Understanding “Beyond”

Some topics are legitimately outside the scope of CMMI.

Some topics address the “how” rather than the “what” of a maturity model.
  • potentially supplemental information in CMMI
  • grist for “how to” guides and studies

“Total” Quality Management and successful change management frequently needs to go beyond any framework to address underlying business needs.
CMMI Use Should Involve a “Learning Mindset”

### Appropriate use vs. Misuse

<table>
<thead>
<tr>
<th>Appropriate use</th>
<th>Misuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus on improved <strong>performance</strong></td>
<td>Focus only on maturity or capability level</td>
</tr>
<tr>
<td>Identify, motivate, learn about, and improve the processes by which the <strong>business</strong> gets done</td>
<td>Use as a process standard. (Note: CMMI says it “contains neither processes nor procedures”)</td>
</tr>
<tr>
<td>Recognize <strong>knowledge work</strong> is often not routine, be prepared to learn what works best. Regularly update your standard and project defined processes based on what works.</td>
<td>Assume it is possible upfront to get it all right; never accept blame for failure. Neglect updating your processes once you get to be ML 3.</td>
</tr>
<tr>
<td>Complement the journey with new frameworks, methods, and technologies; learn what works and use it!</td>
<td>Only stick to CMMI and ignore/demonize Six Sigma, Agile, Lean, etc.</td>
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<tr>
<td>Consider the informative material in interpreting and implementing the practices</td>
<td>Either ignore the informative material or use it as a checklist (both extremes constitute misuse)</td>
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<tr>
<td>Focusing on “why.”</td>
<td>Focus on what and how; duck questions on “why.”</td>
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**CMMI-DEV V1.3 PAs:**

**Organized by Maturity Level and Category**

<table>
<thead>
<tr>
<th>Maturity Level</th>
<th>Process Management</th>
<th>Project Management</th>
<th>Engineering</th>
<th>Support</th>
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<tbody>
<tr>
<td>ML5</td>
<td>Organizational Performance Management</td>
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<td>Causal Analysis and Resolution</td>
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<td>ML4</td>
<td>Organizational Process Performance</td>
<td>Quantitative Project Management</td>
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<td>ML3</td>
<td>Organizational Process Focus</td>
<td>Integrated Project Management</td>
<td>Requirements Development</td>
<td>Decision Analysis and Resolution</td>
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<td>Organizational Process Definition</td>
<td>Risk Management</td>
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<td>Product Integration</td>
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<td>Validation</td>
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<tr>
<td>ML2</td>
<td>Project Planning</td>
<td>Project Monitoring and Control</td>
<td>Requirements Management</td>
<td>Configuration Management</td>
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<td></td>
<td>Supplier Agreement Management</td>
<td>Process and Product Quality Assurance</td>
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<td>Measurement and Analysis</td>
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</table>
Outside the Scope of CMMI

Currently three constellations:
- Development
- Services
- Acquisition

Other useful CMMs include:
- People
- Systems Security Engineering
- …

Various frameworks capture knowledge beyond the scope of CMMI as well as implementation oriented concerns.

Topics for Consideration

People… Process… Technology…

Factors that supersede the software discipline
- People issues: mindset, follow through, attention and focus, attention chain
- Team / project issues: team performance, decision making, IPPD
- Organizational issues: People CMM, innovation, strategic business planning

Factors that affect successful improvement
- How national cultures affect improvement
- How organizational cultures affect improvement
Humphrey’s Motivational Speech to Executives

Do you believe that management is a good idea that adds value to your organization?

Do you believe that organization learning makes for more effective and efficient work?

Do you believe that using measurement and data to drive decisions is better than intuition?

Do you believe that continual improvement builds business value?

... Then why don't you do any of those things?

Pfeffer’s One-Eighth Rule

Why aren’t “best practices” that are known to be effective implemented by all organizations?

• One half of all people, in spite of the evidence, don’t believe the connection between the practices and the results.

• One half of those who see the connection try to make isolated changes rather than using a comprehensive and systemic approach.

• Only about half of those who make systemic changes persist long enough to derive the benefits.
Evidence-Based Software Engineering

Glass, Facts and Fallacies of Software Engineering, 2004


Evidence-based management

• Pfeffer and Sutton, Hard Facts, Dangerous Half-Truths, & Total Nonsense: Profiting from Evidence-Based Management, 2006

Technology

Technology is an enabler of effective and efficient processes.

• technology changes rapidly…
• perhaps the best we can offer is improving technology change management

Humphrey’s 1987 software process maturity framework included two technology levels.

People Are Our Most Important Asset

The mind of the worker is the most powerful tool available, especially when guided by job aids and tools that enable its power to be effectively and efficiently focused.

Does the organization demonstrate that it considers people its most important asset?
- Constantine, *Constantine on Peopleware*, 1995

The “Attention Chain” for Knowledge Work

[Konrad 2011]

What an individual knowledge worker needs to "pay attention" to is influenced by all three “links” in the attention chain: the organization, the team, and the knowledge worker himself/herself.

*Not included as ‘links’ but could’ve been: professional societies, standards organizations, and similar communities of practice.*
Individual Differences

DeMarco and Lister
- Count on the best people outperforming the worst by about 10:1
- Count on the best performer being about 2.5 times better than the median performer

Process discipline improves quality by 79% and productivity by 12% while decreasing variability.

The bottom quartile with disciplined processes outperforms the top quartile when undisciplined – but the top performers remain at the top when using disciplined processes.


PSP Quality Trends By Ability Quartile
Mindset
[Carol Dweck, HBR 283: The Right Mindset for Success]

Bottom Line: Successful people tend to be the ones that have a “Growth Mindset (GM).”

“They believe their talents and abilities can continue to be developed; not worried about how smart they are, how they'll look, what a mistake will mean, they challenge themselves and grow from that.”

To develop a GM:
• Expect to stretch beyond your Comfort Zone and take reasonable risks; don’t limit yourself to things you are already good at over and over again.
• Value process, reward process.
• Take on big but reasonable challenges, pursue them doggedly, engage your team and stakeholders.

Leading others to develop a GM: don’t praise talent or ability, reward process (the effort, grit, strategies, doggedness, resilience, bouncing back, trying something new when previous thing didn’t work) and not just a successful outcome.

Follow Through
[Peter Bregman, “18 Minutes”]

• We can feel motivated to do X, but not follow through, why?
• We want to meet our commitments: we know that we should feel motivated – the problem is that our mind immediately comes up with reasons for not following through—or we get distracted—and so we procrastinate.
• When we’re stressed out, tired, or feeling bad about ourselves, we enter a “slippery slope:” we give in to negative thoughts and thus feel worse, etc.
• “The mind is essential to motivation. But with follow through, it’s the mind that gets in the way … if you want to follow through on something, stop thinking.”
• Summarizing Pattern (note these map to most CMMI GPs):
  – Set specific targets about your commitment (the W’s).
  – Create a supporting process and environment (nudging you along).
  – Make yourself accountable to a friend.
  – When the time comes to follow through, don’t let your minds “sabotage your aspirations.” (You can train your mind to ignore “the bait.”)
  – As you learn what works, adjust to improve consistency of performance.
Follow Through
[Roy F. Baumeister, “Science Friday 123011 Hour 2 Resolutions”]

There is something essential for follow through. You have one stock of it, it generally decreases with use, increases with eating; what is it?

Willpower (= capacity for volitional action, self-control)

Summarizing Principles for managing willpower:

• Start by committing to small, achievable goals; develop your capability (and capacity) to tackle bigger commitments.
• Break big commitments into smaller pieces that can be addressed one at a time.
• Maintain a limited # of commitments. (As you attend to one commitment, what is available for others gets depleted) This means you may need to free yourself of some commitments.
• Failure leaves one demoralized; you can improve your resilience by envisioning failure in advance and what you should do if failure happens.
• Nutrition matters: 1) Balanced diet; eat frequently. 2) But for an urgently-needed, short-term boost, take sugar 😊.

Attention and Focus
[Konrad 2011, Schenker]

Summary Observations on attention and focus (Kakuro, Bridge)

• If you find yourself succeeding at a task, maintaining focus is easy.
• But when you're failing, it takes much more willpower to maintain attention.
• Distractions lead to a higher rate of making mistakes when resuming the task (due to errors in context switching, part of which happens unconsciously).
• Ability to resist distractions may be due to inherited as well as learned dispositions.
  – Also, hunger and fatigue increase susceptibility and decrease focus control
  – For some people performing some tasks, it may actually take more willpower to address the distraction than keep one’s focus on the task.
• What you can do when distracted: 1) remove the source or 2) remove yourself (work to clear your reaction to the distraction from your mind so you can regain and sustain your task focus upon your return).
• Process can aid you by 1) making things routine that otherwise would grab our attention and distract us from where our focus should be put; 2) helping establish sufficient context in process/process step launches and handoffs.
Teamwork

Effective and high-performing teams are much better at accomplishing our goals.

- Katzenbach and Smith, The Wisdom of Teams, 1993
- Goleman, Emotional Intelligence, 1997
  - The single most important factor in maximizing the excellence of a group’s product was the degree to which the members were able to create a state of internal harmony, which lets them take advantage of the full talent of their members.

Personal Software Process (PSP)
- Team Software Process (TSP)
- Accelerated Improvement Method (AIM)

Team Performance
[Herb Brooks, www.herbbrooksfoundation.com]

Herb Brooks: “All-star teams fail because they rely solely on the individual's talent. [But] The Soviets win because they take that talent and use it inside a system that's designed for the betterment of the team. My goal is to beat 'em at their own game.”


Herb Brooks: “Well, Lou, that's why I want to pursue it.”

Herb Brooks coached the 1980 Winter Olympics American ice hockey team (of amateurs) to beat the Soviets (and then Finland) to take the gold medal.

Another quote: “This team isn't talented enough to win on talent alone.”
Team Performance
[Anita Williams Wooley, www.sciencemag.org/content/330/6004/686/suppl/DC2]

There is an analog to IQ for groups, called “c” (for collective intelligence, the ability to perform successfully on a wide variety of tasks) that can be measured and used to predict future group performance.

- c accounts for about 40% of the variation in task performance across tasks.
- c correlates (both strongly and positively) with three factors:
  - average “social sensitivity” of group members (how well group members perceive each others’ emotions)
  - equality in distribution of conversational turn taking (e.g., everyone takes turns to speak)
  - proportion of females in the group (perhaps due to first bullet)

Surprisingly, the following were inferior predictors (group tasks):
- maximum or average individual group member intelligence
- group cohesion, motivation, and satisfaction
- some personality types such as maximum extraversion

Building Team Performance
[Katzenbach and Smith]

- Establish urgency, demanding performance standards, and direction.
- Select members for skill and skill potential, not personality.
- Pay particular attention to first meetings and actions.
- Set some clear rules of behavior.
- Set and seize upon a few immediate performance-oriented tasks and goals.
- Challenge the group regularly with fresh facts and information.
- Spend lots of time together.
- Exploit the power of positive feedback, recognition, and reward.
Teamicide – A Bad Thing
[DeMarco and Lister]

Defensive management

Bureaucracy

Physical separation

Fragmentation of people’s time

Quality reduction of the product

Phony deadlines

Clique control

Decision Making

People have systemic biases and fallacies when making decisions.

- Gladwell, *Blink - The Power of Thinking Without Thinking*, 2005
- Kahneman, *Thinking, Fast and Slow*, 2011

Principled negotiation can lead to win-win relationships

Herb Simon: skilled intuition = recognition of patterns stored in memory
Subjective experience is not a reliable indicator of judgment accuracy; on the contrary its compellingness often blinds us!
Intuitions arise from “System 1,” which operates mostly unconsciously.
• Such intuitions engage the same part of the mind as “the Interpreter,” which continually integrates what information it has and delivers a coherent tale so that we see ourselves as “one person.”
• Effortlessly and immediately, we become aware of a judgment
• But anchoring biases the sample that is brought to mind
• And attribute substitution replaces the issue we were to address with an issue for which there is a readily available answer
• Also, faulty statistical intuitions survive both training and experience

Under what conditions can one develop expert intuition within a domain?
• The domain is predictable with opportunities to learn its “regularities”
• Prolonged practice accompanied by immediate, accurate feedback
“Expert judgment” should also engage System 2. We must question our intuitions; consider base rates of outcomes associated with those of the situation; and mitigate against anchoring and attribute substitution.

How long does it take to be an expert surgeon?
• 5-7 years residency training
• 10 years to learn how to operate, fine details, more confident
• 10 more years on how to operate in very tough situations
• 10 more years on when Not to operate, because can hurt patient
**Principled Negotiation**  
[Fisher, Ury, and Patton]

Separate the people from the problem

Focus on interests not positions

Invent options for mutual gain

Insist on using objective criteria

---

**Collaboration**  
[Morton Hansen, “What Leaders Need to Know ...”]

Summarizing Principles:

1. Collaborate with purpose: achieving better results (revenues, etc.)
2. Culture of collaboration must originate from the top (CEO)
3. Set up systems and processes to encourage collaboration
4. Allocate “decision rights” to people; but if there is no consensus then the most senior person “closes the decision"
5. Create valuable collaboration by promoting *constructive conflict*
6. Organize diverse collaborative teams for a broader spectrum of ideas; seek talented individuals in the periphery of the organization
7. At “close of decision” strive for unity in execution among all participants; this is achieved by recognizing common goals
8. Maintain transparency of effects of decisions so that costs and benefits can be openly assessed
9. Politics is poison – avoid backroom deals to prevent disunity
IPPD

Teamwork → IPPD for overcoming organizational barriers

Alternative practices

• sign-offs by affected departments
• liaison departments
• job rotation
  – Smith, “The Historical Roots of Concurrent Engineering Fundamentals,”
• chief engineer +
  – Sobek, Liker, and Ward, “Another Look at How Toyota Integrates Product

People CMM V2 and Process Area Threads

<table>
<thead>
<tr>
<th>Maturity Levels</th>
<th>People CMM Threads</th>
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<tbody>
<tr>
<td></td>
<td>Developing Individual Capability</td>
</tr>
<tr>
<td>5 Optimizing</td>
<td>Continuous Capability Improvement</td>
</tr>
<tr>
<td>4 Predictable</td>
<td>Mentoring Competency Based Assets</td>
</tr>
<tr>
<td>3 Defined</td>
<td>Competency Development Competency Analysis</td>
</tr>
<tr>
<td>2 Managed</td>
<td>Training and Development Communication &amp; Coordination</td>
</tr>
</tbody>
</table>
Pfeffer’s Seven Practices of Successful Organizations

- Employment security
- Selective hiring of new personnel
- Self-managed teams and decentralization of decision making
- Comparatively high compensation contingent on organizational performance
- Extensive training
- Reduced status distinctions and barriers

Knowledge Management => Innovation on Front Line -1 [Hatchuel, “… design-oriented organizations”]

Staying relevant:
- Today’s firms struggle to stay relevant and competitive.
- Companies do not understand “how knowledge (K) is formed, who possesses it, and which bodies of K should be safeguarded”
- Management can only make provisional allocations of work and guidance – subject to refinement by those pursuing the work.

The modern nature of organizational K:
- There is no such thing as K in itself. K is meaningful only in the context of collective learning processes adapted to (1) rationale of what is taking place and (2) organizational relationships.
- “Communities of Practice” are not a solution as they do not address the collective aspect of K development (in which multiple competencies interact to design solutions, solve problems, etc.)
- Likewise for matrix organizations because competencies are continually specializing, shifting, merging.
Knowledge Management => Innovation on Front Line -2  
[Hatchuel, “… design-oriented organizations”]

To stay innovative, organizations need to regenerate themselves. They do this by continually evolving:

• Skills, partners, processes, and channels as needed to stay relevant and innovative while "maintaining their identity."
• Collective learning processes in terms of:
  – concept objects (what types of products or services they work on that will give them a competitive edge)
  – relevant occupations (competencies) whose maturation will generate new specializations or occupations and projects

Design-Oriented organizations are those organizations that consciously pursue:
• collective learning cycles
• regeneration of skills, objects, and occupations within each cycle
• piloting of processes that create new concepts, objects, and occupations

Also key to learning is the use of error detection and root causal analysis not just to detect/prevent errors but to understand how design processes work.

A Framework to Support Creativity  
[Glass and DeMarco, Software Creativity 2.0, 2006]

No matter how deep the need for creativity in a field, there was also always a need to a more formal framework to nurture and support that creativity.

"Any art that’s worth the name has some kind of discipline associated with it." Murray Gell-Man

"Creativity is not a result of instinct. Rather it is the endless conflict between discipline and intuition." Yo-Yo Ma
Sutton’s Weird Ideas
[Sutton, Weird Ideas That Work, 2007]

Driving out variation makes sense when organizations do proven things in proven ways that still work.

Variance in people, knowledge, activities, and organizational structures is crucial to creativity and innovation.

Forget the past, especially your company’s successes.
Remember and replicate your company’s past successes.

Lessons from High-Reliability Organizations -1
[Weick and Sutcliffe, “Managing the Unexpected”]

Summarizing principles of high-reliability organizations:

1) Preoccupation with failure:
   • Identify and mitigate significant mistakes that must not be made
   • Attentive monitoring
   • Reflection

2) Reluctance to simplify: early warning signs are easily hidden; thus question categories, assumptions, and expectations.

3) Sensitivity to operations:
   • Give undivided attention to small deviations and interruptions
   • Treat plans, processes, and designs skeptically; making frequent adjustments to keep errors from accumulating
   • Be wary of treating routines in a mindless way
   • Use “Close calls” to maintain appreciation for potential for failure
Lessons from High-Reliability Organizations -2
[Weick and Sutcliffe, “Managing the Unexpected”]

Summarizing principles of high-reliability organizations (continued):
4) **Commitment to resilience**: sometimes the unexpected happens and begins escalating to a crisis.
   • Maintain business functions in the face of internal and external changes and allow them to degrade gracefully when they must.
   • Learn and grow from previous episodes (and prepare for resilience).

5) **Deference to expertise**: engage others in the system having the capabilities to address the evolving problems and involve them in the solution.
   • This may require the problem to migrate to the part of the organization that can best address it.

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Strategic Business Planning

Strategy making is a complex, interactive, evolutionary process, best described as one of adaptive learning.
• Mintzberg, *The Rise and Fall of Strategic Planning*, 1994

Intended strategy $\rightarrow$ deliberate + unrealized $\rightarrow$ realized strategy $\rightarrow$ emergent strategy

Various schools of thought view strategy formation process differently:
• design: conception  learning: emergent
• planning: formal  power: negotiation
• positioning: analytical  cultural: collective
• entrepreneurial: visionary  environmental: reactive
• cognitive: mental  configuration: transformation

Constantine’s Organizational Paradigms

Random
(creative, independent)

Open
(adaptable, flexible)

Synchronous
(harmony, unified vision)

Closed
(stable, hierarchical)

intrinsic flexibility

group cohesion


National Culture and Change Management

Consider Hofstede’s factors characterizing value systems in different national cultures.

- power distance
- individualism vs collectivism
- confrontation vs compromise
- uncertainty avoidance
- long-term vs short-term orientation

G. Hofstede, *Cultures and Organizations, Software of the Mind*, 1996.
Questions and Answers

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