Predictors of Adoption of Measurement Tools
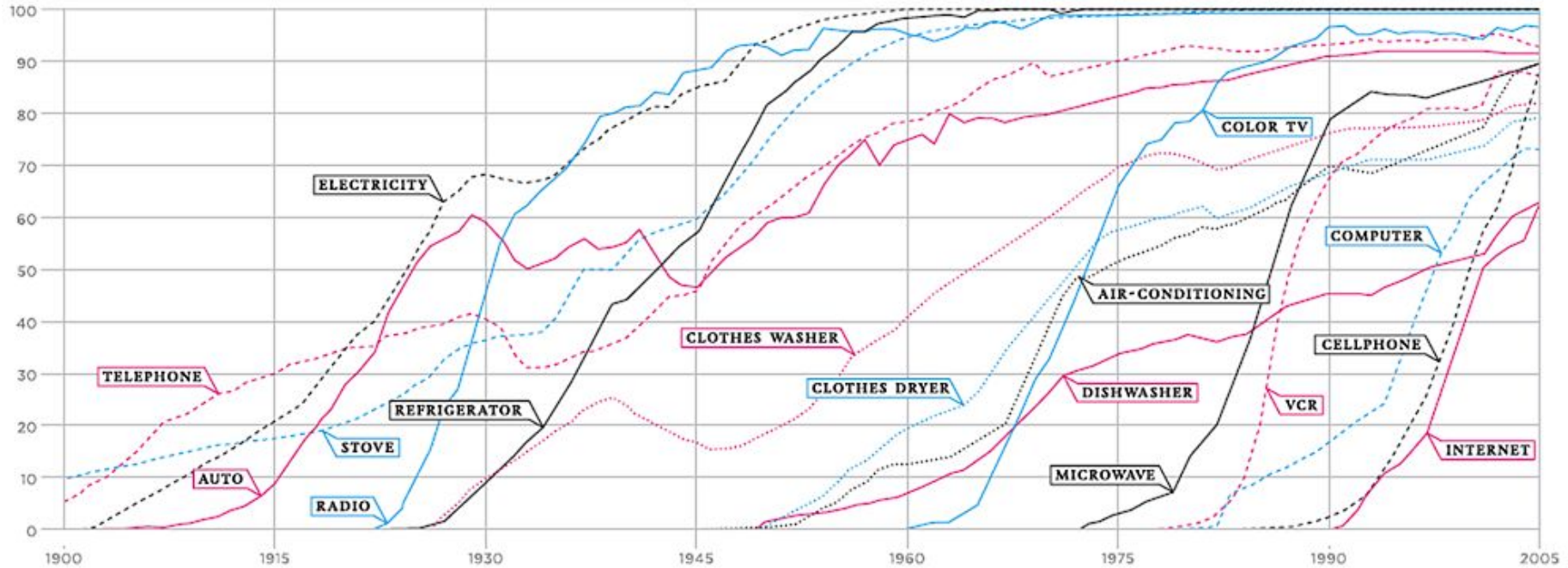
Dr. Ricardo Valerdi
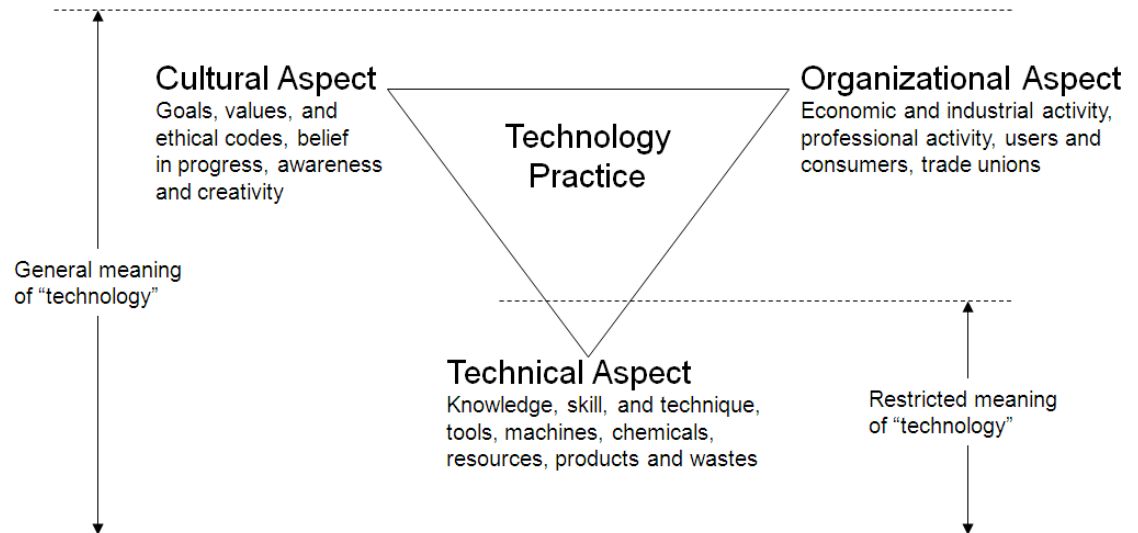**Massachusetts Institute of Technology**
January 21, 2009

Cox, W. M., Alm R., "You Are What You Spend," NY Times, Feb 10, 2008.

MoProSoft Example

- **CMMI fared well in the U.S., but what about Mexico?**
- **92% of Mexican software companies are small/medium-sized (< 100 people) and average process capability level is 0.9 (Oktaba 2006)**
- **Only 3 Mexican companies have achieved level 2; 33 are level 1**
- **Modelo de Procesos para la Industria de Software (MoProSoft)**

	Adequate for low-maturity SMEs	Inexpensive to adopt	Permissible as a national standard	Specific for SW dev. and maint.	Based on int. recognized practices
ISO9000:2000	Yes	Yes	Yes	No	No
CMM/CMMI	Yes	No	No	Yes	Yes
ISO/IEC 12207	?	?	Yes	Yes	Yes
ISO/IEC 15504	?	?	Yes	Yes	No

Oktaba, H., "MoProSoft: A Process Model for Small Enterprises," Proceedings of the 1st International Research Workshop for Process Improvement in Small Settings, CMU/SEI-2006-SR-001, Software Engineering Institute, Carnegie Mellon University, 2006.

Culture of Technology
supply side/developer-based

- **Product architecture often mirrors organizational architecture**
- **Technology is <u>not</u> culturally, morally, and politically <u>value neutral</u> (Pacey 1983)**
  - **Snowmobile must fit into a pattern of activity which belongs to a particular lifestyle and set of values**

Cultural Aspect
Goals, values, and ethical codes, belief in progress, awareness and creativity

Organizational Aspect
Economic and industrial activity, professional activity, users and consumers, trade unions

Technology Practice

General meaning of "technology"

Technical Aspect
Knowledge, skill, and technique, tools, machines, chemicals, resources, products and wastes

Restricted meaning of "technology"

Pacey, A., *The Culture of Technology*, MIT Press, 1983.

- **American Appliance Company (1922)**
- **Submarine Signal Corporation (1946)**
- **Raytheon Manufacturing Company (1959)**
- **Beech Aircraft (1980)**
- **Hughes/General Dynamics Missiles (1992)**
- **E-Systems (1995)**
- **Texas Instruments Defense Systems & Electronics (1997)**

- **Organizational culture is influenced by**
  - **Legacy processes**
  - **Customer demands**
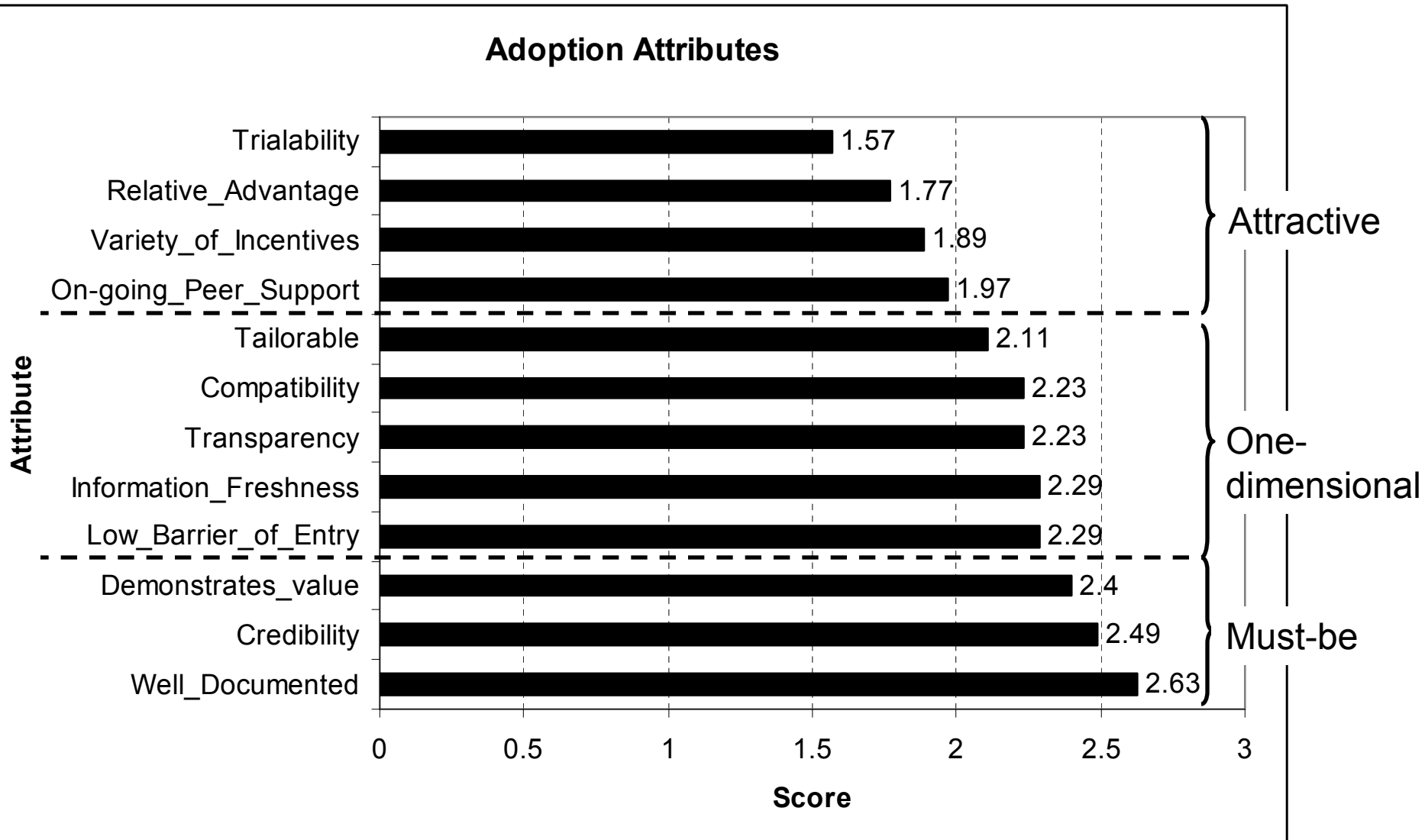 - **Product/systems delivered**
  - **Geographic location**
  - **Etc.**

http://www.raytheon.com/ourcompany/stellent/groups/public/documents/image/cms04_024719.swf
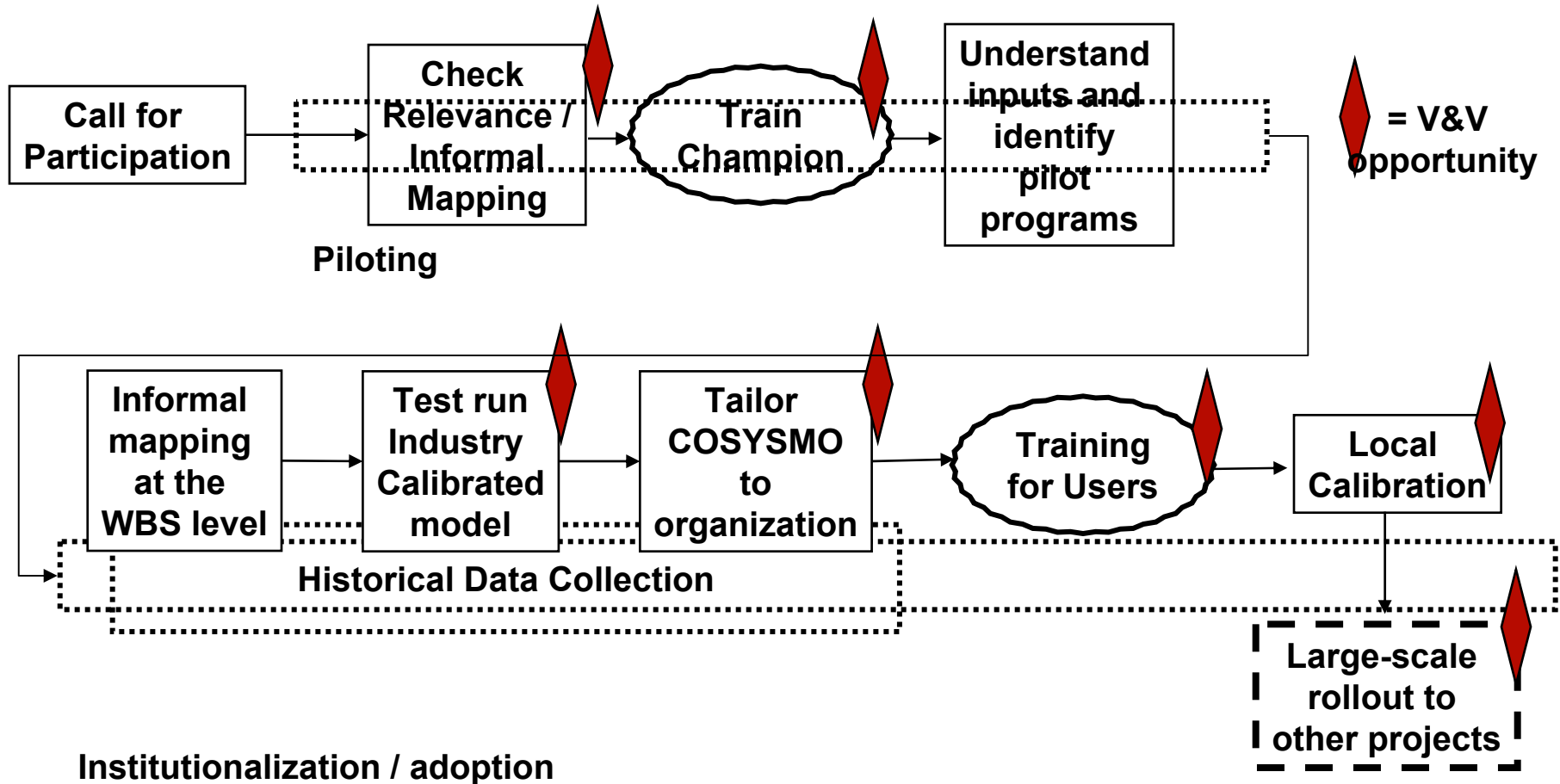
What Makes measurement systems Adoptable? (survey Qs)

- **Well documented**
- **Trialability**
- **Low barrier of entry**
- **Transparency**
- **Demonstrates value**
- **Variety of incentives**

- **Tailorable**
- **Information freshness**
- **Relative advantage**
- **Compatibility**
- **On-going peer support**
- **Credibility**

- **Agility**
- **Flexibility**
- **Failure modes**
- **Enabled by IT**
- **Data validity/integrity**

Ranking of Adoption Attributes (n=35)

Adoption Attributes

Attractive

One-dimensional

Must-be

Attribute	Score
Trialability	1.57
Relative_Advantage	1.77
Variety_of_Incentives	1.89
On-going_Peer_Support	1.97
Tailorable	2.11
Compatibility	2.23
Transparency	2.23
Information_Freshness	2.29
Low_Barrier_of_Entry	2.29
Demonstrates_value	2.4
Credibility	2.49
Well_Documented	2.63

COSYSMO Adoption Process

Piloting

Call for Participation	→ Check Relevance / Informal Mapping → Train Champion → Understand inputs and identify pilot programs

◆ = V&V opportunity

Institutionalization / adoption

Informal mapping at the WBS level → Test run Industry Calibrated model → Tailor COSYSMO to organization → Training for Users → Local Calibration

Historical Data Collection

Large-scale rollout to other projects

Valerdi, R., Miller, C., "From Research to Reality: Making COSYSMO a trusted estimation tool in your organization," *17th INCOSE Symposium*, June 2007, San Diego, CA.
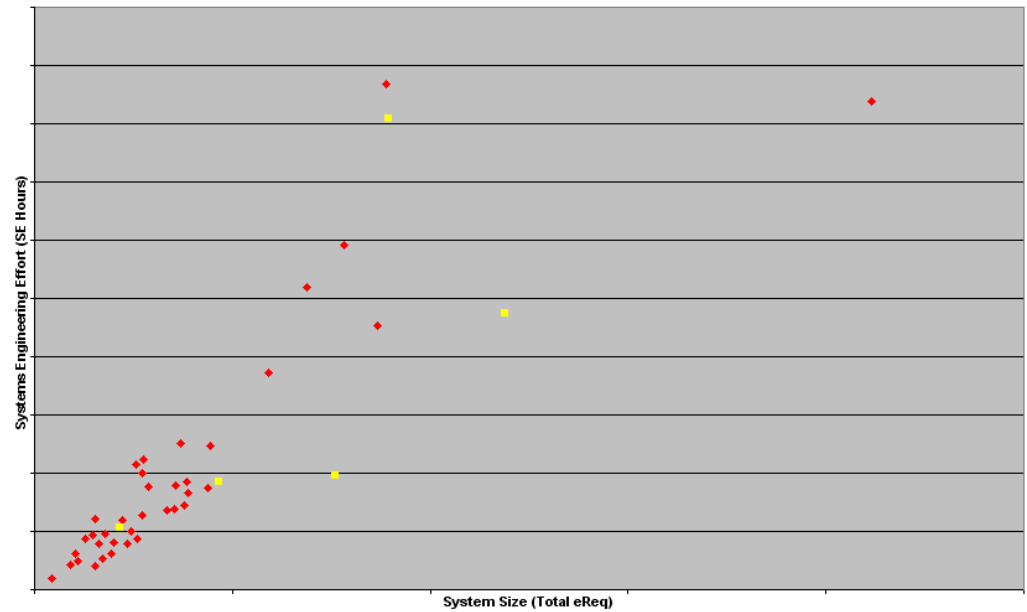
BAE Systems Reuse Model
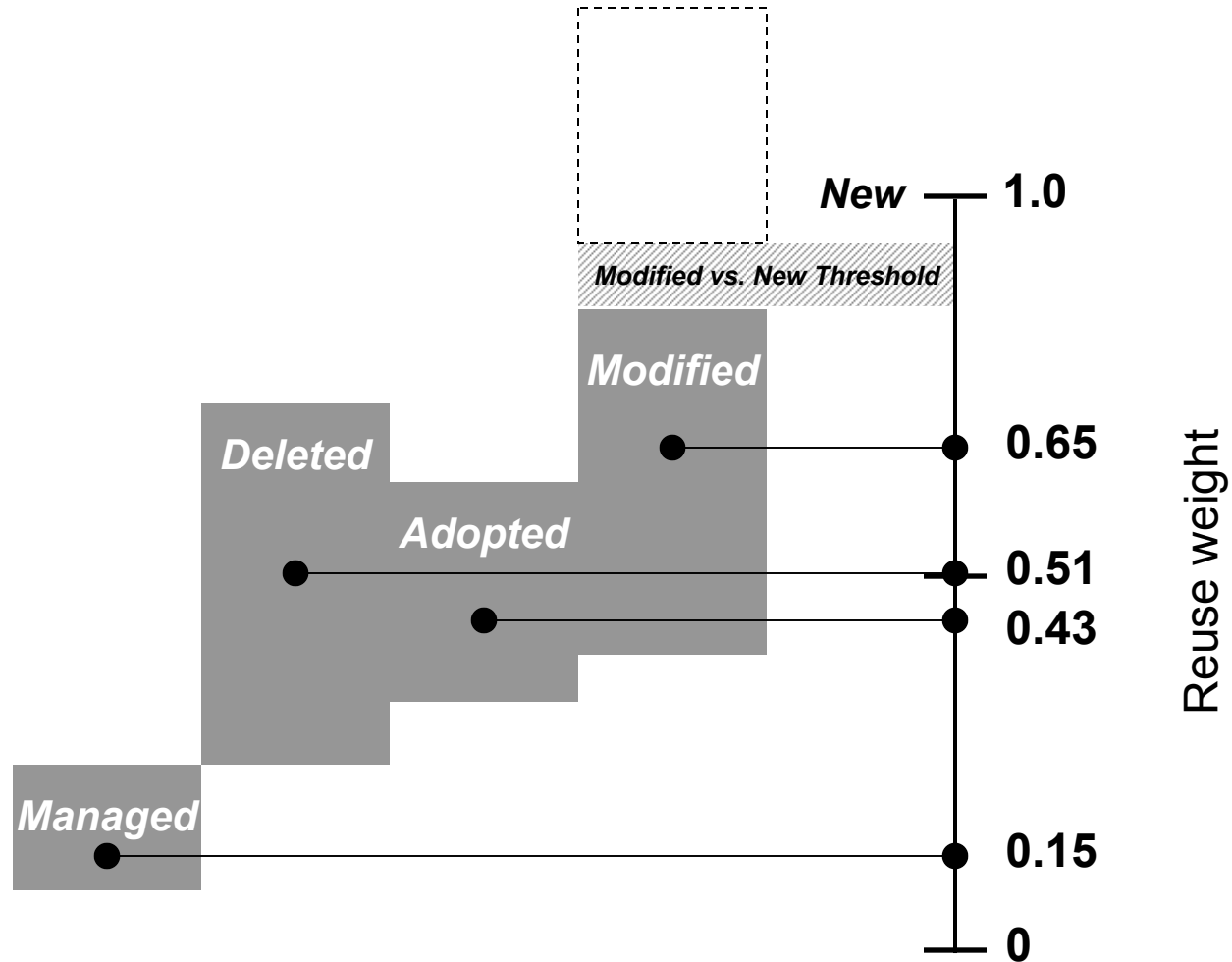
Wang, G., Valerdi, R., Ankrum, A., Millar, C., Roedler, G., "COSYSMO Reuse Extension," *18th INCOSE Symposium*, June 2008, Utrecht, the Netherlands.

2007 OG Wide Systems Engineering Effort (Systems Engineering Effort by System Size)
Blue = Open, Yellow = In-Progress, Red = Completed

Wang, G., Valerdi, R., Ankrum, A., Millar, C., Roedler, G., "COSYSMO Reuse Extension," *18th INCOSE Symposium*, June 2008, Utrecht, the Netherlands.

Next Steps

- **Diagnose organizational culture characteristics that lead to successful adoption of new processes**

- **Complete case study on Raytheon's successful "Enterprise Dashboard"**

- **Disseminate successful adoption attributes and influence future tool development**

Goal: to improve the rate of adoption of new process improvement methods & tools within the LAI Consortium