IEEE SW Test Workshop

Semiconductor Wafer Test Workshop

Boyd Daniels Texas Instruments
Stu Crippen Intel
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ISMI Wafer Probe Council

Team Activities & Industry Perspectives

June 8-11, 2008

San Diego, CA USA

Overview

- Probe Council Introduction
- Benchmarking
- Supplier Assessments
- Technical Activities
- Summary

What is ISMI?

- *What we do*: Drive **productivity solutions for current and future challenges** in our members' factories, enabling best in class productivity levels.
- *How we do it*: Providing platforms for **collaboration** among our members and directing **development** activities in key areas

- **ISMI = Value to Members**
  - Productivity
  - Cost reduction
- **ISMI is "Member driven"**
  - Agenda and priorities set by members
- ***Collaboration* is key to our mutual success**

ISMI Membership

16 Global Semiconductor Companies

Accelerating Manufacturing Productivity

ISMI Councils Portfolio

SEMICONDUCTOR MANUFACTURING

Wafer Processing Assembly & Packaging

Operations Councils

- Manufacturing Methods Council
- Facilities Council
- Wafer Probe Council
- Yield Council
- Test Council

Business Councils

- Critical Materials Council
- Reliability Council
- Supplier Relations Action Council
- Statistics Council
- Failure Analysis (FA) Council
- Quality Council
- Semiconductor Logistics Forum

INTERNATIONAL SEMATECH ISMI MANUFACTURING INITIATIVE

ISMI Probe Council

Charter: ***Improve Member Company value in Wafer Probing methods and technology***

Three Council face-to-face meetings per year

- US Member Company (MC) site
- Asia or European MC location
- At Semiconductor Wafer Test Workshop (San Diego in June)

Benefits of Participation

- Highly-rated annual Probe Metrics Survey
- Fast information gathering through *mini-surveys*
- Forum for technical interaction on topics of common interest
- Best Practice Sharing
- Networking opportunities

Membership – Probe Council

	Probe Council Representative
AMD	J Kober
HP	S Rubart
IBM	S Duda / P Diesing
Infineon	O Nagler / S Hoenack / M Horn
Intel	W Crippen / S Brooks
Micron	J McBride / B Crump
National Semiconductor	KL Ang
Panasonic	K Hirae
Qimonda	F Pietzschmann
Spansion	A Romriell
Texas Instruments	B Daniels (Chair)
TSMC	J Chiu

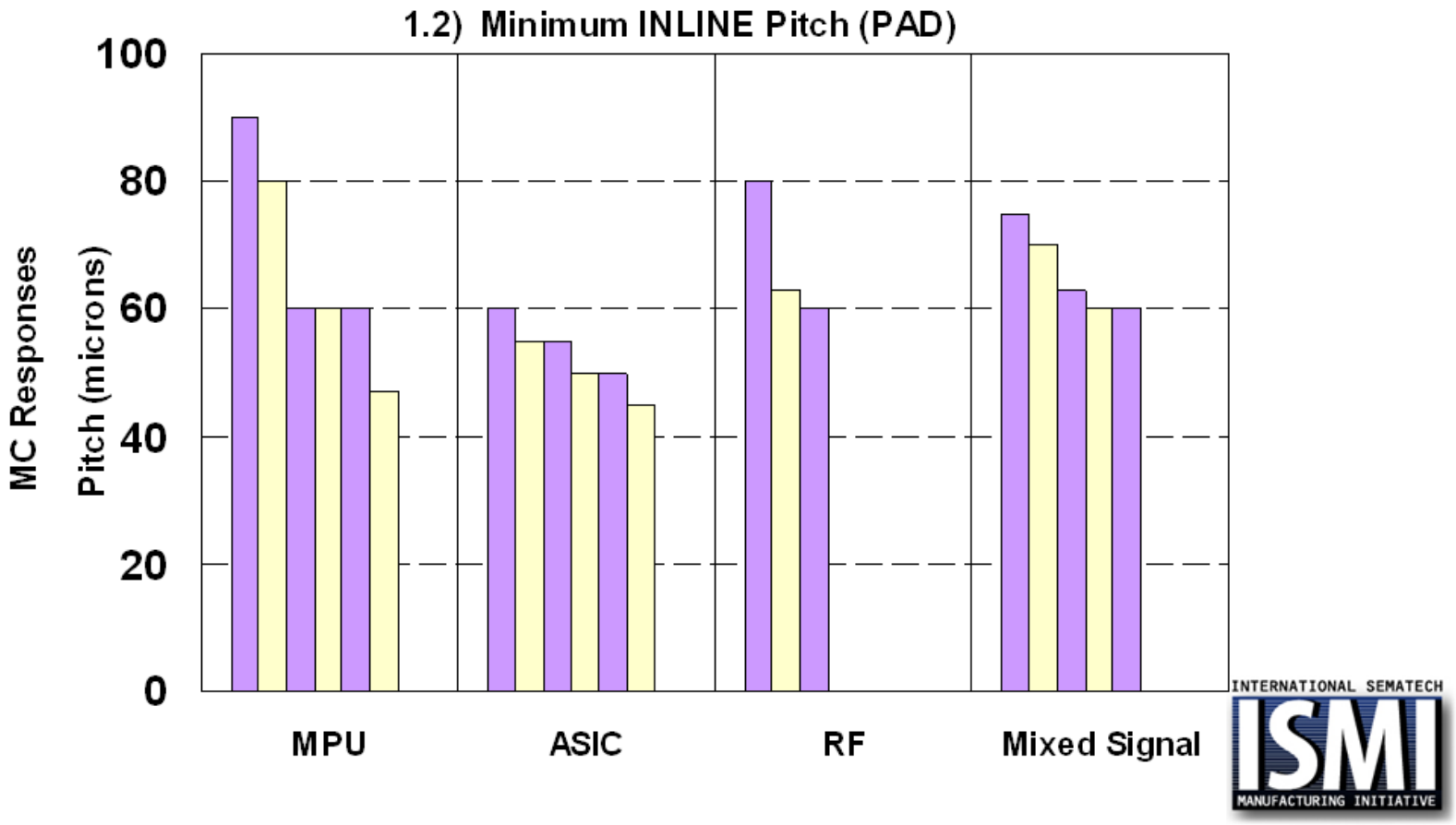
Metric Benchmark Surveys

Probe Metrics Survey

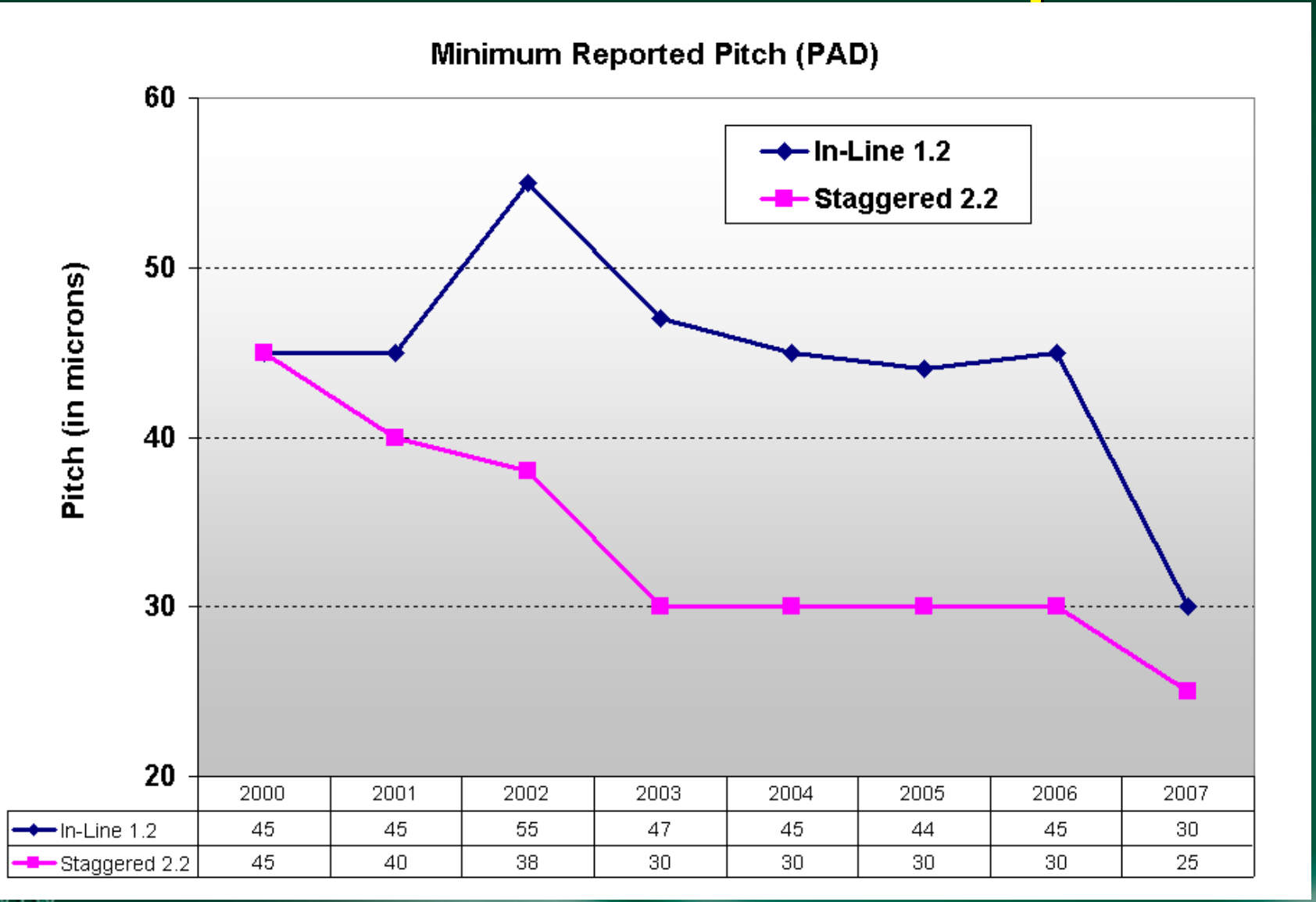
- Completed every year since 2000
- Data-Intensive Survey
  - 37 different metrics tracked
    - Engineering/Technical
    - Operational
    - Quality
- Inputs grouped and output summarized by
  - Bump vs Pad Technologies
  - Product Family (CPU, Logic, ASIC, RF, Memory)
- Provides framework for ITRS projections
- Generates “Best-in-Class” Sharing in Council Meetings

Annual Probe Metrics Survey Results

Excellent reference of how companies' capabilities compare

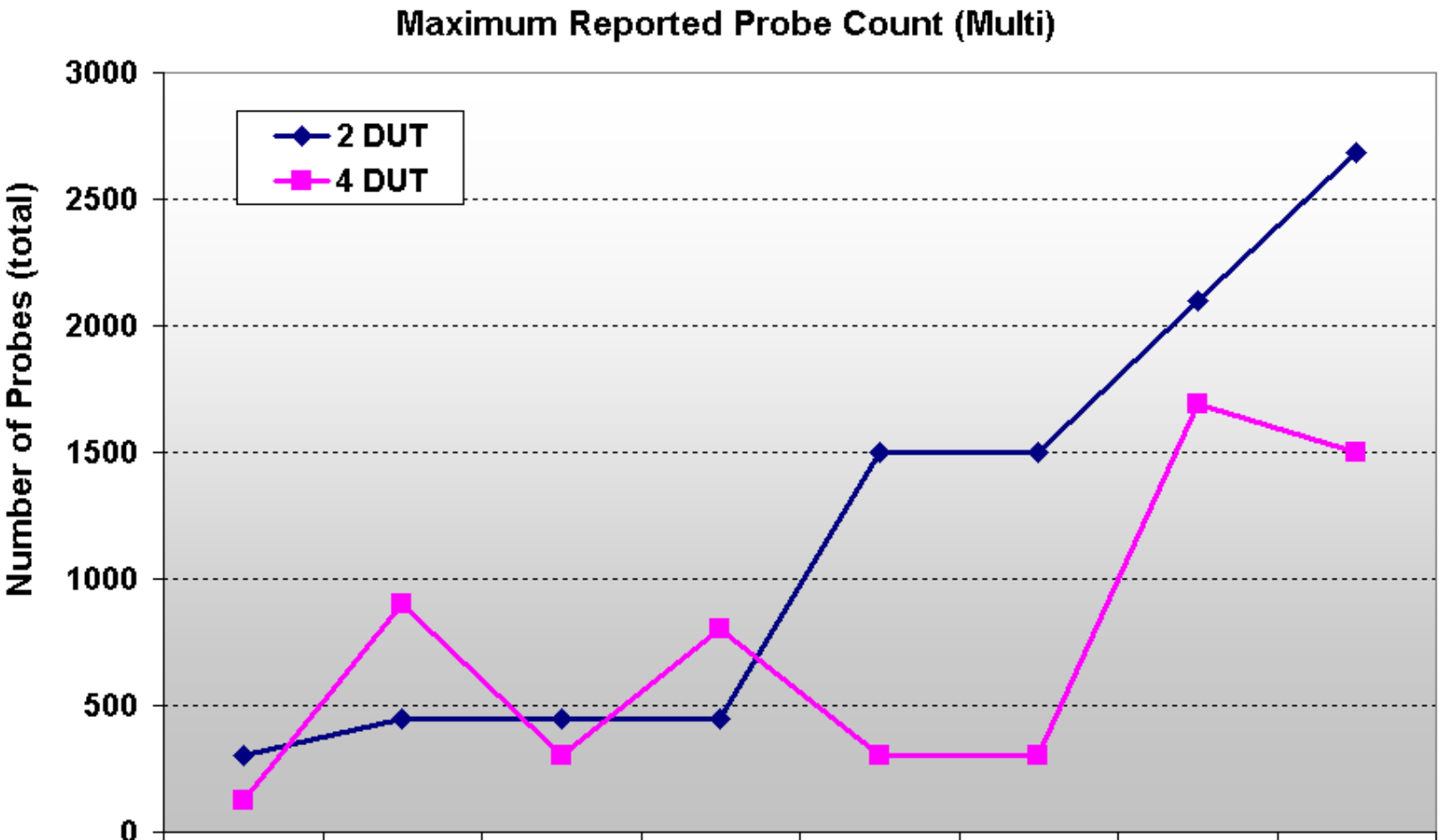


Trends Based on Members Capabilities



	2000	2001	2002	2003	2004	2005	2006	2007
In-Line 1.2	45	45	55	47	45	44	45	30
Staggered 2.2	45	40	38	30	30	30	30	25

Trends Based on Members Capabilities



	2000	2001	2002	2003	2004	2005	2006	2007
2 DUT	300	445	450	450	1500	1500	2100	2687
4 DUT	125	900	300	800	300	300	1690	1500

Supplier Assessment Surveys

- **Probe Card Supplier Assessment**
  - Done annually since 2004
  - In 2008
    - Collected input from 11 Member Companies
    - Ten Suppliers will receive results (minimum 3 responses)
    - Engaged with Probe Council for 1:1 Feedback
  - Performance Areas: **Quality, Support, R&D, Value**
- **Benefits**
  - Provides framework for internal council discussions
  - Specific feedback to suppliers from key customers
    - NOT a competitive ranking exercise
    - Provides insight to suppliers on what they do well
    - Highlights areas for improvement
    - Tracks performance year-to-year

Probe Card Supplier Assessment

Snapshot of Output

2007 Results – Major Performance Categories

	A	B	C	D	E	F	G	H	I	J	AVE	MIN	MAX
1.0 Quality													
1.1 Meets Specs	6.80	6.50	7.20	6.70	6.42	7.63	7.00	7.70	7.67	8.08	7.17	6.42	8.08
1.2 Works first try	5.92	6.50	7.32	7.37	6.54	7.63	6.50	7.30	7.67	7.50	7.02	5.92	7.67
1.3 No recurring problems	5.76	6.00	7.20	6.70	5.84	7.50	5.00	7.30	7.67	6.67	6.56	5.00	7.67
1.4 Robust in production	5.24	6.50	6.44	7.20	6.14	7.88	5.75	8.05	7.33	7.25	6.78	5.24	8.05
1.5 Change control	6.20	6.17	7.00	7.80	6.67	7.63	6.50	6.70	7.67	7.42	6.97	6.17	7.80
1.6 Quality system in place	6.16	6.17	6.80	7.47	6.16	7.13	6.25	7.05	7.67	6.92	6.78	6.16	7.67
2.0 Support & Services													
2.1 Global manufacturing	3.64	6.80	5.05	6.37	7.20	5.75	6.33	5.85	7.33	3.92	5.82	3.64	7.33
2.2 Lead time new cards	4.40	6.67	5.98	7.00	6.79	7.50	6.25	5.40	7.67	6.25	6.39	4.40	7.67
2.3 Response at bringup	6.84	6.00	6.50	7.20	6.40	8.00	6.00	6.75	7.67	6.50	6.79	6.00	8.00
2.4 Leadtime repeat builds	5.12	6.33	6.68	6.83	6.98	8.00	6.50	6.25	7.67	6.25	6.66	5.12	8.00
2.5 Line support & warranty	6.16	6.17	5.90	6.73	7.00	7.63	5.75	6.90	8.00	7.00	6.72	5.75	8.00
2.6 Global repair	3.88	6.67	4.80	5.80	6.88	6.38	5.75	7.15	7.67	4.67	5.96	3.88	7.67
2.7 Fast repair	4.64	5.67	5.78	7.13	6.43	6.63	6.25	5.45	8.00	7.08	6.31	4.64	8.00
2.8 Repairable designs	3.08	5.83	7.04	7.47	6.85	7.50	6.25	5.10	7.67	4.33	6.11	3.08	7.67
3.0 R & D													
3.1 Roadmap	5.80	5.17	6.60	5.73	5.85	6.63	5.50	5.90	7.33	6.58	6.11	5.17	7.33
3.2 Meets R&D commitments	6.60	5.33	6.85	4.92	5.60	6.50	5.33	5.73	7.67	6.78	6.13	4.92	7.67
3.3 Meets customer roadmap	5.65	5.50	6.90	6.08	5.90	5.88	5.67	6.47	7.33	6.89	6.23	5.50	7.33
3.4 Aligned w/ ITRS rdmp	5.87	5.17	5.80	5.25	6.00	6.75	5.67	6.88	7.67	6.83	6.19	5.17	7.67
3.5 Strong engineering team	7.70	6.00	6.92	6.33	6.31	6.88	5.00	7.90	8.33	6.83	6.82	5.00	8.33
4.0 PRICE / COST													
4.1 Competitive prices	3.84	6.17	5.88	6.20	6.44	7.75	7.25	4.30	7.00	5.83	6.07	3.84	7.75
4.2 Prices continually improve	3.32	5.67	5.52	6.08	6.17	6.75	6.75	4.20	7.00	5.50	5.70	3.32	7.00
4.3 Active cost reduction	3.68	5.67	5.28	4.47	5.60	6.00	5.50	4.00	7.67	5.00	5.29	3.68	7.67
4.4 Shares cost details	3.52	4.00	4.52	5.07	6.04	4.88	6.50	3.40	7.00	5.33	5.03	3.40	7.00
4.5 Global and vol pricing	4.96	6.20	6.30	6.08	6.04	5.63	6.00	5.35	7.33	5.83	5.97	4.96	7.33

Supplier Assessment Surveys

New Supplier Engagement Activities

- **Prober Supplier Assessment**
  - Done for the first time in 2007
  - All Major Suppliers will receive feedback
- **2009 Plan**
  - Metrology Supplier Assessment
  - Survey tool under development

Council Technical Activities

- **Successful past efforts include**
  - RFID User Guideline
  - Current Carrying Capability Measurement
  - Probe Card Cost of Ownership Model
    - In Public Domain since 2007
- **Future Activities**
  - Greater focus on Industry Guidelines, Methodologies, and White Papers
  - Consensus-based technology evaluations
  - Greater Council participation by ISMI Japanese members

Probe Council Technical Direction

Future Activities

INDUSTRY INFLUENCE	SUPPLIER IMPROVEMENT	TECHNICAL INNOVATIONS
Probe Mechanical Lifetime Assessment Standard	Standard Test Vehicle for Probe Card Evaluation/Qualification	Performance Capability Test Vehicle for Probe Cards
Impact of Pad/Bump metallurgy on probing quality	Supplier Assessment Methodology Guideline	Influence of tip geometry on probe quality attributes
Fine-Pitch Vertical Probe Technology Capability Assessment	Standard User Requirements Guideline	
Full-Contact Wafer Probing Capability Assessment		

ISMI Wafer Probe Council

Thank You!

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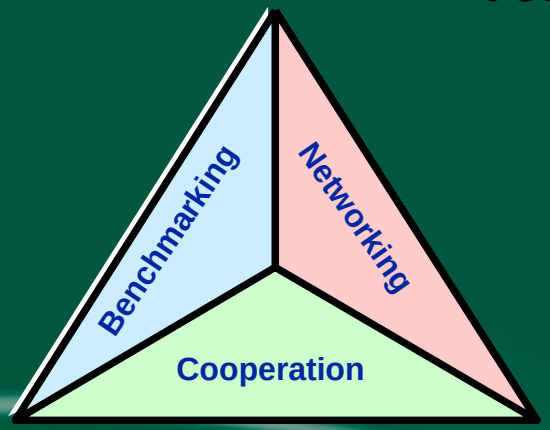

ISMI Councils

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