



# *Investing in Software Process Improvement An Executive Perspective*

**Mark C. Paulk**

*mcp@sei.cmu.edu -or- Mark.Paulk@ieee.org*

**Software Engineering Institute  
Carnegie Mellon University  
Pittsburgh, PA 15213-3890**

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## *Executive Responsibilities*

**Executives and senior managers have many  
roles and responsibilities:**

- **establishing a vision for the organization**
- **being role models**
- **making decisions**
- **creating an effective culture**

**Process improvement (and Total Quality  
Management) can provide an important  
contribution to success -- and should be a topic  
for executive consideration.**



## *Topics -- Executive Responsibility*

### → **Establishing a vision for the organization**

**Being role models**

**Making decisions**

**Creating an effective culture**



## *Practical Prerequisites for a Vision*

**Are you unhappy with the status quo with respect to software in your organization?**

- dissatisfaction can be self-motivated

**Are your customers dissatisfied?**

- customer expectations change over time

**Is the competition using software superiority to gain competitive advantage?**

- “quality” is frequently relative to a benchmark

***If the answers are “No,” it is unlikely that***

- ***your behavior will change***
- ***your “sponsorship” will inspire change in others***



## Standish Group - CHAOS Study

In the U.S. in 1995, \$250 billion / year spent on information technology for 175,000 software projects

- 31% of projects canceled before completion
- 53% of projects cost 189% of original estimates
- spend \$81 billion for canceled software projects

Only 16% of software projects completed on-time and on-budget

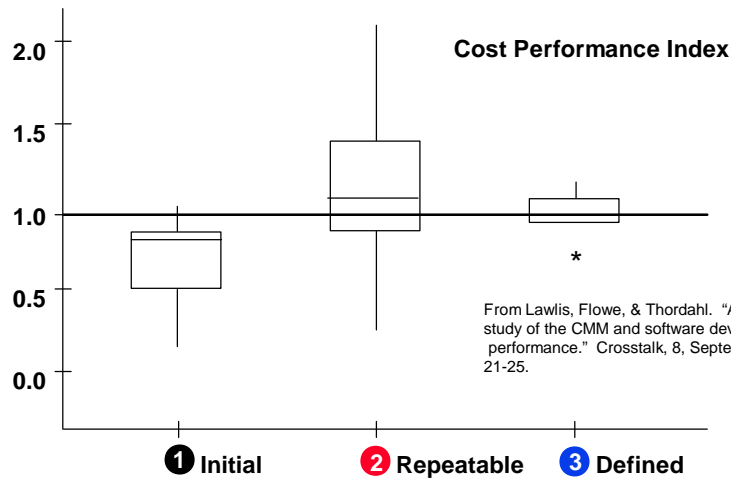
See <http://www.standishgroup.com/chaos.html> for further info.



## Evolution of Process Capability

Level	Process Characteristics	Predicted Performance
5 Optimizing	Process improvement is institutionalized	
4 Managed	Product and process are quantitatively controlled	
3 Defined	Software engineering and management processes defined and integrated	
2 Repeatable	Project management system in place; performance is repeatable	
1 Initial	Process is informal and unpredictable	

## AFIT Study

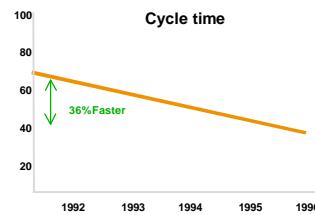
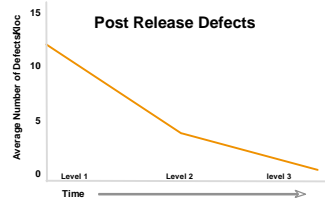
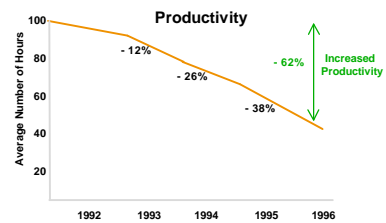
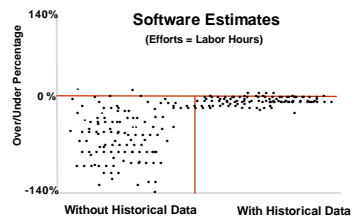


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## Impact of Software Process Improvement: Boeing Data



John Vu, Boeing, keynote talk at SEPG '97, "Software Process Improvement Journey (From Level 1 to Level 5)"

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## “Trends” in Quality Results

Maturity Level	Design Faults / KSLOC (Keene)	Delivered Defects / FP (Jones)	Shipped Defects / KSLOC (Krasner)	Relative Defect Density (Williams)	Shipped Defects (Rifkin)
5	0.5	0.05	0.5	0.05	1
4	1	0.14	2.5	0.1	5
3	2	0.27	3.5	0.2	7
2	3	0.44	6	0.4	12
1	5-6	0.75	30	1.0	61

Samuel Keene, “Modeling Software R&M Characteristics.” Unpublished report.  
 Capers Jones, “Software Benchmarking,” IEEE Computer, October 1995, pp. 102-103.  
 Herb Krasner, “Self-Assessment Experience at Lockheed,” Third Annual SEPG Workshop, 7 November 1990.  
 Karl D. Williams, “The Value of Software Improvement... Results! Results! Results!” SPIRE97, 4 June 1997.  
 Stan Rifkin, “The Business Case for Software Process Improvement,” Fifth SEPG National Meeting, 26-29 April 1993.

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## Values Help Drive Vision

Does your vision for your organization include

- meeting cost and schedule commitments?
- decreasing cycle time?

Do you plan to achieve cost and schedule improvement targets by focusing on quality as a core competency and competitive advantage?

*Operational excellence is one possible value system to drive business success -- there are other values than reliability and meeting commitments, though all are important.*

- *product leadership -- features, innovation*
- *customer intimacy -- customization, service*

*Tracy and Wiersema, The Discipline of Market Leaders.*

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## *Topics -- Executive Responsibility*

**Establishing a vision for the organization**

**→ Being role models**

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## *Espoused vs Actual Values*

**What are your espoused values?**

**What values do you really have -- as demonstrated by your behavior?**

**Are the espoused values and the actual values aligned?**

**How do you resolve conflicting goals?**

*Read “Assumptions in the Capability Maturity Model” section of Caputo’s [CMM Implementation Guide](#), pages 24-32.*



## *Paying Attention*

Practitioners and managers know what senior executives really care about.

Within limits of character and integrity, people will modify their behavior to address the concerns of those “higher in the food chain.”

*Practically speaking, it is impossible for an executive to “control” a large organization...*

*... but it is crucial that executives “lead” the organization.*



## *Results Oriented*

As the Baldrige award suggests,

If the business *results* are not measurably visible as improvement trends....

⇒ it signals an *approach* or *deployment* problem....

⇒ perhaps resulting from a focus on getting a “level” or “certificate” rather than achieving business objectives



## *Managing Improvement*

1. Do you have improvement objectives?
2. Do you measure progress toward achieving those objectives?
3. Can you forecast whether you will achieve the objectives?
  - If yes, are you considering what new objectives to establish?
  - If no, what are you doing to take corrective action? Revise plans? Develop a new strategy?

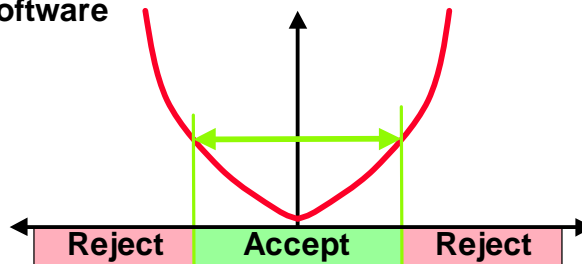


## *Going Beyond the Minimum*

High maturity organizations -- organizations with a quality culture -- go beyond the minimum.

Implies an understanding of Taguchi loss function

- “defective” is not a step function, even for software





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## *Making Decisions*

**Many possible choices for an improvement framework...**

**SEI's Capability Maturity Model(s)**

**ISO 9001 (Quality Management Systems)**

**ISO/IEC 15504 (Software Process Assessment)**

*... or Baldrige (USA), Bootstrap (Europe), ISO/IEC 12207 (Software Life Cycle Processes), Software Productivity Research (MIS), Trillium (telecom), ...*

*... or improvement "philosophies" such as Deming, Juran, Crosby, Six Sigma, Goal/Question/Metric, ...*



## What Is the Software CMM?

A **common-sense** application of process management and quality improvement concepts to software development and maintenance

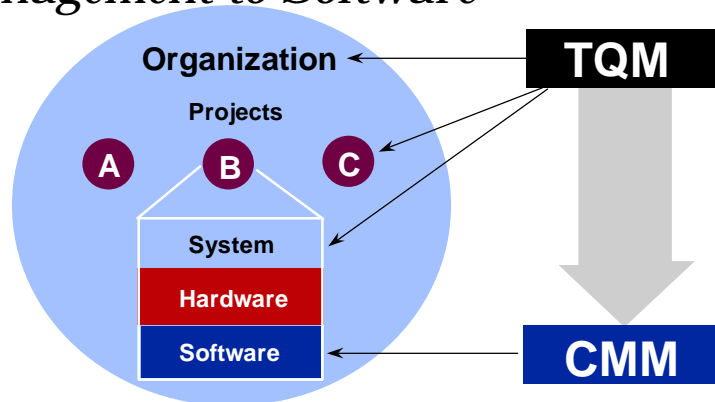
A **community-developed** guide

A model for **organizational** improvement

The underlying structure for **reliable and consistent** CMM-based appraisal methods



## Applying Total Quality Management to Software



Process improvement fits in an overall business context—CMM applies to software.

## Software CMM v1.1 Key Process Areas

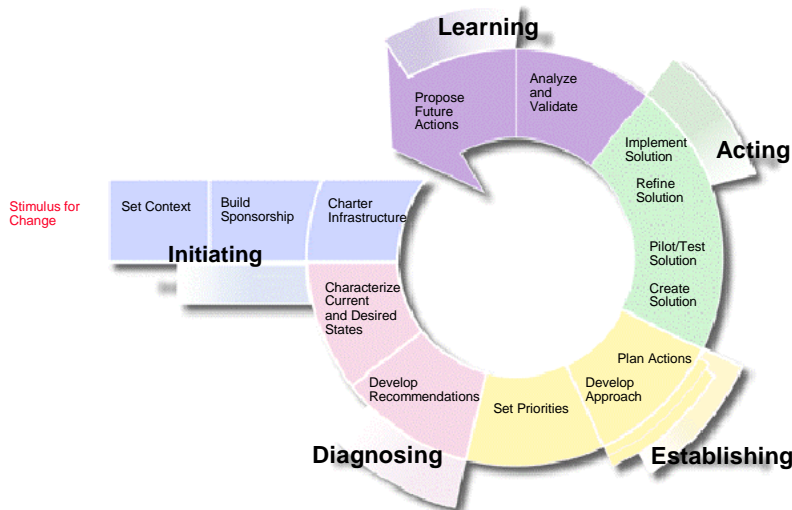
Level	Focus	Key Process Areas	
5 Optimizing	<i>Continuous process improvement</i>	Defect Prevention Technology Change Management Process Change Management	Quality Productivity
4 Managed	<i>Product and process quality</i>	Quantitative Process Management Software Quality Management	
3 Defined	<i>Engineering processes and organizational support</i>	Organization Process Focus Organization Process Definition Training Program Integrated Software Management Software Product Engineering Intergroup Coordination Peer Reviews	
2 Repeatable	<i>Project management processes</i>	Requirements Management Software Project Planning Software Project Tracking & Oversight Software Subcontract Management Software Quality Assurance Software Configuration Management	
1 Initial	<i>Competent people and heroics</i>		Risk Waste

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## SEI's IDEAL<sup>SM</sup> Approach



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## *What Are the Benefits of Model-Based Improvement?*

**Establish a common language**

- **forge a shared vision**

**Build on a set of processes and practices developed with input from a broad section of the software community**

**Provide a framework for prioritizing actions**

**Provide a framework for performing reliable and consistent appraisals**

**Support industry-wide comparisons**



## *What Are the Risks of Model-Based Improvement?*

***Models are simplifications of the real world.***

**Models are not comprehensive.**

**Interpretation and tailoring must be aligned to business objectives.**

**Judgement is necessary to use models correctly and with insight.**

**Potential for dysfunctional behavior to get a maturity level rating.**



## *Picking a Framework*

***Any model or standard can be helpful; all models and standards must be used with intelligence and common sense.***

The best-known and most widely used “quality standard” for general use is ISO 9001 (plus 9004).

The best-known and most widely used model for software process improvement is the Software CMM.

Some models and standards may be more relevant to your environment, e.g., Trillium for telecom

***Models and standards are not necessary for effective improvement.***



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## *Creating the Culture*

Process improvement is a lifestyle change...

### ***Silver Bullet = Diet***

- **95% of all dieters regain the weight they have lost... and more... within one year of a diet**

### ***Process Improvement = Lifestyle Change***

- **60% of those who change their lifestyle to eat less and exercise more maintain their weight loss**



## *Process Management and the Known*

Management must deal with both known and unknown factors.

- ***process management*** focuses on the known, on controlling repeatable (if not repetitive) processes
- ***risk management*** focuses on controlling the unknown
  - superior life cycle models: incremental, evolutionary, etc.
  - identifying and tracking risks



## *Processes That “Last”*

**Deal with the normal day-to-day work, with waivers for exceptional conditions (common sense!)**

**Are defined by the people doing the work**

**Contain the minimum essential information to do the job**

**Balance discipline with creativity**

**Are supported by both tools and culture**

**Are continually improving**



## *In Conclusion*

**Any model or standard can be used effectively for process improvement -- if used with the proper spirit.**

**Some models and standards are arguably more effective in particular environments.**

- **Software CMM, for example, is written to guide software process improvement**

**A systematic approach to process management and improvement leads to performance excellence in achieving business objectives.**



## *Let Common Sense Prevail!*

		Process Rigor	
		Yes	No
Common Sense	Yes	Quality	Creative Chaos
	No	Mindless Bureaucracy	Mindless Chaos

With thanks to Sanjiv Ahuja, former President and COO of Telcordia Technologies.

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## *General SEI Information*

**SEI Customer Relations +1 (412) 268-5800**

**SEI FAX number +1 (412) 268-5758**

### **Internet Address**

**customer-relations@sei.cmu.edu**

### **Mailing Address**

**Customer Relations  
Software Engineering Institute  
Carnegie Mellon University  
4500 Fifth Avenue  
Pittsburgh, PA 15213-3890**

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## *Internet Access to SEI*

### **SEI Web pages**

- [www.sei.cmu.edu](http://www.sei.cmu.edu)
- [www.sei.cmu.edu/cmm/](http://www.sei.cmu.edu/cmm/)
- [www.sei.cmu.edu/cmm/cmm.articles.html](http://www.sei.cmu.edu/cmm/cmm.articles.html)
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