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Using Six Sigma to Accelerate the Adoption of CMMI for Optimal Results

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Objective

Share findings from a project that explores a non-traditional but relevant view of Six Sigma.

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Outline

- Scope of research project
- Findings
- Path forward

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Software & IT Best Practices and Six Sigma: Recent History

Many papers and presentations comparing CMM(I) & Six Sigma

- What are the differences and the similarities?
- How do they compare at the PA, goal, and practice level of CMMI?
- How do they compare at the philosophy, framework, toolkit, and metric level of Six Sigma?
- How can Six Sigma training be tailored for software?

Some papers extending to ISO, TSP, Balanced Scorecard, Measurement & Analysis practices

Technical depth and reports of field experience have increased with time

Venues have included SEPG Conferences, STC Conferences, Crosstalk, and ASQ's Software Quality Professional

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Frequently Asked Questions

How do I leverage Six Sigma with the SPI initiatives already underway in my organization?

Should I pick Six Sigma or CMMI? How do I convince my management that it's not an either/or decision?

What evidence is there that Six Sigma works in software and systems engineering?

How do I train software engineers when Six Sigma training is geared for manufacturing?

What are examples of Six Sigma projects in software? IT?

Isn't Six Sigma only about advanced statistics?

What is a software "opportunity"? How do I calculate sigma?

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Our Observations

Current Reality

- A small number of organizations are excelling in their combined usage of SEI technologies and Six Sigma to speed the realization of bottom-line benefits.
- The DoD is not getting the benefit of this.

Desired Future Reality

- Defense contractors, DoD organizations, and commercial organizations achieve bottom-line impact faster and more effectively by joining SEI technologies and Six Sigma.
- The DoD uses Six Sigma's strategic aspects to select best technology solutions to achieve its mission.

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Six Sigma as Transition Enabler

The SEI is conducting a research project to explore the feasibility of Six Sigma as a transition enabler for software and systems engineering best practices.

Hypothesis

- Six Sigma, used in combination with other software, systems, and IT improvement practices, results in
  - better selections of improvement practices and projects
  - accelerated implementation of selected improvements
  - more effective implementation
  - more valid measurements of results and success from use of the technology

Achieving Process Improvement… Better, Faster, Cheaper.

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What is Transition?

Technology transition is the process of creating or maturing a technology, introducing it to its intended adopters, and facilitating its acceptance and use, where *technology* is

- Any tool, technique, physical equipment or method of doing or making, by which human capability is extended."
- "The means or capacity to perform a particular activity."

Are maturation, introduction, adoption, implementation, dissemination, rollout, deployment, or fielding part of your process improvement effort?

Each indicates "transition activities."

[Forrester], [Schon], [Gruber]

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Research Scope

Primary priorities

- CMMI adoption
- IT operations and security best practices
  - Information Technology Infrastructure Library (ITIL)
  - Control Objectives for Information and Related Technology (COBIT)

Secondary priority

- architecture best practices and Design for Six Sigma

Primary audiences

- Software Engineering Process Groups (or equivalent)
- Black Belt and Green Belt Practitioners

We also considered the relevance of this project for technology developers.

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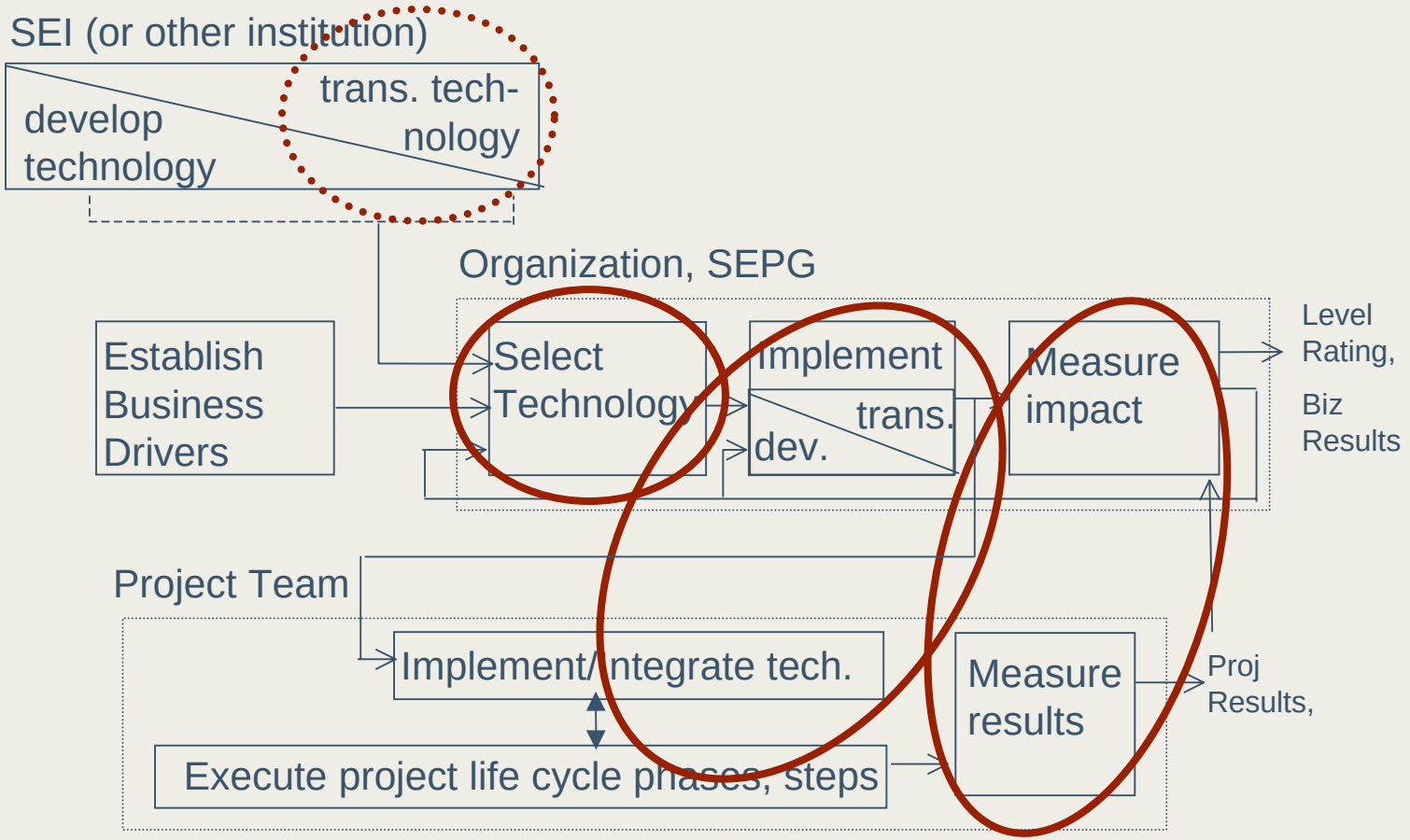
A Technology Adoption View



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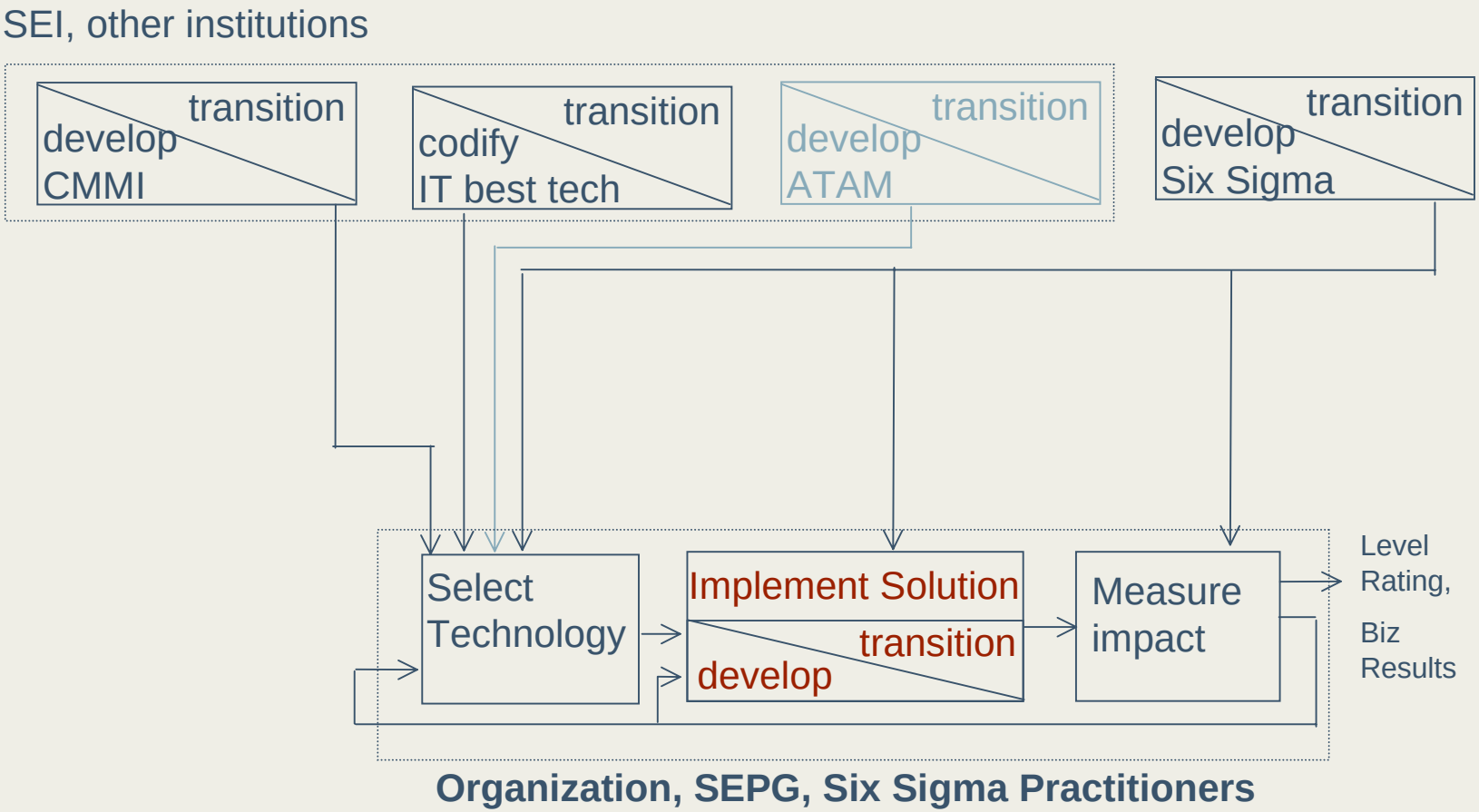
Project Scope X Adoption View



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Our Approach

Research Method: Grounded Theory

Data Collection
- Case study interviews
- Surveys
- Literature

Data Evaluation
- Qualitative evaluation of text
- Conducted by Jeannine and Eileen (no non-SEI parties)
- Findings verification via research participant feedback

“Feasibility” Criterion
- Minimally, a hypothesis required one credible example of its application to be deemed “feasible.”

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Collaborators and Contributors

Collaborators for Research Direction

- Lynn Penn, Lockheed Martin IS&S
- Bob Stoddard, Motorola
- Dave Hallowell, Six Sigma Advantage
- Gary Gack, Six Sigma Advantage
- John Vu, Boeing
- Lynn Carter, CMU West
- Gene Kim, ITPI
- Kevin Behr, ITPI
- SEI colleagues: Julia Allen, Mike Phillips, Gian Wemyss

Other contributors

- ISSSP
- isixsigma.com
- Case study and survey participants (many anonymous)

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Outline

Scope of research project

Findings

Path forward

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Data Breadth and Depth

Results are based on the project data set, including information from

- 11 case study interviews
- 8 partial case study interviews
- survey responses from more than 80 respondents, representing at least 62 organizations and 42 companies
- several pilots that are underway to try new ideas

Because of the proprietary nature of our data and the non-disclosure agreements in place, the results in this public briefing are intentionally at a high level.

Additional detailed reports and briefings are planned, pending project participant approvals.

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Context of Findings

Participating organizations spanned

- Low-to-high maturity
- Nearly all commercial sectors
- Medium-to-large in size
- Organic, contracted, co-sourced software engineering, and IT
- IT development, deployment, and operations

Small organizations' and DoD organizations' use of Six Sigma in this context has neither been refuted nor supported by project evidence.

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Context of Findings

While our focus was on CMMI, ITIL, and COBIT, we gathered information on other technologies “in play.”

- The list included People CMM and other maturity models, ATAM, TSP, ISO Standards, EIA Standards

The Six Sigma adoption decision

- was frequently made at the enterprise level, with software, systems, and IT organizations following suit.
- was driven by senior management’s previous experience and/or a burning business platform.

Six Sigma deployment was consistently comprehensive.

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Primary Findings

Six Sigma is feasible as an enabler of the adoption of software, systems, and IT improvement models and practices (a.k.a. “improvement technologies”).

The CMMI community is more advanced in their joint use of CMMI & Six Sigma than originally presumed.

We have 23 significant (and interrelated) findings.
A selection are included on the following slides.

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General Findings 1

Six Sigma helps integrate multiple improvement approaches to create a seamless, single solution.

Rollouts of process improvement by Six Sigma adopters are mission-focused as well as flexible and adaptive to changing organizational and technical situations.

Six Sigma is frequently used as a mechanism to help sustain (and sometimes improve) performance in the midst of reorganizations and organizational acquisitions.

Six Sigma adopters have a high comfort level with a variety of measurement and analysis methods.

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General Findings 2

Six Sigma can accelerate the transition of CMMI.

- Moving from CMMI ML 3 to 5 in 9 months, or from SW-CMM Level 1 to Level 5 in 3 years (the typical move taking 12-18 months per level)
- Underlying reasons are strategic and tactical

When Six Sigma is used in an enabling, accelerating, or integrating capacity for improvement technologies, adopters report quantitative performance benefits, using measures they know are meaningful for their organizations and clients. For instance,

- ROI of 3:1 and higher, reduced security risk, and better cost containment

[Hayes 95]

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CMMI-Specific Findings

Six Sigma is effectively used at all maturity levels.

Participants assert that the frameworks and toolkits of Six Sigma exemplify what CMMI high maturity requires.

Case study organizations do not explicitly use Six Sigma to drive decisions about CMMI representation, domain, variant, and process-area implementation order; however, participants agree that this is possible and practical.

CMMI-based organizational assets enable Six Sigma project-based learnings to be shared across the software and systems organizations, and thereby, enable a more effective institutionalization of Six Sigma.

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IT-Specific Findings

High IT performers (development, deployment, and operations) are realizing the same benefits of integrated process solutions and measurable results.

- However, they are using the technologies and practices specific to their domain (ITIL, COBIT, sometimes CMMI).

CMMI-specific findings apply to IT organizations who have chosen to use CMMI.

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Architecture-Specific Findings

Multiple organizations are pursuing the joint use of Six Sigma, CMMI, and ATAM, focusing on the strong connections among DFSS, ATAM, and the engineering process areas of CMMI.

Many survey respondents are in organizations currently implementing both CMMI and Six Sigma DMAIC and many are in organizations progressing or DFSS.

- Of those implementing DFSS, the majority are at least progressing with CMMI (but some are not using CMMI at all) and none are using ATAM.

There is much untapped potential here!

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Remaining Hypotheses

There are 33 remaining significant inferences and hypotheses.

They have been reviewed by case study participants.

Most of the reviewers believe that most (but not all) of the hypotheses are true; however, we do not yet have case evidence.

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Why Does It Work for Transition?

We observe that

- Six Sigma supports more effective transition because it
  - requires alignment with business drivers
  - garners effective sponsorship
  - supports excellent and rational decision making
  - aids robust implementation or change management
  - offers credible measures of results for investment

- The latter is particularly crucial for convincing majority adopters to transition, and is often the sticking point in failed transitions (popularly labeled after Moore as failing to “cross the chasm”).

[Moore]

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Concluding This Project

The initial report on this project is available on the SEI website.

Additional publications are planned, including

- detailed reports
- how SEI and other technologies add value to Six Sigma only adopters' organizations
- briefings at future conferences
- internal SEI briefings

Please contact Jeannine or Eileen if you

- would like to be notified of publications
- have relevant information you would like to share
- can apply the results of this work
- have input on our proposed path forward (next slide)

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Proposed Paths Forward

Apply specific findings to further development work on CMMI, Product Line Practices, and Measurement & Analysis technologies.

Characterize robustness of Six Sigma as a transition enabler.

- Organizational fit, characteristics
- Technology fit, characteristics
- Measuring transition progress
- Extension to organizations and technologies (individual and combined) not yet studied

Use component-based development methods and Six Sigma methods to create guidance for the effective integration and deployment of multiple models.

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