SEI Approach to Harmonization

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SEI Outline

Value Proposition for Harmonization, including

- 'Voice of the Customer' from 2007
- Field reports

Harmonization of Improvement Technologies

- Overview of reasoning framework

The Path Ahead

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Value Proposition for Harmonization

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What Do We Mean by *Multimodel Environments*?

Multiple improvement technologies[1]

- Concurrently implemented
- At different hierarchical levels
- Across different organizational functions

For example…

- Enterprise governance
- Process infrastructure
- Engineering methods
- Government regulations
- IT operations
- Sector-specific regulations or technologies
- And so on…

[1] We use the terms *improvement technologies*, *technologies*, or *models* interchangeably when referring to reference models, standards, best practices, regulatory policies, and other types of practice-based improvement technologies

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Challenges in Multimodel Environments

Competition for implementation resources

- Infrastructure
- Training
- Compliance
- Performance measurement

Independent, non-aligned project portfolios

Unclear relationships between technologies

- Overlaps
- Differentiators

Consequences

- Excess costs
- Erosion of benefits from any single effort

2007 VOC Top 7 significant challenges

Separate improvement technology ownership

Change management

Technical connections

Senior management understanding

Training and resources

Strategy determination

Senior management sponsorship

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Harmonization *IS* about…

- Mission
- System thinking
- Performance-driven improvement
- Value contribution of technologies
- Technology neutrality
- Process system design and alignment from strategy to implementation

CMMI & Six Sigma Research Findings, 2004

Mission-focused, flexible, adaptive to changing org. and tech. situations
Single, seamless solution; meaningful quantitative performance benefits
Six Sigma effective at all CMMI maturity levels; exemplifies high maturity/capability
High-performing IT orgs. realizing similar benefits, with domain-specific technologies
Majority of DFSS implementers progressing with CMMI; a few using ATAM
CMMI offers institutionalization mechanisms
CMMI implementers often well-suited as Six Sigma Black Belts

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Harmonization *IS NOT about*…

- Creating a master metamodel
- Developing a
  - — new single technology that encompasses all other technologies
  - — universal combination to suit every organization
- Promoting any single combination of technologies as the best
- (*Necessarily*) adding more technologies

Harmonization is NOT another process—it relies on an underlying improvement process paradigm

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Harmonization Layers and Considerations

An Initial View

Mission

Technology Selection and Composition

- Strategic choices, aligned with mission
- Feature overlaps and differentiators

Organizational Process

- Robust process architecture and standard processes
- Aligned with organizational mission
- Comprises properties of technologies of interest

Implementation

- Improvement infrastructure and resources
- Improvement project portfolios
- Measurement system
- Audit and appraisal

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Benefits of Harmonization

Business focus

Cost and cycle-time reduction

- Implementation
- Audit

Robustness

- Process robustness for a dynamic world of models and regulations
- Long-term and robust organizational approach to technology selection

2007 VOC

Top 7 significant benefits

Holistic, more complete views

Efficient

Synergy

Acceleration

Effective

Understanding of the specific connections for specific combinations

Measurement

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Integrating Initiatives: *Field Notes* [1]

(Public domain literature)

Northrop Grumman Mission Systems

- CMMI, Six Sigma, ISO, KM
- ".. accelerate achievement of Levels 4 and 5 ..."
- "[6S]... an enabler for measuring the value of... improvements"
- "Six Sigma provides a way to connect process improvement and business value"
- "..conducting Level 5 SCAMPI appraisals in 5-6 days…"

Raytheon

- CMMI + R6S + IPDS + DFSS
- Escaping defects from 6/KSLOC to 1.16/KSLOC

University of Pittsburgh Medical Center (UPMC)

- CMMI, Sarbanes Oxley (SOX), and ITIL.
- First non-profit medical system in U.S. to be certified compliant with the most stringent provisions of SOX

[Facemire 04], [Hefner 04], [Mackertich], [Carmody]

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Integrating Initiatives: *Field Notes* 2

(Public domain literature)

Tata Consultancy Services

- CMMI, ITIL, ISO 9001, P-CMM ➔ "Integrated Quality Mgmt System"
- "…development center…reduce[d]...in-process failure costs...5 to 1%..."

Wipro

- ISO 9001, CMM, P-CMM, TL9000, British Standard 7799, Six Sigma ➔ "Enterprise Integrated System"
  - Quantitative understanding, cost savings, performance improvement
  - "customer-centric, data-driven paradigm for ... quality"
- " ... financial services division ... Process ... to eliminate non-value adding steps and mistake-proof the system."
  - Projecting a 30% cycle-time reduction in computer business
  - Estimated short-term [ROI for 6S investment is] six to eight times investment in Six Sigma

Others

- Lockheed Martin (profiled on the following slides)
- JP Morgan Chase, Honeywell, and more

[Keeni 03], [Srivastava], [Wipro 04], [Wipro 01]

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Profile: *Lockheed Martin Integrated Systems & Solutions*

LOCKHEED MARTIN

STRATEGY

Establishment of Process Architecture and "Required Dev. Process"

Pursuit of high maturity ➔ Growth & Sustainment

- RDP expansion to Program Process Standard
  - Minimum mandatory set of development processes
  - Updated for industry standards where certifications desired
- Measurement infrastructure (PSM; DMAIC implicit)
- New process methods such as architecture-based design
- New Corporate Initiative: Lean
  - Enabled by CMM
  - Accelerated new CMMI PA implementation (lo & hi mat.)
  - Addressed business processes outside of CMMI
  - Applied to appraisals

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Profile: *LMCO IS&S*

LOCKHEED MARTIN

RESULTS and BENEFITS

Benefits of Chosen Strategy

- 30% cycle-time reduction; idea to proposal
- Robust; easy to build in new models, practices
- All models working together to achieve performance; distinct contribution of any individual model difficult to extract

Success Factors

- Built the vision while at “low maturity”
- Senior management sponsorship
- Key personnel with needed systems and strategic outlooks as well as breadth of experience

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Harmonization:

An Initial Reasoning Framework

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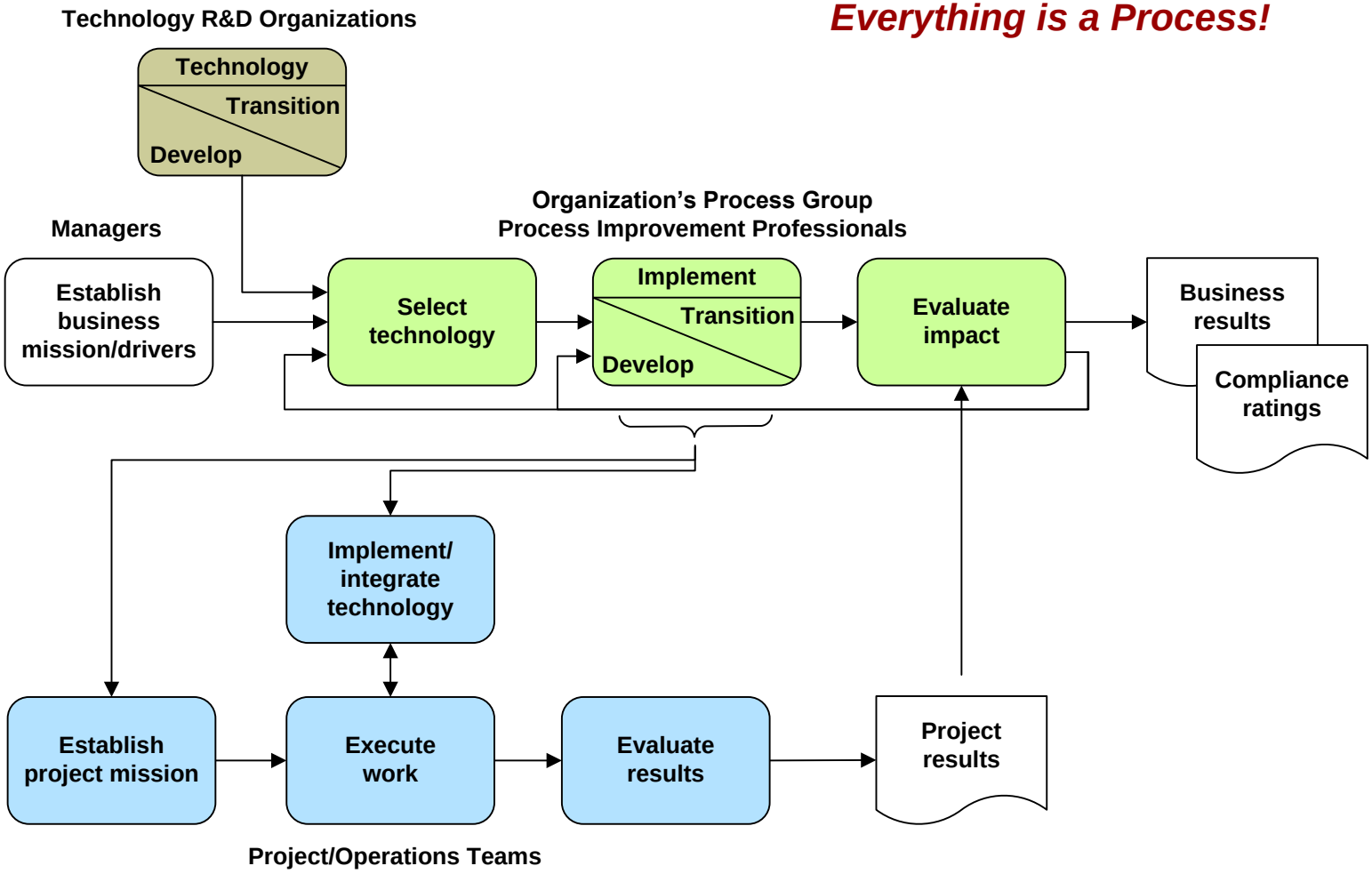
A Process Paradigm

First Remember:
Everything is a Process!



[Siviy 04]

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Key Guidance Questions

What is your mission? What are your goals?

Are you achieving your goals? What stands in your way?

What process features are needed to support your goals?

What technologies provide or enable these features?

What is the design of a cohesive (integrated), internal standard process that is rapidly and effectively deployed, easily updated, compliant to models of choice?

Mission Translation
Strategic Technology Selection
Technology Composition
Process Architecture
Process Standard
Implementation Considerations

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Mission Translation

Practices to Leverage

- FAST-based Goal Structures
  ("front end" to Goal-Question-Indicator-Metric)
- Y to X Decomposition
- Quality Function Deployment (QFD)
- Critical Success Factors
- Theory of Constraints: Systems Thinking Diagrams
- Strategy Maps
- Roadmapping

Translating organizational goals and metrics to individuals and teams continues to be one of the most difficult management activities and is often a stumbling block to implementation

- from "How the Learning Organization Manages Change"
by Ronald Recardo, Kathleen Molloy, and James Pellegrino

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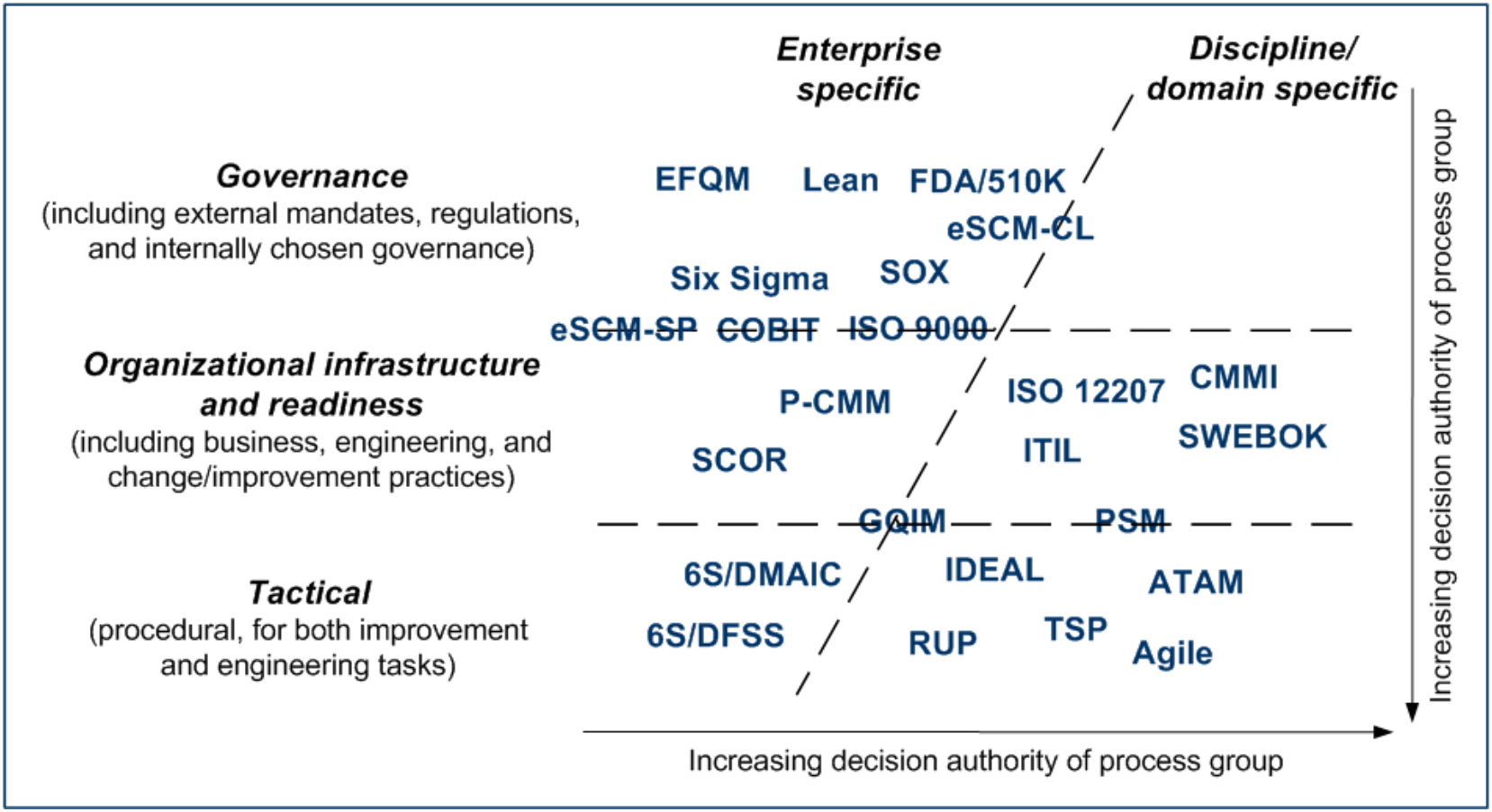
Strategic Classification Taxonomy



Strategy/Selection Guidance

Emerging Research

Methods

- Affinity groups
- QFD
- Pugh's concept selection
- TRIZ
- Benchmarking, pattern matching and "Positive Deviance"
- Methods from the field of Operations Research

Considerations

- Technology readiness
- Organizational readiness and culture
- Decision authority, regulatory compliance requirements
- Scenarios
- Interoperability

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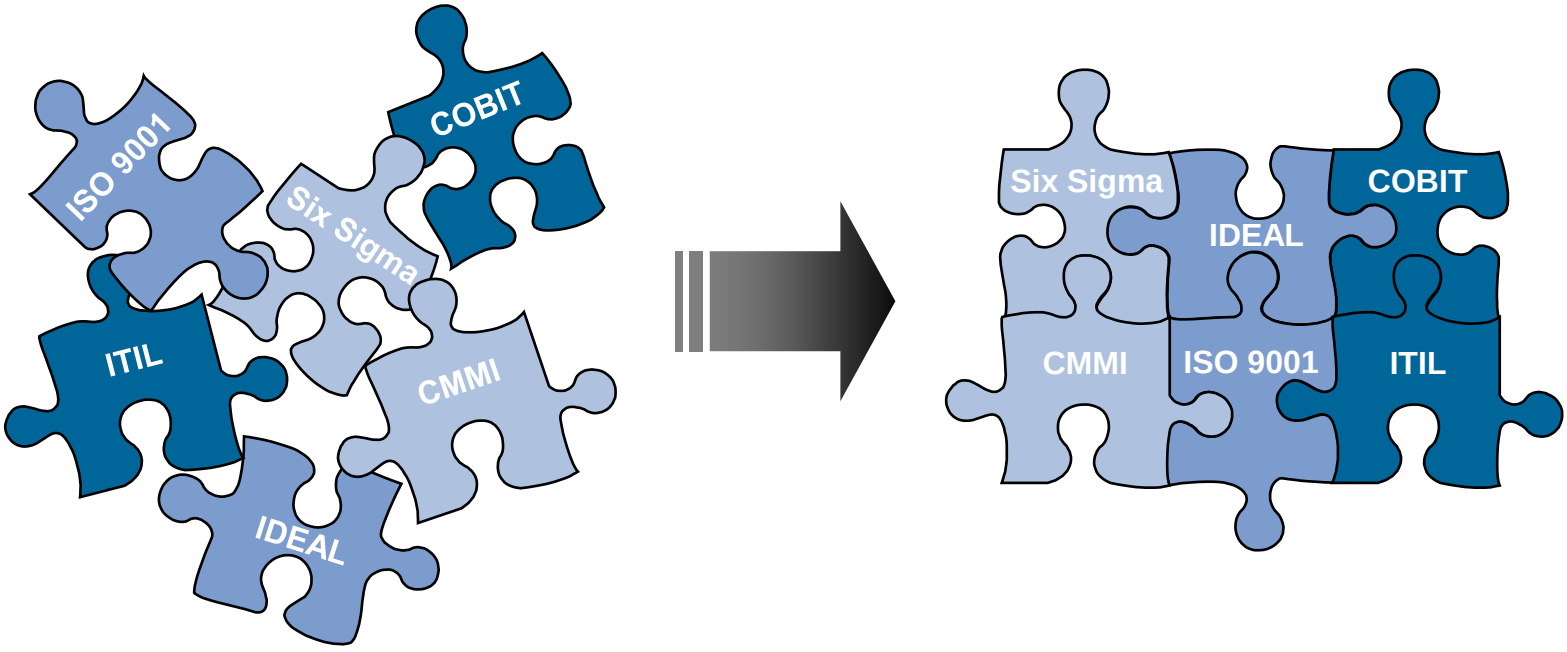
Technology Composition using Element Classification



- What is common among the elements?
- Can we derive a common view of these elements?
- How can we help the different stakeholders in their daily work with the elements?

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Element Classification Taxonomy

Good Practice Elements	Improvement Method Elements	Institutionalization Elements
CMMI PAs and PLA ISO 15504 and ISO 12207 COBIT EFQM ISO 9001	Change management techniques: IDEAL and Six Sigma	CMMI Generic Goals and Practices: GG3, GG2, and GG1

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Process Architecture

Emerging Research

Definitions

- ***CMMI:*** ordering, interfaces, interdependencies and other relationships among process elements in a standard process
- ***Kasser:*** function of process architecting is to design, set up and continuously optimize, the process for the development of the specific system being produced
- ***Business Analysis BoK:*** processes needed to conduct business, how those process interact and how they are managed and modified over time.
  - A process architecture should remain fairly intact even as the details of process execution evolve and change.

Features

- Functional properties, including classes, flow, and attributes
- Outputs, including flow and relationships
- Roles and responsibilities, including users and actors
- Information flow
- Overall interrelationships, dependencies, and constraints

[Kasser], [BABOK]

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Process Architecture

Emerging Research

Practices, methods, disciplines to leverage

- DFSS, DFLSS, incl mapping and robust design techniques
- Software and related engineering technologies
  - Technologies/principles: Interoperability; COTS; architecture
  - Diagramming/notations: UML; Little JIL process language
- Business process management architectures and models
  - Architecture of Integrated Information Systems (for BPM)
  - Riva's process definition technique
  - Goal Oriented Business Process Modeling (BPM)
- Beers Viable Systems Model
- Operations Research

[Osterweil 1], [Osterweil 2], [Avrunin], [Albert et al 02], [Scheer 00], [Davis 01], [BA Insight 06], [Ould 06], [Bider 05], [Beer 85], [Beer 94], [Espeio and Harnden 89]

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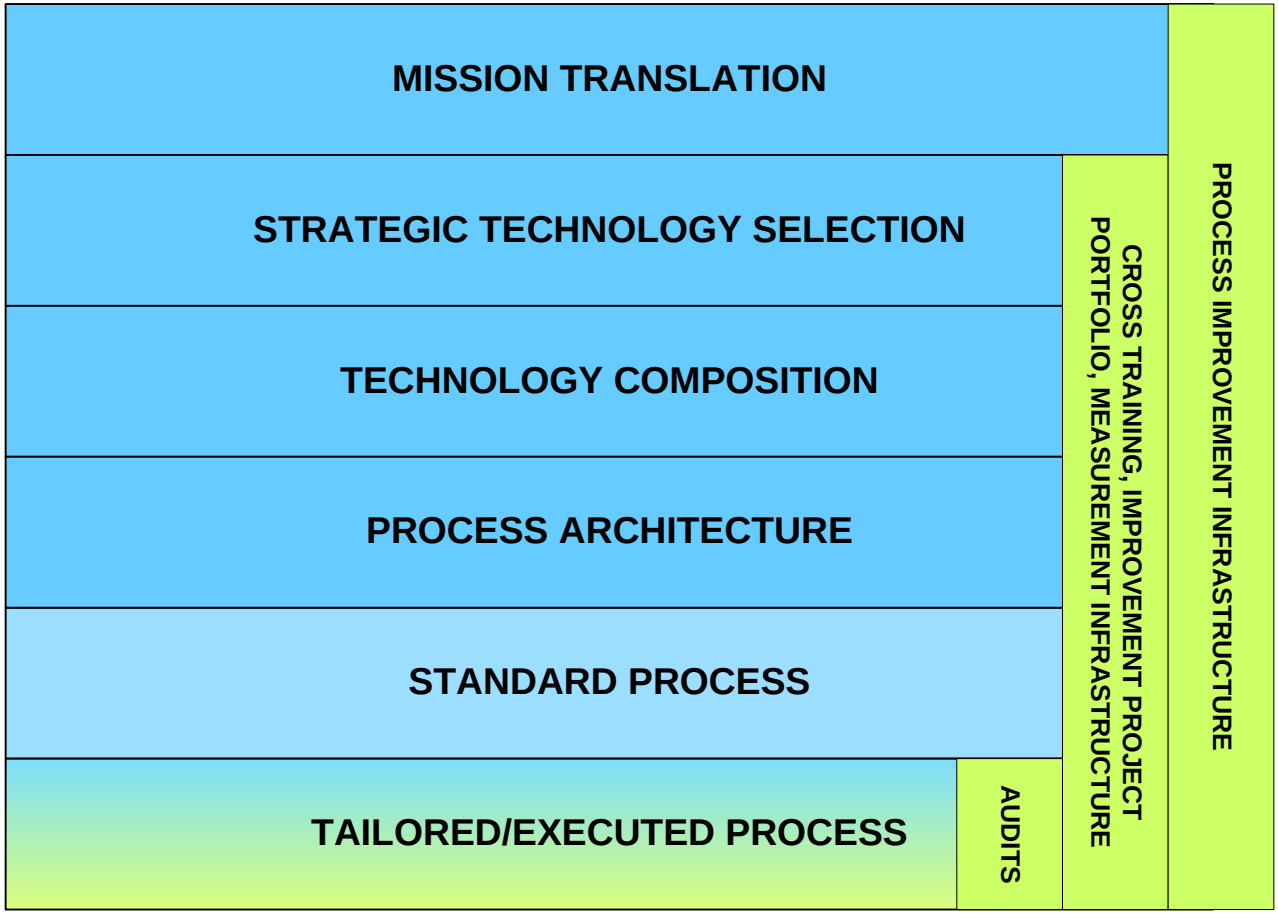
Harmonization Layers



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The Path Ahead

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Multimodel Harmonization Builds on Existing Works

Publications generating awareness, ideas, approaches, methods

- Armstrong: Systems Approach to Process Infrastructure
  - Best practices, tools, improvement, measurement
- Kasser: Process Architecting
- Halvorsen et. al.: Taxonomy to compare SPI Frameworks
- Mutafelija: Process Architecture Views and Properties
- Bendell: Structuring Business Process Improvement Methods
  - Problem-solution decision model
- Osterweil: Little JIL process language
- Amescua, Garcia, Sanchez et. al.: Patterns
- Others

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Multimodel Harmonization Builds on Existing Works

Guidance, frameworks, metamodels for specific combinations

- SEI research and publications
  - CMMI & Six Sigma sponsored research, book, courses
  - Tech reports: CMMI & ISO, CMMI & Agile, CMMI & TSP…
  - Resiliency Engineering Framework
- Numerous Mappings & Relationship Diagrams
- Integrated Systems Framework (ISF) [Byrnes-Vasques]
- Change Engine [Ghetto-Klar]
- OPEN Process Framework (OPF) [Firesmith]
- eSourcing Capability Model (eSCM) [Hyder et. al.; Hefley et. al]
- Many internal corporate endeavors, mostly proprietary
- Others?

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Preliminary Sponsored Work on Harmonization

Sponsored by Lockheed Martin IS&GS

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White paper for managers

Maximizing your Process Improvement ROI through Harmonization

White paper series for process improvement professionals

1. *The Value of Harmonizing Multiple Improvement Technologies: A Process Improvement Professional's Viewpoint*
2. *Strategic Classification and Technology Selection in Multimodel Environments*
3. *Improvement Technology Classification and Composition in a Multimodel Environment*
4. *Process Architecture in a Multimodel Environment*
5. *Implementation Challenges in a Multimodel Environment*

May 8 Workshop:
Hard Questions for Process Improvement in Multimodel Environments

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But there is much more work to do….

Process Improvement in Multimodel Environments (PrIME)

- an SEI-led project on harmonization
- Common set of principles that all can use
  - base “recipes” from research effort
  - foundation for more “recipes” to be built by the community
- Convergence at the “mutlimodel” level

Year	Focus Areas	Activities and Deliverables
1	• Strategy • Decision Tools • Selection of Technology Combinations for Study	Case Studies Patterns Guidebook Training Workshops Pilots Specific “recipes”
2	• Technology Decision Guidance • Technology Composition • Appraisal Guidance	
3	• Process Architecture • Technology Design • Scalability	

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Summary: Multimodel Improvement is Our Reality

Value of Harmonization

- Performance
- Cost and cycle-time reductions
- Robustness

Reasoning Framework for Harmonization

- Mission translation and alignment
- Technology adoption scenarios, selection patterns and decisions, sequencing
- Technology classification and composition
- Process architecture and process architects
- Measurement as integrating platform
- Implementation considerations

Recipes for Specific Technology Combinations

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Everything should be made as simple as possible, but not one bit simpler

- Albert Einstein

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