

## **In Search of the Perfect Bill of Materials**



***Improving New Product Introduction Metrics***



# Topics to be Covered

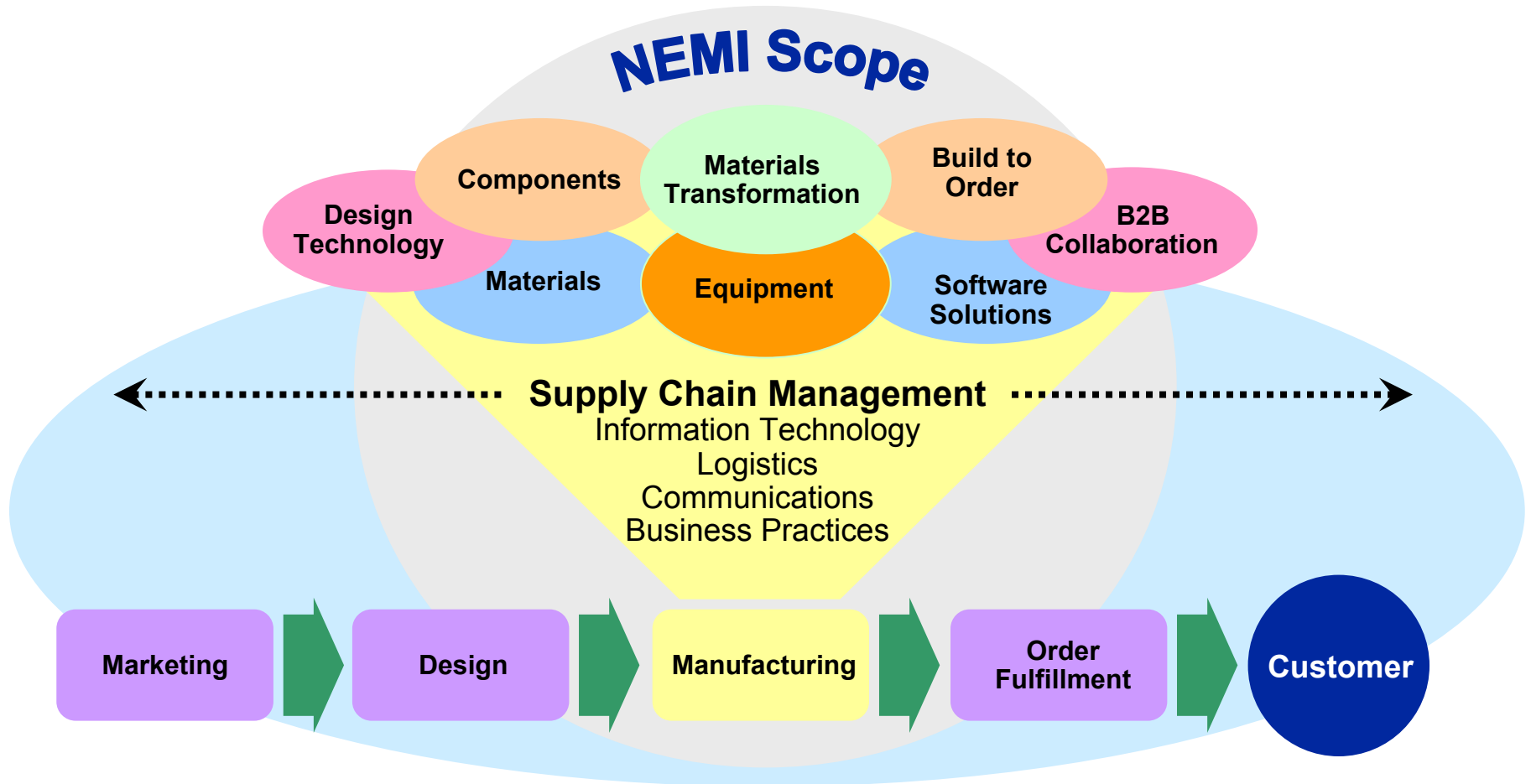
- **NEMI background**
- **Perfect BoM industry collaboration**
- **The issues**
- **The solutions**
- **Next steps**
- **Feedback/closure**

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# NEMI Mission

*Assure the Global Leadership of the North American Electronics Manufacturing Supply Chain*



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## What Does NEMI Do?

***Leverage the combined power of member companies to provide industry leadership***

- **NEMI roadmaps the needs of the North American electronics industry**
- **NEMI identifies gaps (both business & technical) in the North American infrastructure**
- **NEMI conducts industry forums on emerging topics**
- **NEMI stimulates R&D projects to fill gaps**
- **NEMI establishes implementation projects to eliminate gaps**
- **NEMI stimulates standards to speed the introduction of new technology & business practices**

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# Perfect BoM Industry Collaboration

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## History-How Did It Start?

- **Electronic manufacturing services (EMS) providers and OEMs meeting in June 2001 to discuss issues related to bill of materials (BoM)**
- **Discovered that BoM issues were similar and pervasive throughout the industry**
- **Discovered that errors on BoMs ranged from 40% to as high as 80%**
- **Agreed that there was significant value in addressing the problem and that there was a collaborative role for NEMI to play**



## The Team and Process

- **NEMI sponsored team consisting of OEMs (Nortel, Motorola, Delphi Delco) and EMS (Celestica, Solectron, Sanmina-SCI)**
- **Expert participants from AMR Research and NIST**
- **Team gathered statistical as well as anecdotal data to confirm magnitude of problem**
- **Team recommendation on steps needed to be taken in addressing the problem**



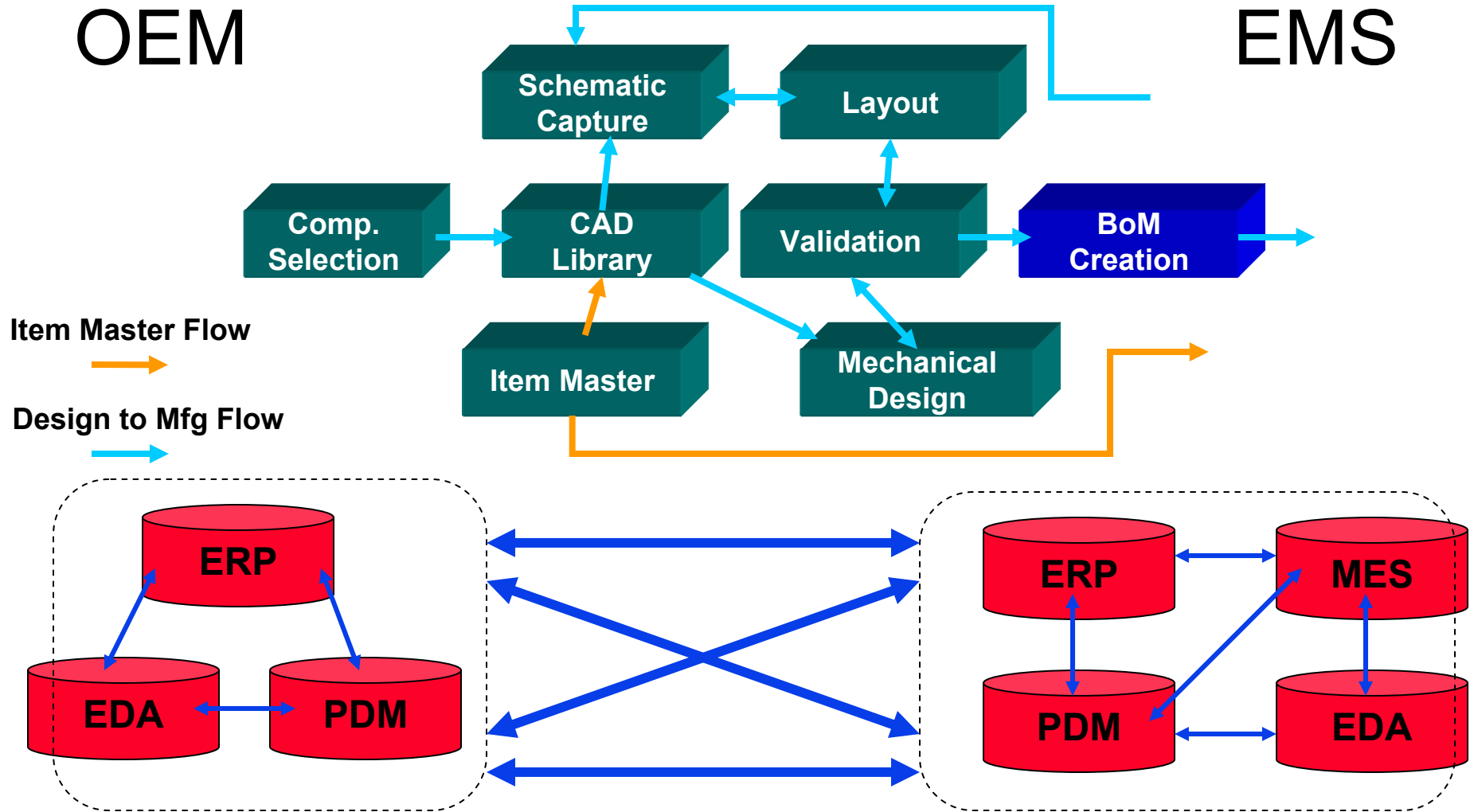
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## Issues

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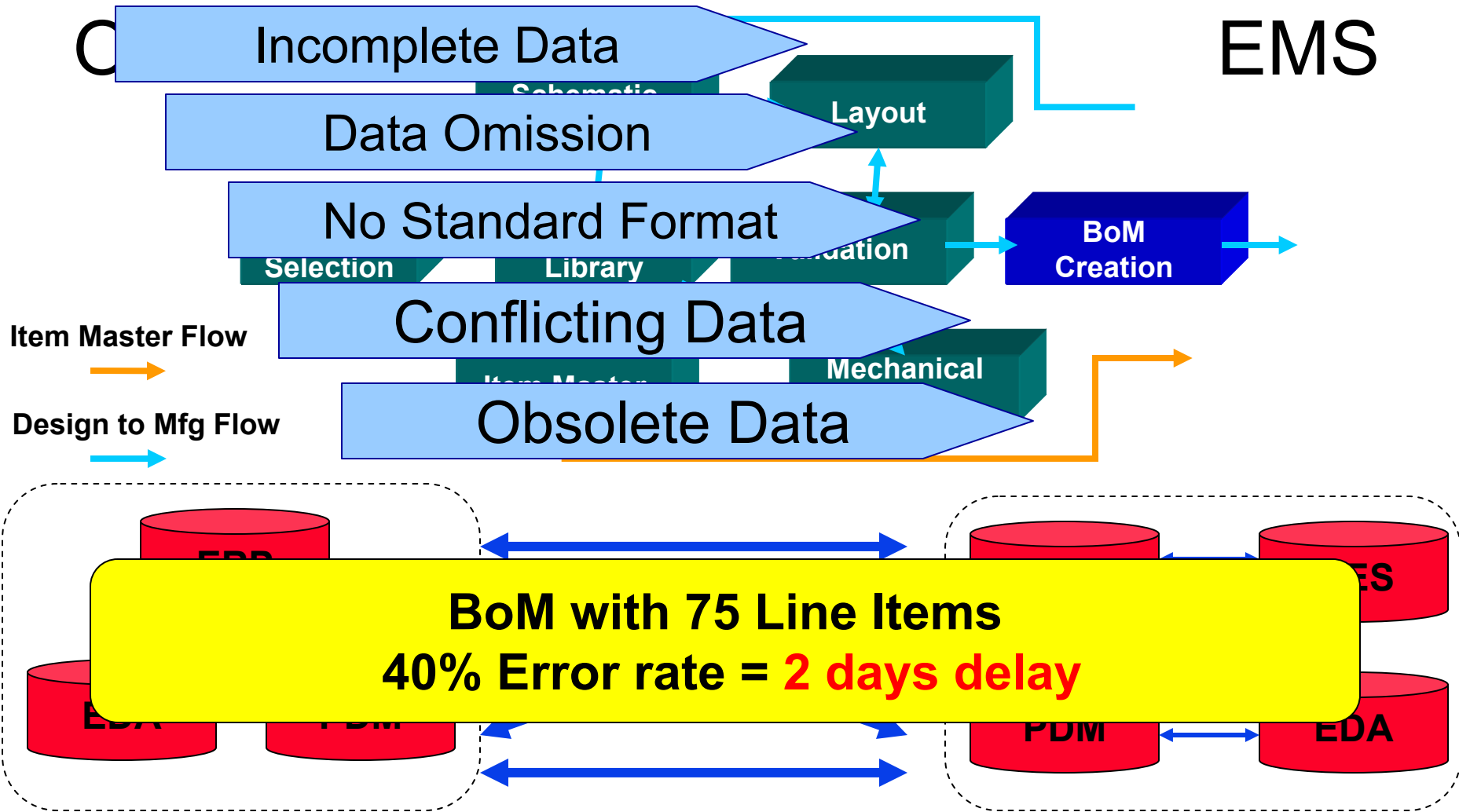
# Design to Manufacturing Data Flow



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# Data Issues Delay TTM and TTV



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## What Makes It Worse

- **Outsourcing is on the rise**
  - In 2000 EMS and SMS growth was 2 times industry growth
  - In 2001 slow down was slower than the industry
- **No “C-level” visibility (CEO, CFO, CTO)**
- **Too much fire fighting – issue resolution is all reactive**
- **Sophisticated designs are making BoMs more complex than before**
- **Wide variety of design, PDM and ERP tools in the mix**
- **Missing tools for validation of BoMs and MPNs**

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# Defect Observations

**BoM  
Released  
To EMS**

**Neutralize  
& Validate  
BoM**

**Inconsistent  
format**

**Hard copies**

**Inconsistent  
with CAD  
files**

**Foreign  
language**

**80%**

**Validate  
& Set Up  
Components**

**Inconsistent  
content**

**Invalid  
supplier info**

**Incomplete  
information**

**Missing  
information**

**Customer  
specific info**

**40%**

**Source  
Material**

**Allocations**

**Supplier  
withholds  
customer  
information**

**Obsolete  
parts**

**20%**

**Material  
Pipeline  
Established**

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# Defect Data Sample

	Neutralize & Validate BoM				Validate & Setup Components			
	( Yes / No )				( # / total )			
Customer	Inconsistent Format	Hard Copies	Inconsistent with CAD File	Foreign Language	Inconsistent Contents	Invalid Supplier Info	Incomplete Info	Missing Info
Customer A	NO	NO	NO	NO	0/6	N/A	0/6	0/6
Customer B	YES	NO	NO	NO	0/1	0/1	0/1	1/1
Customer C	YES	NO	NO	NO	0/40	N/A	10/40	10/40
Customer D	NO	NO	NO	NO	0/6	N/A	6/6	6/6
Customer E	NO	YES	NO	NO	0/1	N/A	0/1	0/1
Customer F	YES	NO	YES	NO	0/30	25/30	25/30	25/30
Customer G	YES	NO	YES	NO	20/200	N/A	100/200	10/200
Customer H	YES	NO	NO	NO	0/200	50/200	150/200	10/200
Customer I	YES	YES	NO	NO	2/5	5/5	1/5	1/5
Customer J	NO	NO	YES	NO	0/10	N/A	0/10	0/10
Customer K	YES	NO	NO	NO	25/80	N/A	60/80	60/80
Customer L	NO	NO	YES	NO	0/30	N/A	2/30	2/30
Customer M	NO	NO	NO	NO	N/A	N/A	N/A	N/A
Customer N	NO	NO	YES	NO	0/8	N/A	1/8	1/8
Customer O	NO	NO	NO	NO	0/8	0/8	2/8	2/8
Customer P	NO	NO	NO	NO	N/A	N/A	N/A	N/A

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# Solutions

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# Improve, Detect and Integrate

- **Improved design process**
  - Better availability of manufacturing/supplier data to designer
  - Early identification/correction of errors
- **Seamless and consistent BoM data exchange**
  - Standard interfaces between design & manufacturing systems
  - Performance metrics to track improvements
- **NEMI's activity:**
  - Perfect BoM format team
  - Perfect BoM team becomes an implementation team
  - Virtual Factory Information Interchange Project
  - Product Data eXchange (PDX) standards

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# Design Community Specifics

- **Integrity and consistency of data entry**
  - A complete and accurate MPN is critical. Be more diligent in entering the information.
  - A correct description needs to be provided as most EMSes use the description to populate key attributes in their PDM, ERP and MES.
  - A description that matches the MPN is key. The EMS often validates the MPN to the description.
  - Standardize on design tools and PN format across your company.
- **Ensuring consistency between databases**
  - Information flow to the EMS via several DBs; think about how you can ensure consistency with the design DBs.
  - The design info in the design DB should feed downstream DBs. Don't allow other members of your company to update ERP/PDM without going through the design DB.
  - Ensure same MPN list for the same PN (EMS often sees differences across design groups within same OEM)

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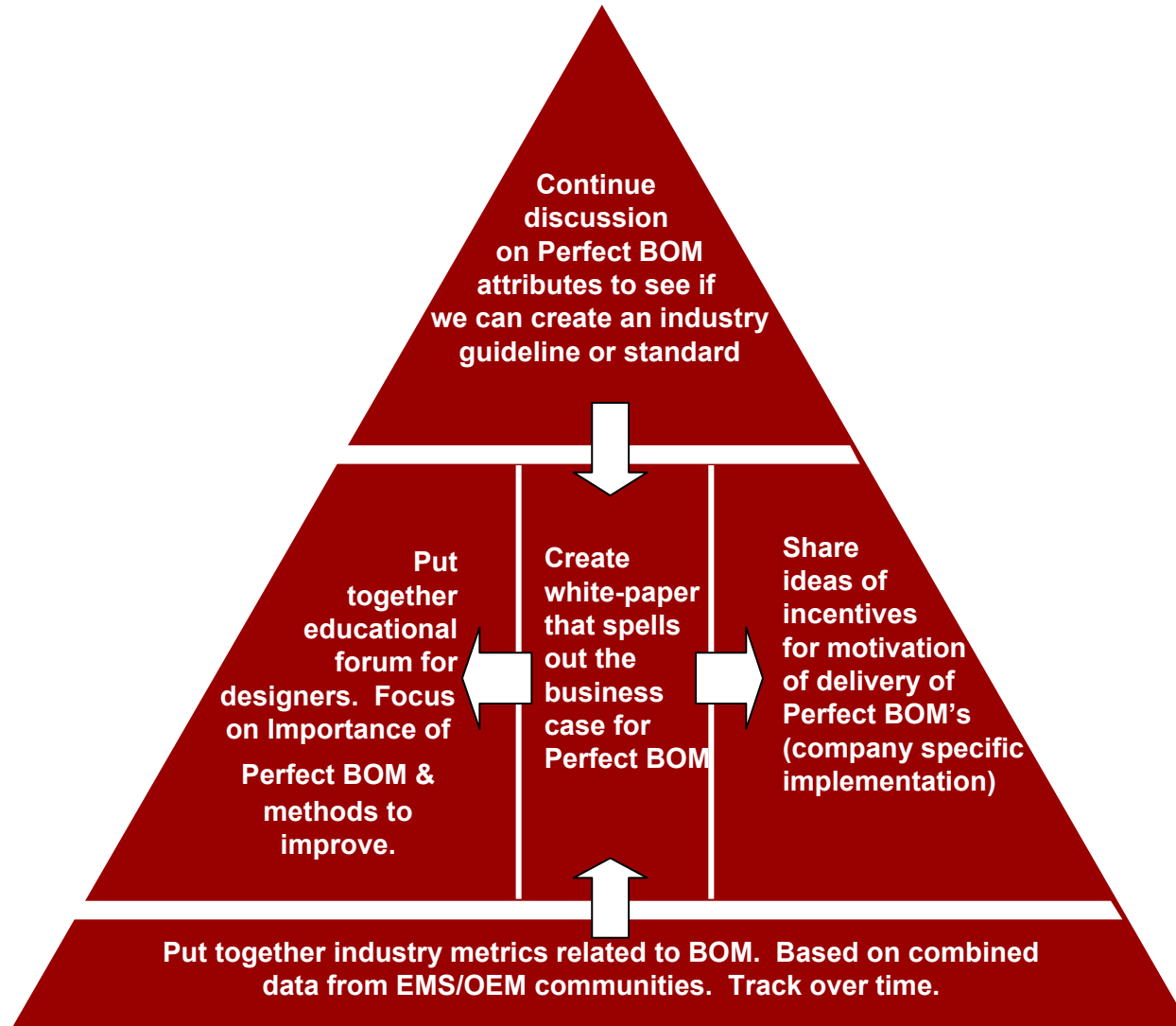
# Design Community Specifics II

- **Real time updates**
  - MPN changes need to be updated real time. The next transmission of data from the OEM's design DB to the EMS will overwrite existing EMS' data.
  - Late updates usually lead to high maintenance at the EMS' DBs.
- **Collaboration**
  - The EMS typically track incoming defect levels. Work with your EMS provider to understand issues, root causes and action plans to solve. Measure improvements.
  - Most designers will collaborate on improving the design and direct cost, but are “too busy” to collaborate on improving the data quality. The EMS would be very willing to collaborate with designers to improve the data quality.
  - Sometimes, it's just a misinterpretation of the data (classic example is MPN qualification status). Collaborate to ensure correct understanding by the EMS.

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# Perfect BoM Plan



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## Next Steps

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## Team Recommendations for NEMI

- **Dissemination - education**
- **Validation**
- **Standardize format - PDX is a viable solution**
- **PDM vendor integration**
- **Pilots**
- **Monitor implementation and publish results**

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## Feedback/Closure

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# Product Data eXchange (PDX) Standards

- **IPC-2571**      **Generic Requirements for Supply Chain Communication (published)**
- **IPC-2576**      **Requirements for Supply Chain Communication of As-Built Product Data (published)**
- **IPC-2577**      **Requirements for Supply Chain Communication of Quality Data (working draft)**
- **IPC-2578**      **Requirements for Product Design Configuration (published)**

*Specifications for all of the PDX standards  
are available at [webstds.ipc.org](http://webstds.ipc.org)*

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# Glossary of Terms

- **CAD - computer-aided design**
- **DB - database**
- **ERP - enterprise resource planning**
- **EDA - electronic design automation**
- **PDM - product data management**
- **MES - manufacturing execution system**
- **MPN - manufacturer's part number**

*continued*

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## Glossary of Terms, *cont'd*

- **PDX** - product data exchange
- **PN** - product number
- **SMS** - semiconductor manufacturing services
- **TTM** - time to market
- **TTV** - time to volume



## Contacts

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