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GOVERNMENT CONSULTING

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Data Management Support for Modeling and Simulation

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Agenda

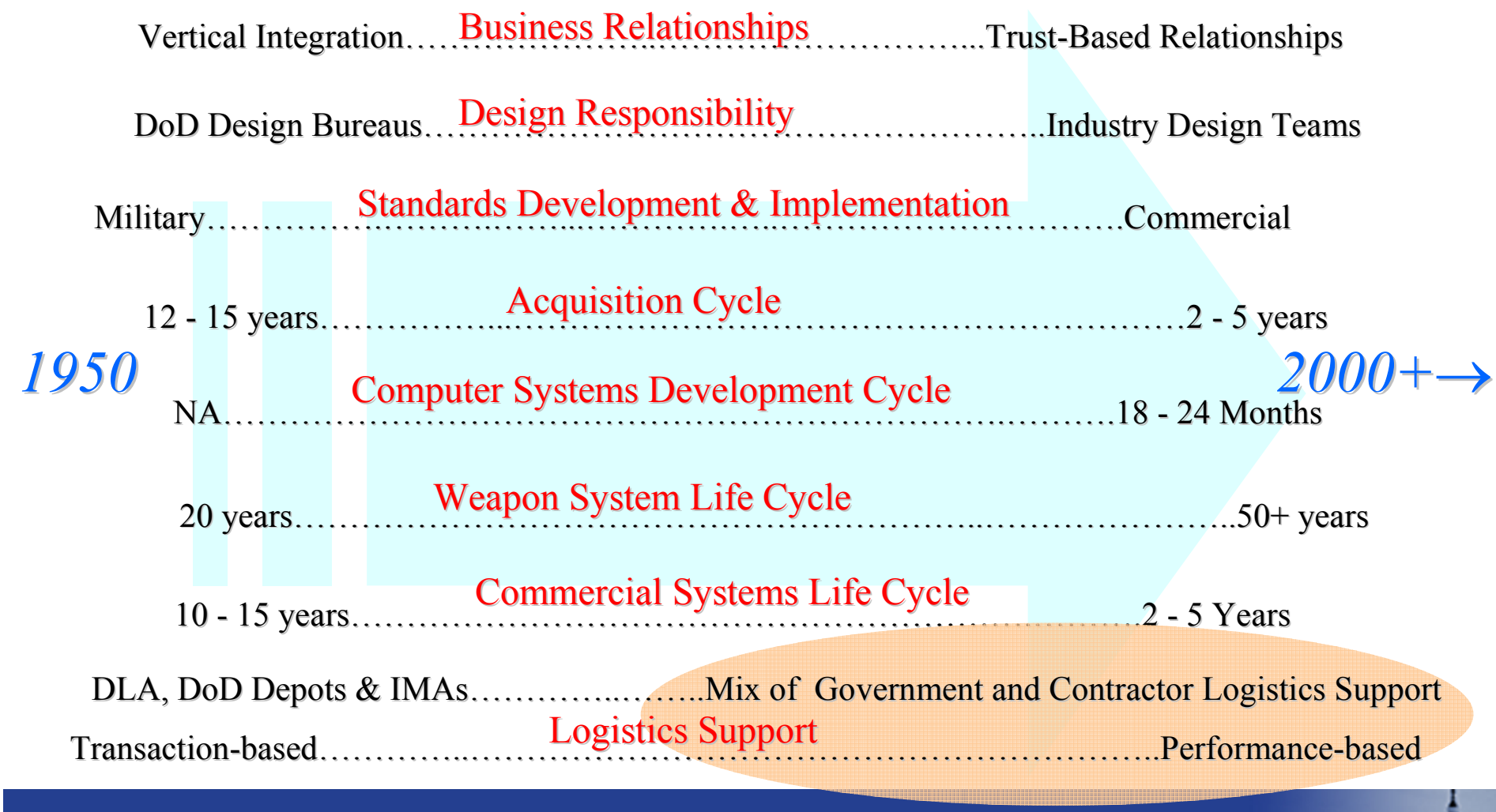
- Data Management
  - Changes in environment
  - New support to Data Management
    - Standard
    - Handbook
    - COP and BOK
  - Data management yesterday, today, and tomorrow
- Modeling and Simulation DM Challenge
- Example DM solutions and approaches
- Summary

Which Data Are We Talking About?

Focus of 859 projects

Type *Usage*	Examples
Product *Collaboration*	Cost, schedule and performance data. Scientific data such as written notes and observation data. Engineering drawings and models, parts catalogues, software applications and documentation, operational and maintenance instructions, and training materials.
Business *Collaboration*	Plans and schedules, financial information (budgets, bases of estimate, EVMS data…) inventory status, and human resource info.
Operational *Transactional Records Exchange*	Orders, issues, receipts, bills of lading, and invoices.

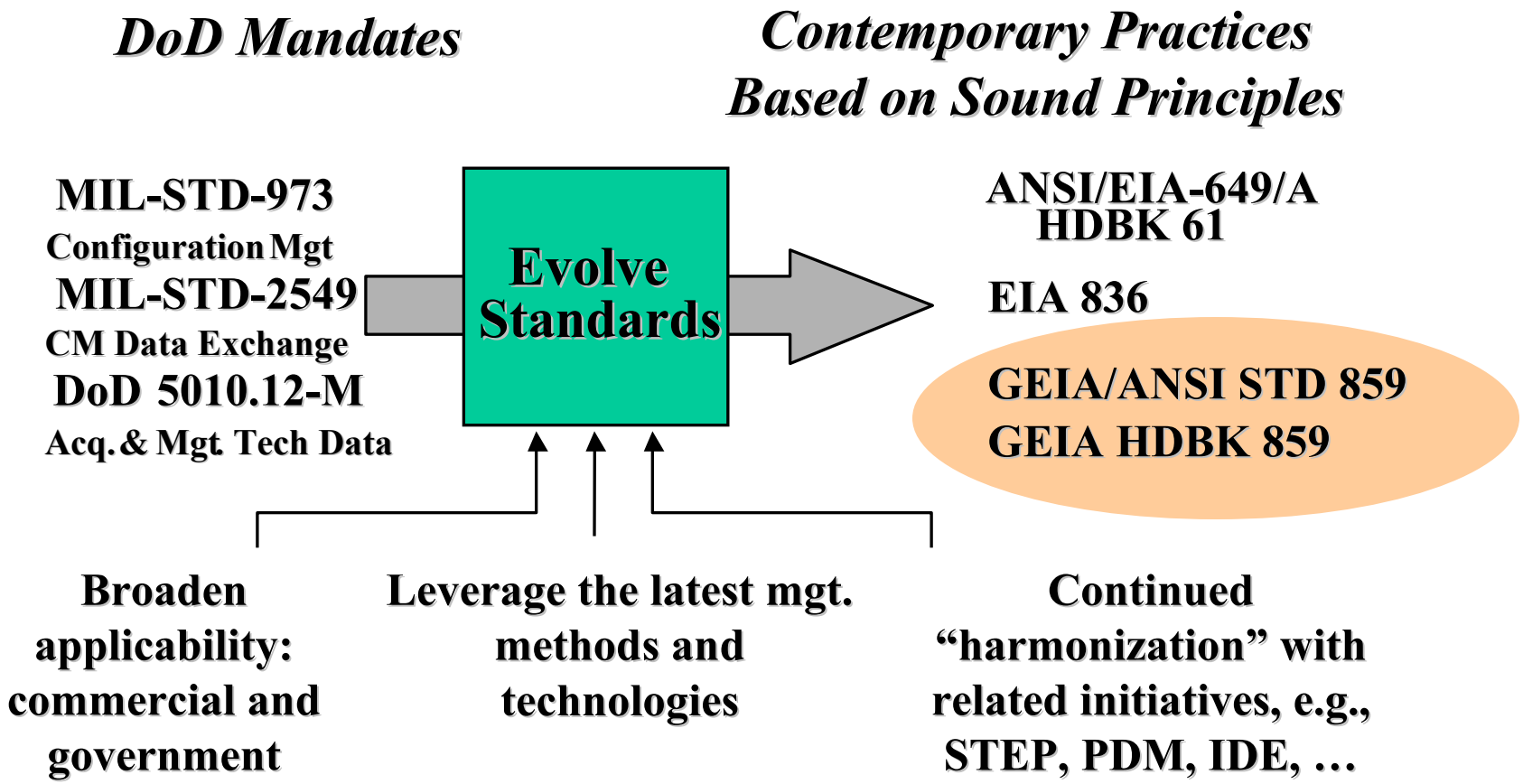
Acquisition Environment Changes



Impact on DM Environment

	From	To
Medium of Delivery	Paper	Electronic
Delivery is	I mail it, you open it	I post to the Web portal, you access
Data environment	•Slow •Bulky, paper storage •Fairly standard •Limited number of copies •Sometimes hard to find or obtain copy	•Rapid →instantaneous •Compact electronic storage •Non-standard •Essentially infinite number of copies •Still difficult to find
Future availability	Infinitely available and interoperable as long as copies not misplaced	Electronic formats subject to rapid technological obsolescence

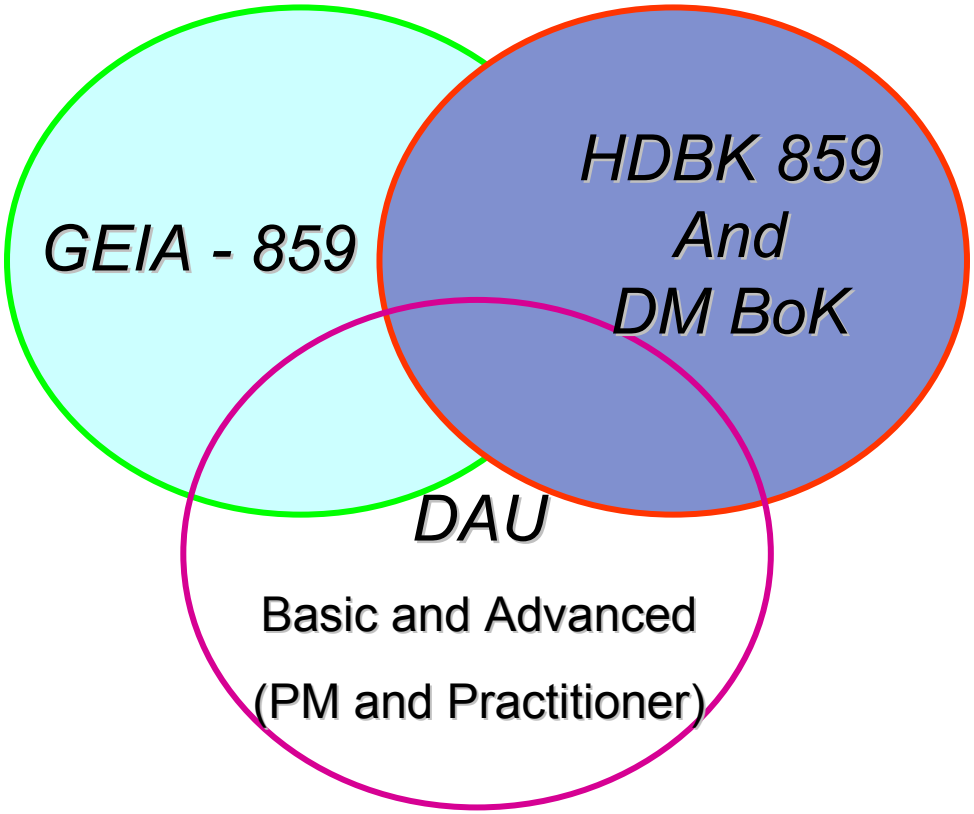
New Support to DM: Industry Standards



Components of New Data Management

Principles

- Basic tenets and values
- General



Practices

- Implementation specifics
- Some will always be organization-specific

Professionalizing the Workforce Through Training

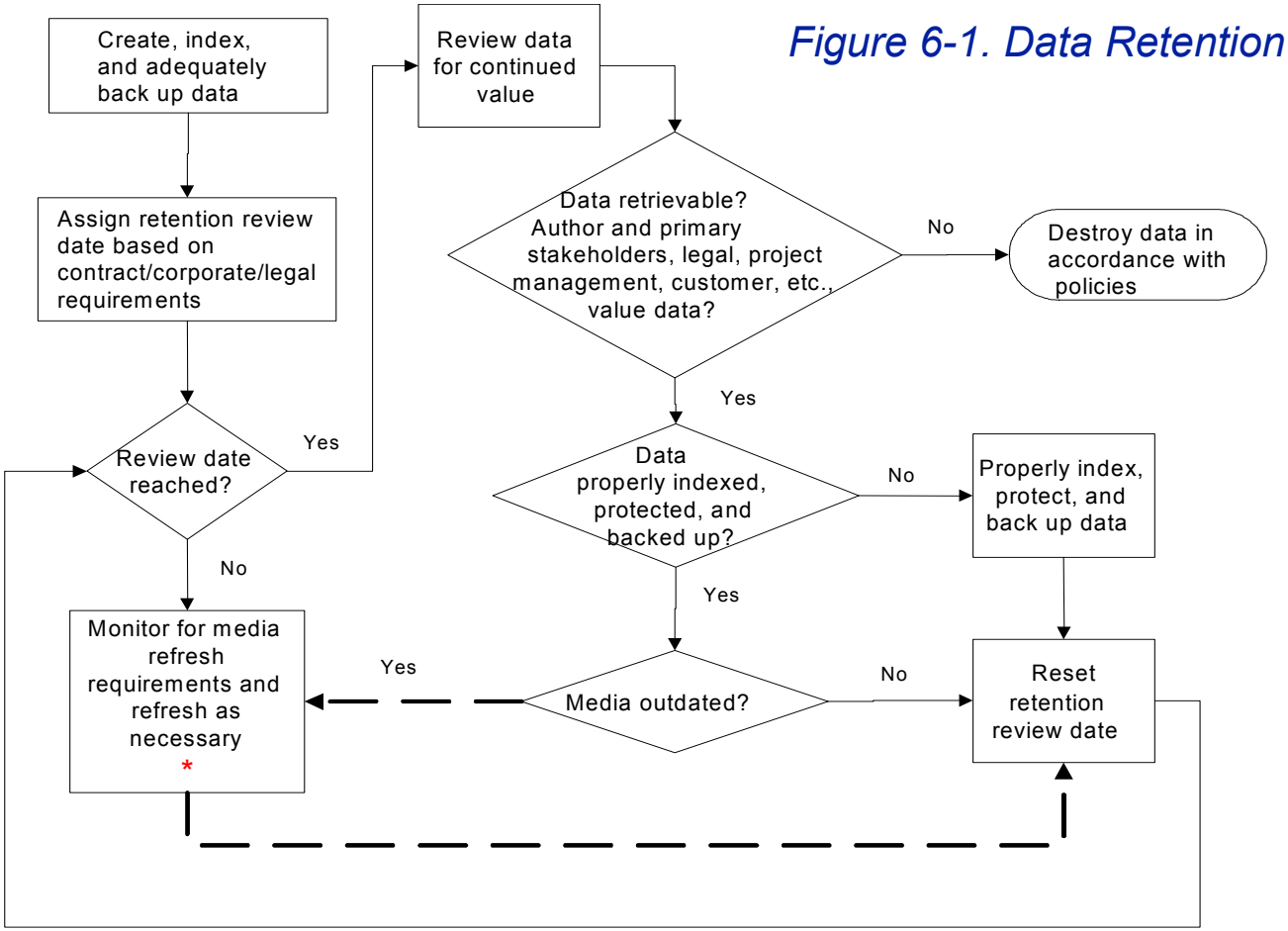
Purpose and Scope of HDBK 859

Provides the first level of ‘how’

- examples and samples
- approaches
- tools
- methods
- mini-case studies
- …to illustrate how to implement DM in accordance with the principles (compliant with the standard)

Example Content from HDBK 859

Figure 6-1. Data Retention Decision Tree



[a]Leads to notional data archive preservation process

More Recent Acquisition Changes:

- System of Systems (SoS) architectures:
  - Choice of platform
  - Choice of sensors
  - Choice of munitions
  - Choice of communications
  - . . .
- Net-Centricity
- Lifecycle Logistics

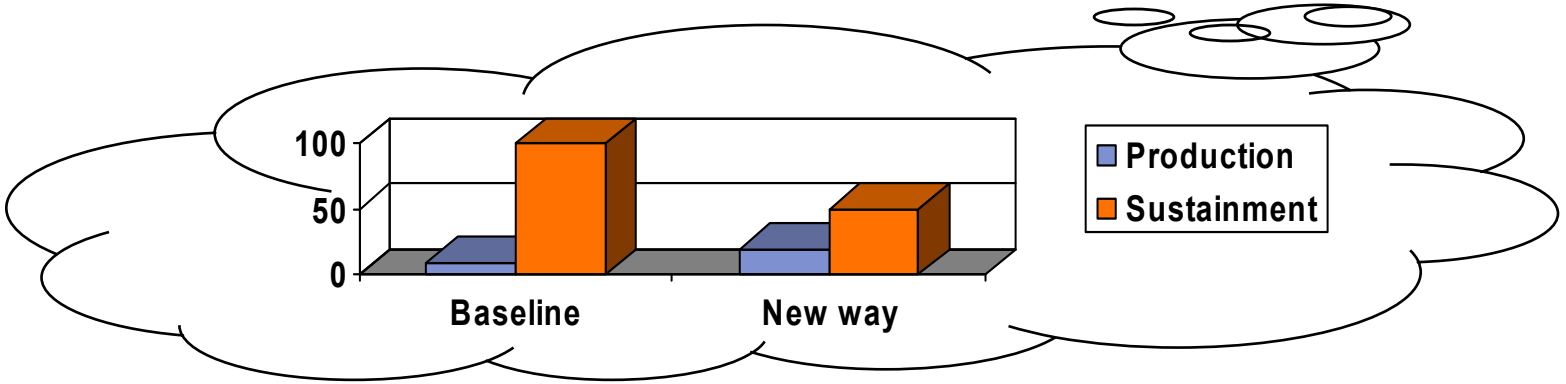
Effects of Recent Changes: Increased Use of Modeling and Simulation

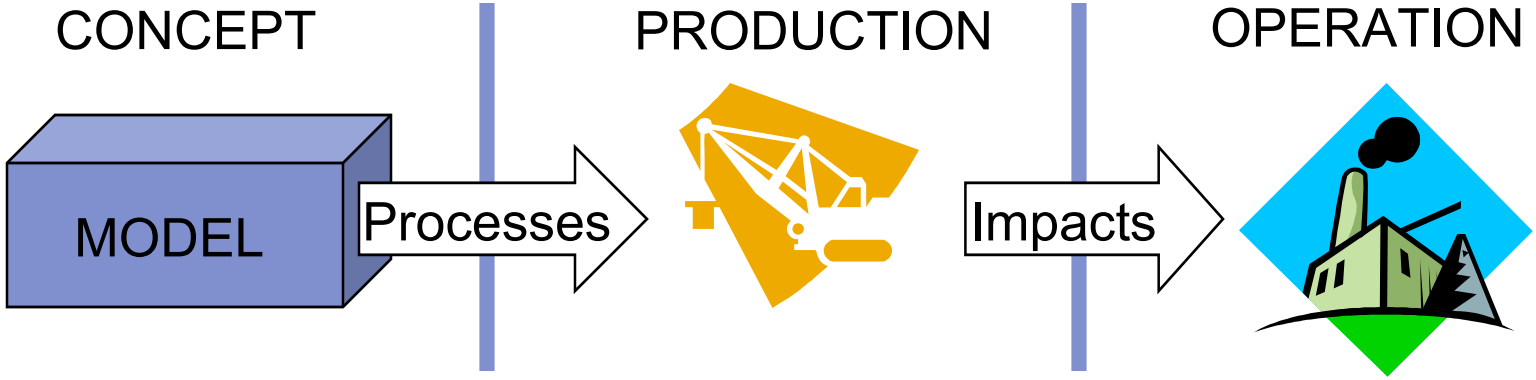
- To evaluate competing architectures before investing too much in to proofs of concept, etc.
- To evaluate full lifecycle costs of competing concepts
  - Much more modeling earlier in the lifecycle of the acquisition, and throughout the lifecycle

M&S Impacts on DM, and vice versa

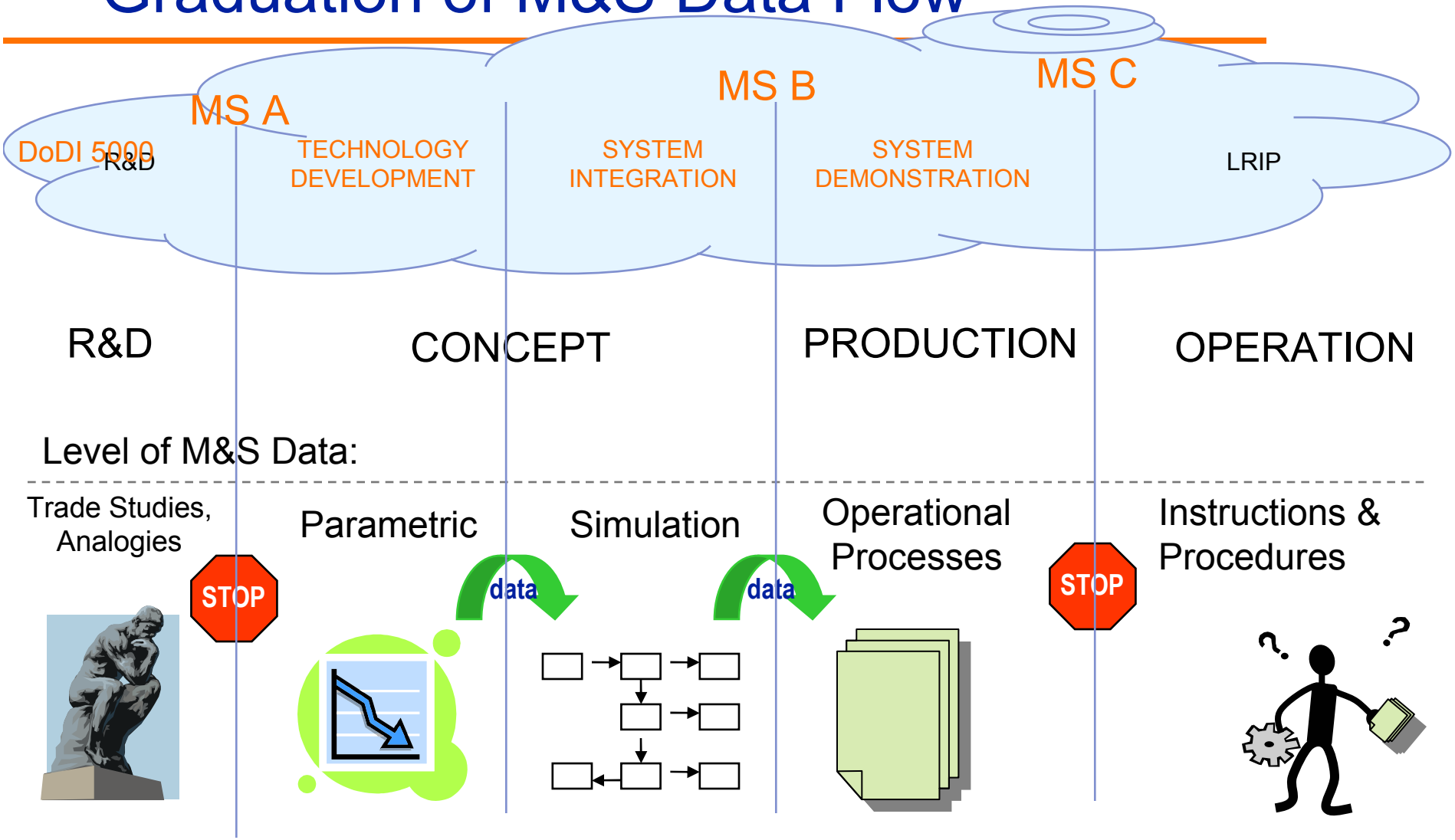
- Impact on Data Management
  - It multiplies the amount of M&S data significantly
  - Leads to M&S being applied at many more phases in the lifecycle
  - Also applied much earlier – before DM stood up in most cases
- How can Data Management help?
  - Manage M&S products
  - Manage M&S data
  - Manage ‘provenance’ of M&S results

Example: M&S Before Investing …





Graduation of M&S Data Flow

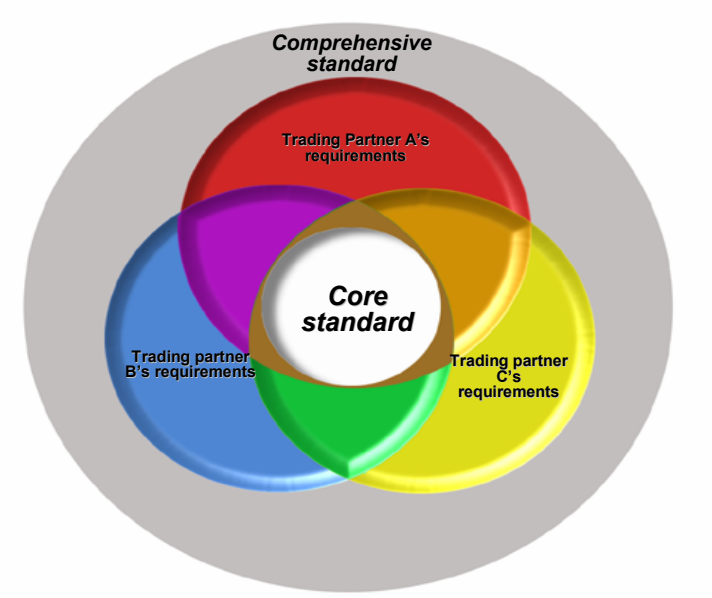


How DM Can Help

- Both DM and CM have evolved away from predictable, clerical functions to a broader perspective.
- DM especially is shifting to a corporate, strategic perspective to identify what types of data will be of importance, to various audiences, over the data's and system's entire lifecycle.
  - Can accommodate the need to capture data earlier in the 5000.2 process (from JCIDS on…?)

Purpose and Scope of Std 859

- Purpose
  - Provide a contemporary, principles-level, guide to requirements for acquisition and management of data across the product life-cycle
  - Enable sharing of data among trading partners
- Scope
  - Common principles
  - Related enablers
  - (Some) key practices



DM Principles of Standard 859

	Area	Principle
1	Focus and Scope	Define the organizationally relevant scope of data management
2	Customer Support	Plan for, acquire, and provide data responsive to customer requirements.
3	Business Context	Develop DM processes to fit the context and business environment in which they will be performed.
4	Identification	Identify data products and views so that their requirements and attributes can be controlled.
5	Change Management	Control data, repositories, data products, data views, and metadata using approved change control processes.
6	Data Rights	Establish and maintain an identification process for intellectual property, proprietary, and competition-sensitive data.
7	Data Retention	Retain data commensurate with value to the organization.
8	Process Improvement	Continuously improve data management.
9	DM/KM Connection	Effectively integrate data management with knowledge management.

Applying DM Principles in a M&S Scenario

1. Define the organizationally relevant scope of data management
   - Data managers now think about the strategic role of data management to the enterprise vs. a focus limited to contractual data, CDRLs and SDRLs.
2. Plan for, acquire, and provide data responsive to customer requirements.
   - A holistic, full lifecycle perspective is used by all data managers. The DM plan includes scheduled reviews of the plan itself to ensure it remains properly responsive to requirements.
3. Develop DM processes to fit the context and business environment in which they will be performed.
   - In a large, multi-tiered M&S environment, perhaps a federated data management approach is best during the most dynamic parts of the lifecycle, for example; in a smaller environment, a different DM architecture could be a better fit
4. Identify data products and views so that their requirements and attributes can be controlled.
   - Each version (in parameters, models, sets of models, scenarios…) uniquely identified so that each can be retrieved and combined correctly; each result can be reproduced

Applying DM Principles in a M&S Scenario

5. Control data, repositories, data products, data views, and metadata using approved change control processes.
   - The data manager will apply CM principles to DM items, tailored to the business context. Solutions will differ based on various factors; an example is the boundaries with CM functions in the participating organization(s).
6. Establish and maintain an identification process for intellectual property, proprietary, and competition-sensitive data.
   - In a multi-partner M&S environment, and/or one that includes proprietary commercial technology, this can both be complex and entail risk . A Bill of Information approach might be a good fit to manage this complexity.
7. Retain data commensurate with value to the organization.
   - Data must be retained for legal, contractual, and entrepreneurial value—but retention, migration, and disposal all have costs associated with them.
8. Continuously improve data management.
   - Well-designed DM processes include metrics to monitor the quality and efficiency of DM.
9. Effectively integrate data management with knowledge management.

Summary

- There's a new appreciation of M&S
  - Growth in number of M&S efforts and where applied
- It's not your father's DM
  - Big changes in perspective, tools, environment
  - Rate of change depends on
    - exposure to Standard, Handbook, BoK, CoP, Training
    - Staffing (both Library and Computer Science applicable)
- Doing both well is worth the investment