1/SC 7	Software and systems engineering
ISO/IEC JTC 1/SC 17	Cards and personal identification
ISO/IEC JTC 1/SC 27	IT Security techniques
ISO/IEC JTC 1/SC 32	Data management and interchange
ISO/IEC JTC 1/SC 37	Biometrics
ISO/IEC JTC 1/SC 38	Cloud Computing and Distributed Platforms
ISO/IEC JTC 1/SC 40	IT Service Management and IT Governance
ISO/TC 10	Technical product documentation
ISO/TC 10/ SC 10	Process plant documentation
ISO/TC 39	Machine tools
ISO/TC 39/ SC 10	Machine tools - Safety
ISO/TC 184	Automation systems and integration
ISO/TC 184/ SC 1	Physical device control
ISO/TC 184/ SC 4	Industrial data
ISO/TC 184/ SC 5	Interoperability, integration, and architectures for enterprise systems and automation applications
ISO/TC 199	Safety of machinery
ISO/TC 211	Geographic information/Geomatics
ISO/TC 261	Additive manufacturing
ISO/TC 292	Security and resilience
ISO/TC 299	Robotics

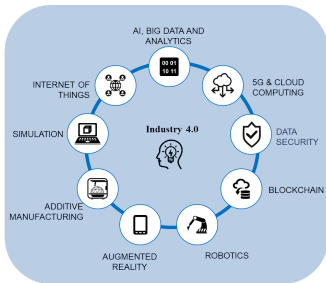
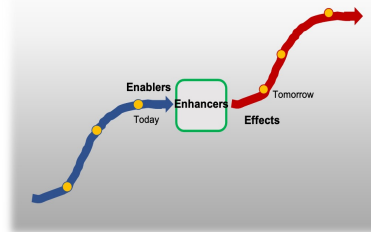


<https://www.iso.org/publication/PUB100459.html>

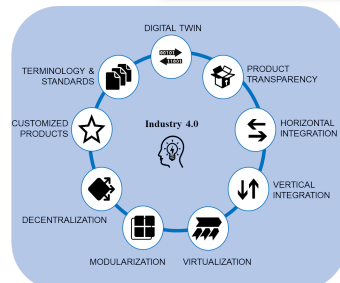


Approach

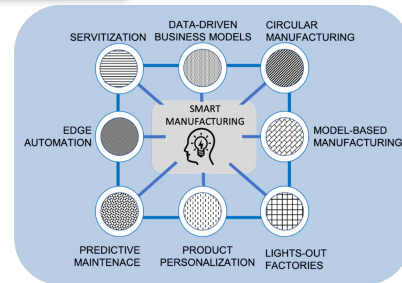
... to explain Smart Manufacturing by utilizing models from innovation.



Enablers



Enhancers



Effects

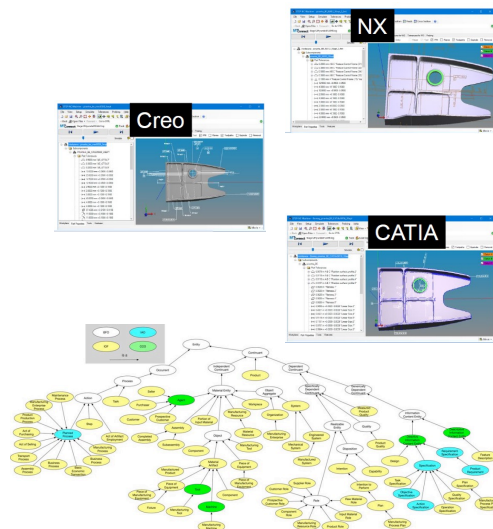
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Back to the Future: Euclid vs Aristotle

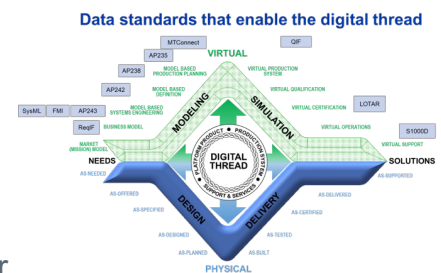
- Euclidian models are deterministic; precise geometric representations
- Ontologies are stochastic models of relationships; great for classifications and inference
- Product models need ontologies! But how to connect?
- Top Level Ontologies like ISO 21838 – 2 and ISO/CD 23726 – 3 offer a path
- No one must drink Hemlock!



<https://www.iso.org/standard/87560.html>

Summary

- The past 40 + years have created a rich, highly structured data set for the future; many repositories of legacy data waiting to be tapped
- The business needs and the use cases for value have changed; multiple digital transformations have identified data reuse and seamless flow as a priority
- Technology solutions are evolving quickly and exposing new value propositions for data use; Ontologies, reasoning engines and AI are rapidly evolving
- Digital Engineering has become the new “Grand Experience”. Standards are more important than ever before!



<https://www.boeing.com/become/modelbasedengineering/mbe-data-and-process-standards>

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