Staged Representation Considered Harmful?

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An Acknowledgement

- Edsger W. Dijkstra, "Go To Statement Considered Harmful"
  - Communications of the ACM, Vol. 11, No. 3, March 1968

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"Stages of Maturity"

Stage	Characteristics
1: Uncertainty	"We don't know why we have problems with quality."
2: Awakening	"Is it absolutely necessary to always have problems with quality?"
3: Enlightenment	"Through management commitment and quality improvement we are identifying and resolving our problems."
4: Wisdom	"Defect prevention is a routine part of our operation."
5: Certainty	"We know why we do not have problems with quality."

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Crosby Quality Management Maturity Grid

	Uncertainty	Awakening	Enlightenment	Wisdom	Certainty
Management understanding and attitude					
Quality organisation status					
Problem handling					
Cost of quality as percentage of sales					
Quality improvement actions					
Summation of company quality posture					

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The Maturity Levels

- Maturity levels are well-defined evolutionary plateaus on the path to becoming a mature software organization.

  - Each level is a layer in the foundation for continuous process improvement.

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The "archetype" – SW-CMM

Optimizing (5)
Focus on process and technology improvement

Managed (4)
Process measured and controlled

Defined (3)
Process characterized, fairly well understood

Repeatable (2)
Can repeat previously mastered tasks

Initial (1)
Unpredictable and poorly controlled

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The Basic Principles

- First, get your basic management practices in place.

- Next, ensure you have consistent performance across the whole of the organization;

- Now, apply basic techniques of statistical process control;

- And ensure continuous improvement.

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Conclusions from this

- Until you have your basic principles in place, you have no real basis for performance.

- Level 1 is "the Initial Level"

- An organization at the Initial Maturity Level:
  - Is performance driven by the competence and heroics of the people doing the work.
  - Is unpredictable-for good or ill.
  - Is characterized by major problems that are managerial, not technical.

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The Concern

- The Maturity Model does not pay attention at an early stage to the importance of "doing a good job".

- The quality of engineering is not considered as a significant issue.

  – Most engineering concerns are not addressed until Level 3.

- There is an assumption that "engineers do adequate engineering".

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The Risk

- The aim at Level 2 is to institutionalise the basic management practices.
  - "The ingrained way of doing business that an organization follows routinely as part of its corporate culture."
- If basic engineering practices are inadequate, the risk is that these may become institutionalised;
  - And therefore resistant to change.

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The Potential Outcome

- An organization that applies sophisticated management practices to defective engineering.

- Deficient engineering practices are a part of the organizational culture, and are rationalised as an "appropriate response to the environment".

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An Example - 1

- Two practitioner teams implemented a single real-time personnel badge-reading application, employing two very different software development approaches.

    - A "CMM4" team used a waterfall-based, relatively traditional, approach, relying on UML (Unified Modeling Language) and Rational Rose and their Capability Maturity Model Level 4 status to produce the required product reliability.

    - A "FORMAL Methods" team used formal methods, including the functional programming language Haskell, and Specware, a tool for formal specification.

Bob Glass, IEEE Software, Jan 2003.

Smidts, Huang and Widmaier, Journal of Systems and Software 61 (2002) 213–224

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An Example - 2

- Both teams failed to meet the goals of the project.

  – The "FORMAL METHODS" group failed largely because of a lack of Process.

  – The "CMM4" group failed because:

    - "They misjudged the set of customer requirements for the product, pronounced that set "one of the best ever," and implemented it without further questions. No designers or implementors analyzed the requirements, which made spotting their flaws (predominantly ambiguity) impossible."

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Interpreting the Results

- The "High Maturity" group in this instance represents an almost text-book case of applying institutionalised poor engineering practice.

- The risks associated with the inadequate approach to requirements engineering were never really recognised.

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Thinking About Maturity

- Our whole view of organizational maturity needs to be revisited to address these concerns.

- There is an assumption that as organizations mature, they will "naturally" identify and correct weaknesses in their approach to engineering.

- This is not necessarily the case.

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Institutionalisation

- The focus on institutionalisation can lead to "group think" that reinforces the use of poor engineering practice.

- Where the practices are not conventionally exercised (in normal day-to-day engineering) their weakness may not be evident.

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A Proposal

- Considering the principles of a Continuous Representation of process capability leads to a new concept for Organizational Maturity:

- Level 1 as an Achievement!

  – Level 1 Maturity represents the situation where an organization has mastery of basic principles of those disciplines that are core to its business.

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The Current Model

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The Proposal

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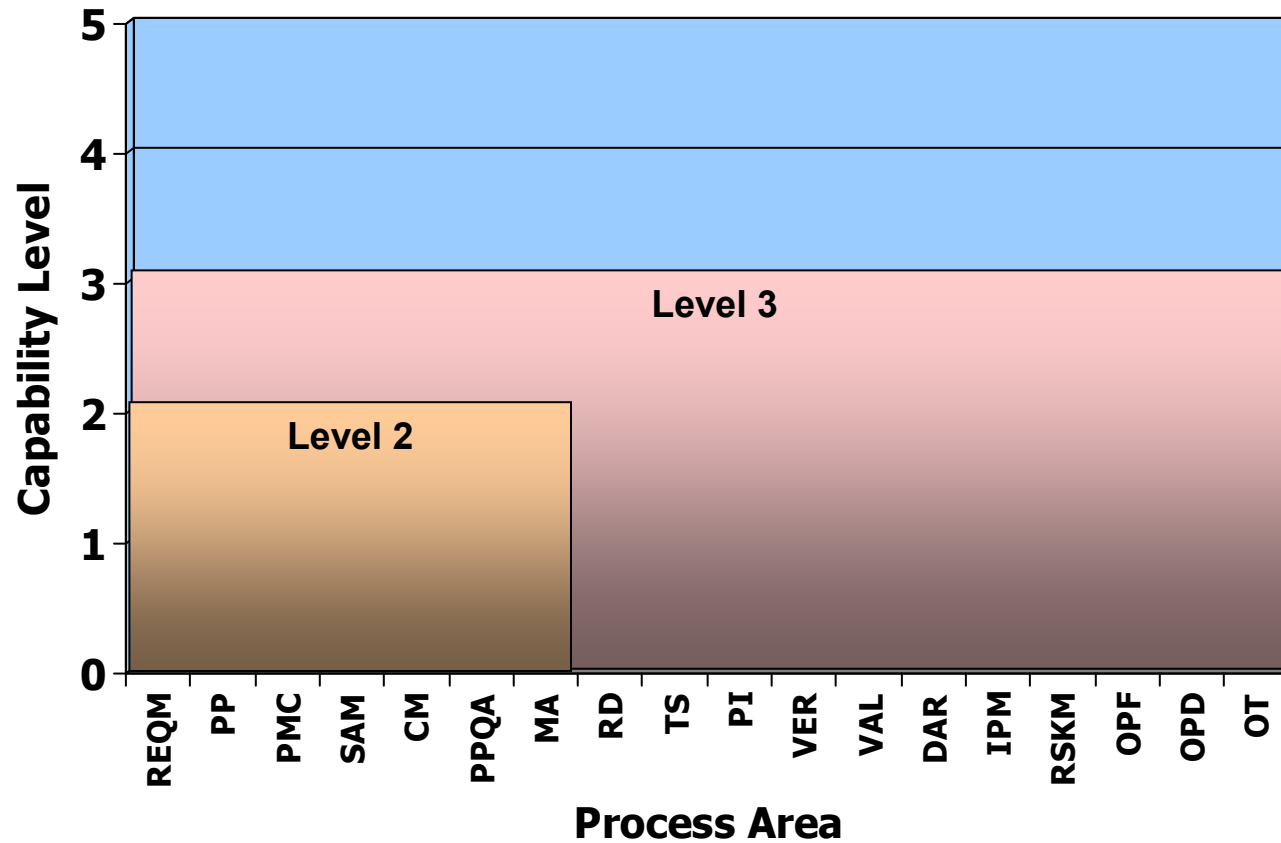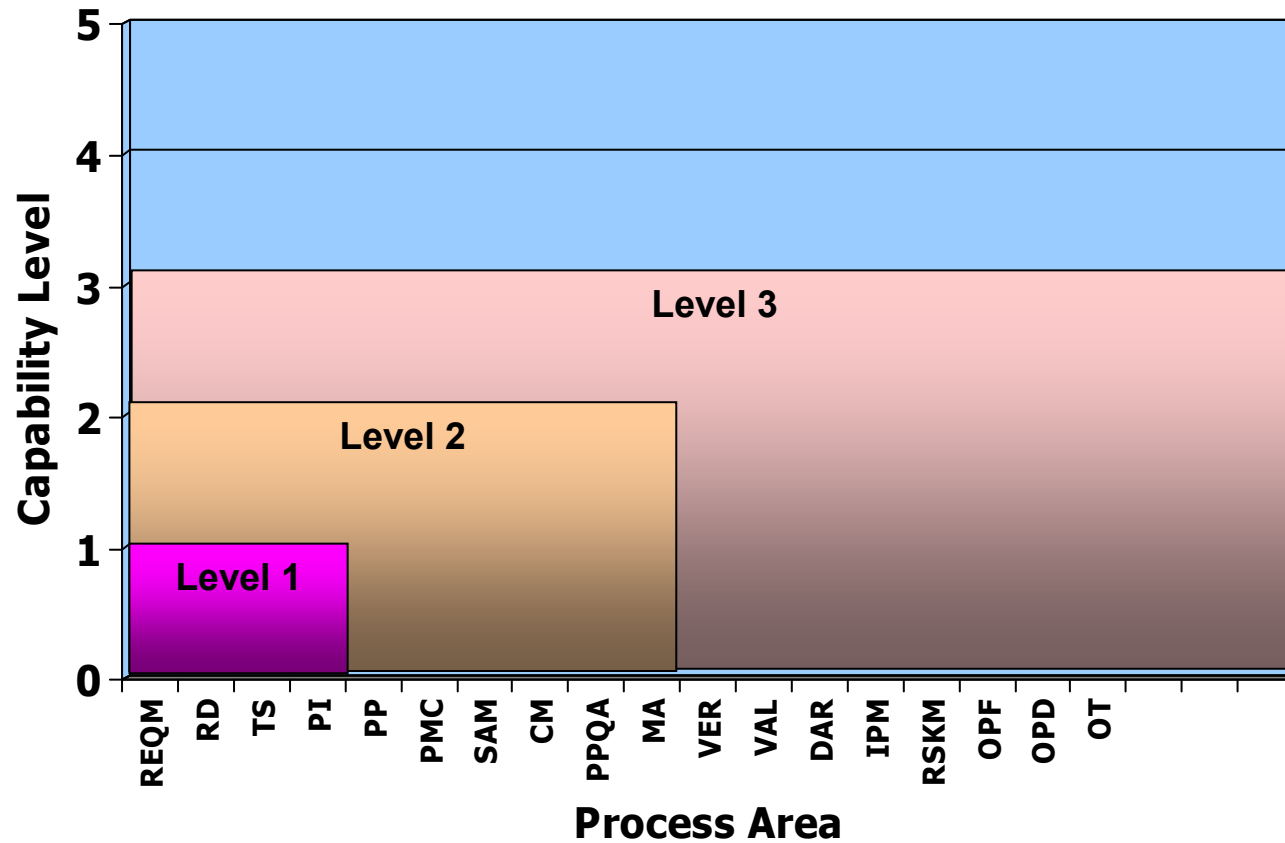
Conclusions

- The view of Organizational Maturity embedded in our current "Staged Representation" can be seen as dangerous because it can lead to the institutionalisation of poor engineering practice, with accompanying risks.

- It is suggested that basic engineering performance should be recognised as an integral part of basic maturity.

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