What the SEI Won't Teach You*

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*Nothing to hide, just not their style.

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Topics

- A brief history of the SEI and CMMI
- What the CMMI is and isn't
- What the appraisal is and isn't
- How the appraisal works
- How you need to qualify and prepare
- Typical P-I Plan
- Different macro-level ways to get everything set-up

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About You

- ▲ *What* is your name?
- ▲ *What* is your purpose?
- ▲ *What* is the airspeed velocity… never-mind..
- ▲ What is your knowledge/experience with CMMI?
- ▲ What would you like to get out of CMMI?
- ▲ What would you like to get out this session?

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Well… it sounded like a good idea.

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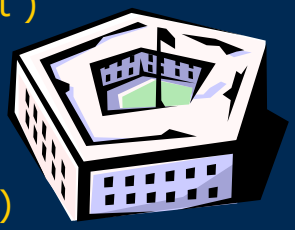
SEI

- Software Engineering Institute
- DOD Funded
- Standish Group Study ("Chaos Report")
- Carnegie Mellon University
- Beat U of MD in a Competition (GQM)



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SEI's Purpose

- STOP THIS:
  - ~80% software projects fail
  - ½ cancelled
  - ½ are over budget and schedule by 2x and deliver <60% expected functionality
  - ~20% succeed:
    - <20% over budget and schedule and deliver >75% of expected functionality

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Brass Tacks

- Software customers
  - Paid ***twice*** as much
  - Waited ***twice*** as long
  - And Got ***half*** of what they expected
- And the DoD was **TIRED** of it!

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CMMI (CMU/SEI-2006-TR-008, ESC-TR-2008-008)

- Started out as CMM
  - C apability
  - M aturity
  - M odel
- Became SW-CMM when SEI introduced
  - SE
  - SA
  - IPD
  - P
  - Security

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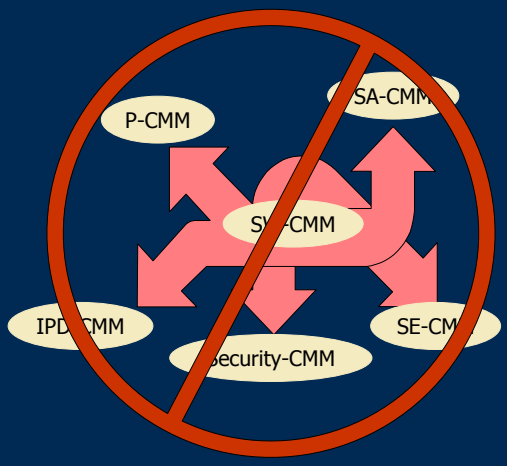
CMMI (CMU/SEI-2006-TR-008, ESC-TR-2008-008)

- ▲ C apability
- ▲ M aturity
- ▲ M odel
- ▲ I ntegration



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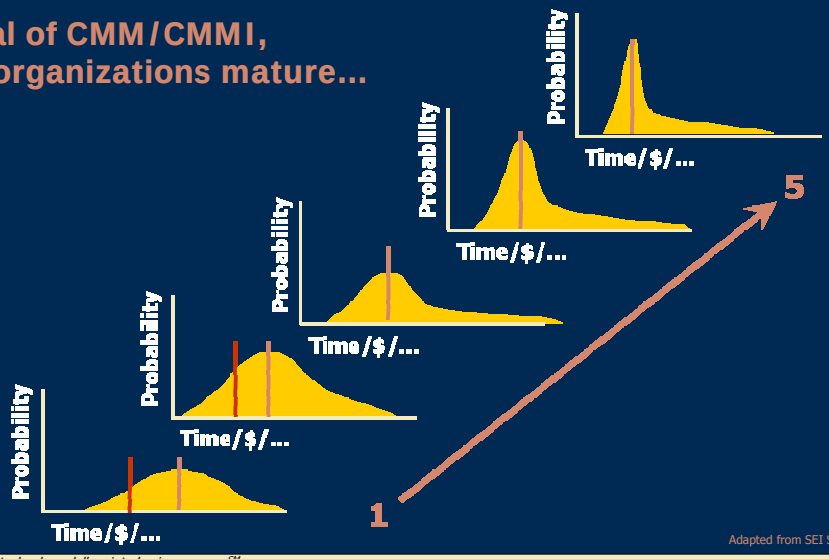
NAME(S) NOTWITHSTANDING

Goal of CMM/CMMI,
As organizations mature…



Adapted from SEI Sources

Definitions and Misconceptions

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CMMI is a FRAMEWORK

- ▲ Not a standard
- ▲ Not a prescription
- ▲ IS a description
- ▲ CANNOT be cookie cutter (and still work well)
- ▲ Does not require purchase of software or tools
- ▲ Meant for process **improvement**, not process **compliance**.

Improvement vs. Compliance

- Process Compliance =

  Do the process this way.

- Process Improvement =

  Do things that will make a difference to your company.

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It Is What It Is...

- CMMI is:

  A **model**

  for ***creating*** **process improvement** ***systems***

  for the **management** of

  development processes.

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Models

Not "Enterprise" Model

© Paramount Pictures

It's Not What It's Not...

- CMMI is NOT:

  A **life cycle**

  or a **standard**

  for **developing products**

  or **development processes.**

Model Structure, Terminology and *Actual* Requirements

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Improvement not Definition

- The *model* is not the *process*!
- CMMI is full of practices to IMPROVE your processes, not to DEFINE your processes.
- You likely have practices of your own in most/all process areas.
  - Probably by other names.
  - Likely generating their own appropriate work products.
- CMMI's practices are meant to improve *those* activities.
- If you're not doing an activity, it's probably a good idea to do it, so you could do worse than consider it.

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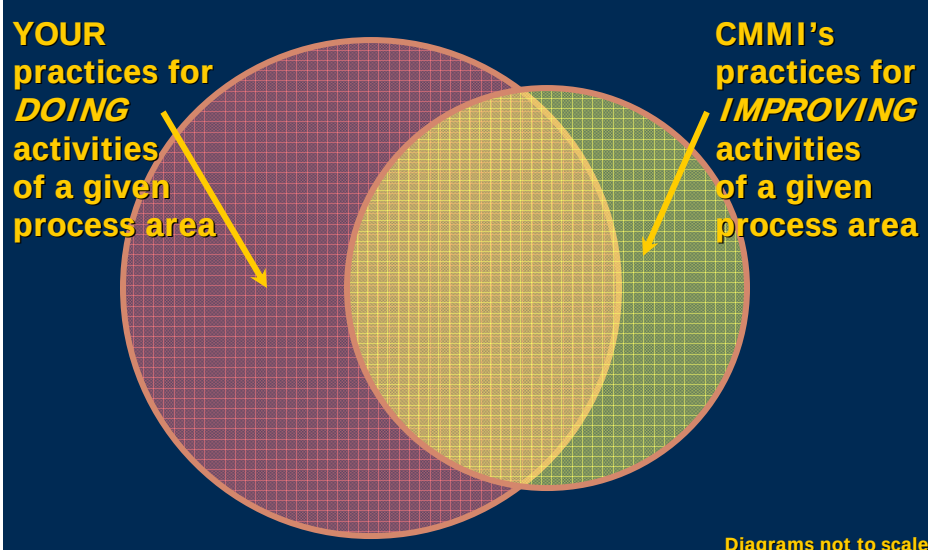
Model Practices vs. Your Practices



Diagrams not to scale.

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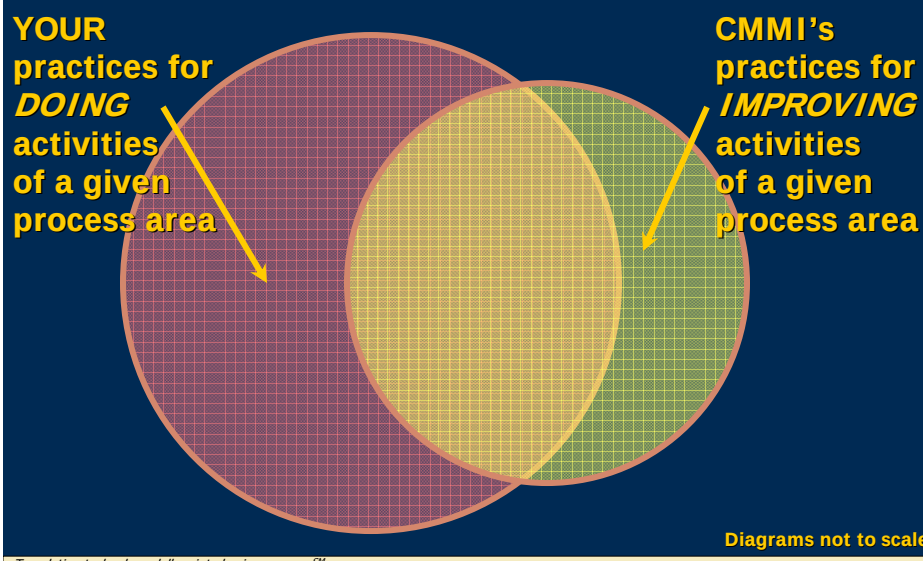
It often seems like this…

© Lucasfilms

Model Practices vs. Your Practices



Diagrams not to scale.

CMMI Structure: A Key to Understanding Your Options

- What "processes" (process areas) do we have to do?
- Do we need a Maturity Level?
- What's Capability Level?
- What's the difference between "Staged" and "Continuous"
- Do we have to do these Generic Practice things?
- Why is it so complicated?
- !&*!!##!??$***$!??
- !
- To answer these questions…

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CMMI Structure

- "Super-Structure"
  - Constellations
    - **DEV** / ***ACQ*** / *SVC* / ,,,
  - Representations
    - Staged / Continuous
  - Additions
- Categories
  - Process Areas related to each other
    - Engineering / Proj Mgmt / Proc Mgmt / Support

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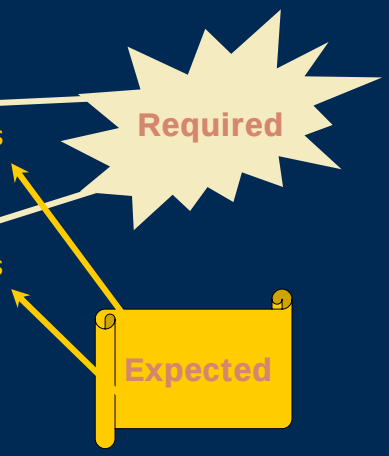
Focus of CMMI Structure

- Process Areas
  - Specific Goals
    - Specific Practices
  - Generic Goals
    - Generic Practices



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CMMI "Representations"

- Staged
  - Familiar levels…
  - Do these cumulative *m* processes for level *x*,
    Do these cumulative *n* processes for level *y*…
  - Results in ***Maturity*** **Level** **Rating**
- Continuous
  - New level structure
  - Do *your pick* of processes to *this extent* for level *p*,
    Do *your pick* of processes to *this extent* for level *q*…
  - Results in a ***Capability*** **Level** **Rating**

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"Additions" & Constellations

- Additions
  - Currently, the only "additions" are for IPPD.
  - Implementing IPPD was once done by including 2 PAs and some goals.
  - PAs denoted by "**+**"s
  - In the future there may be other additions.
- Constellations
  - Core PAs (16)
  - Development
  - Acquisition

  } (Currently the only ones published.)
  - Services (under development)
  - May be others in the future.

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Representations: The PA Mix

- Process improvement path

  or
- Level ratings

- Representations:
  - How you mix and match the choice of PAs, and
  - How you plan to grow your capability and maturity.

- Growing Maturity = # of PAs
- Growing Capability = Depth of Institutionalization

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What is Institutionalization?

- Let's talk about products and projects for a moment.
- You're the PM.
- What would be expected of you to manage the product/project?
  - ...
  - ...
  - ...
  - ...
  - ...
- We like to call it ***acculturation***

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CMMI Components

- Process Areas (PA)
- Specific Goals (SG)
- Specific Practices (SP)

Maturity*

- Generic Goals (GG)
- Generic Practices (GP)

Capability / Institutionalization / (*Acculturation*)

***Not strictly speaking**

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Process Areas (PAs)

- There are 22 Process Areas in the entire CMMI-Dev.
- Each PA describes:
  - One set of goals and practices that make up the process area: **Specific** *Goals* and **Specific** *Practices*
  - And one set of practices that are shared across all process areas: **Generic** *Goals* and **Generic** *Practices*

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Specific Goals (SG)

- Each Process Area has at least 1 Specific Goal
- All the Specific Practices are organized by which Specific Goal they help organizations achieve.
- The Goals are what organizations are ***required*** to pursue.
- While the *Practices* are what organizations are *expected* to perform, they can be swapped with alternative practices.

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Specific Practices (SP)

- What organizations are "**expected**" to actually ***do*** in order to achieve a Goal is described in some number of Specific Practices.
- Most Goals have several practices.
- The straightest line to achieving a goal is to perform the practices.
- *The "straightest line" may a matter of perspective.* ***Do not assume*** *every practice is right for you.*

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Generic Goals (GG)

- Every Process Area has the same Generic Goals with "fill-in-the-blank" differences for each PA.
- Choice of "Staged" or "Continuous" representation determines which Generic Goals are required for a level rating.
- "Capability Level *N*" implies that you are performing all the SG/SPs in a PA + all the GPs in through GG *N*
- GGs imply how "deeply *institutionalized*" your practices are…

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Generic Practices (GP)

- GPs in each GG describe what you're doing to "***institutionalize***" the SGs and SPs.
- @ GG 1 you are barely executing the PA's SPs from project to project.
- @ GG2 you are making a conscious effort to plan, track, and ensure the success of each PA's SPs. It may look different from project to project, but you're doing enough work each time to get it right.

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GP stuff continued

- @ GG3 you have a single set of defined processes that each project uses and tailors to their specific instantiation. With a single set, you can now start to collect and feed-back improvement data on the processes.
- @ GG 4 you will be using the data in GG 3 to manage the processes using numbers, not just management oversight. "Quantitatively Managed"
- @ GG 5 you're able to use computational methods to predict process performance, to anticipate process issues, and to create an environment in which you can really get creative with what you improve, how you improve, and when.

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What's "Required"?

- Goals are **REQUIRED**
- Practices are ***expected*** not required
  - You've 'got' to be doing "something" to be achieving a goal.
  - If you don't already have good ideas for how to achieve a goal, the practices are a good place to start.
- Everything else is "commentary"
  - Which can be helpful if the goals or practices aren't self-explanatory.
- ***Don't assume you and CMMI use terms the same way.***

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Ratings Ingredients, 1

- Maturity Levels (Staged)
  - Level X =
    - All PAs in the LEVEL
    - All SGs in the PA
      - All SPs in the SG
    - All GGs in the PA
      - All the GPs in the GGs

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Ratings Ingredients, 2

- Capability Levels (Continuous)
  - Level X =
    - All GG-Xs in the PAs you've chosen
      - All the GPs in the GG
    - All the SP-Xs in the PAs you've chosen
      - SPs still do add up to SGs

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Ratings Implications

- Saying "ML" 2, 3, etc. carries clear implications.
  - People who know, know which PAs and GGs you are performing.
- Saying "CL" 2, 3, etc. is incomplete.
  - Must be qualified by stating which PAs you are CLx *in*.

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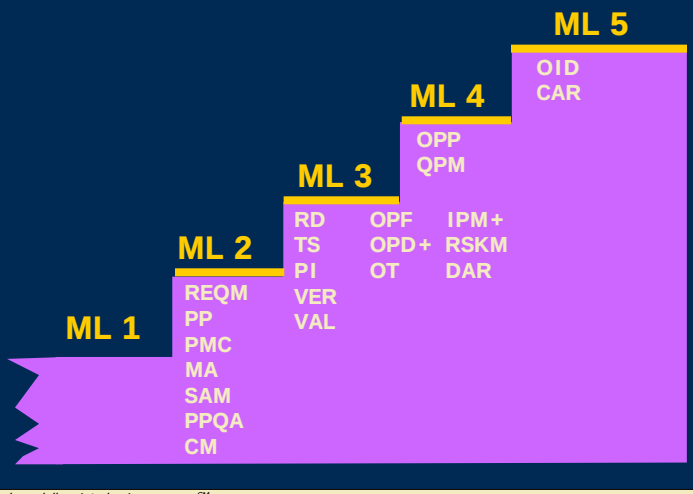
Confusing? An Example: (part 1)

Maturity Levels



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Confusing? An Example: (part 2)

Capability Levels

	PA1	PA2	PA*r*
	SG1	SG1	SG1
	SP1.1	SP1.1	SP1.1
	SP1.2	SP1.2	SP1.2
	SP1.*m*	SP1.*m*	SP1.*m*
	SG*q*	SG*q*	SG*q*
	SP*q*.1	SP*q*.1	SP*q*.1
	SP*q*.2	SP*q*.2	SP*q*.2
	SP*q*.n	SP*q*.n	SP*q*.n
	GG1	GG1	GG1
CL1	GP1.1	GP1.1	GP1.1
	GG2	GG2	GG2
CL2	GP2.1 - 2.10	GP2.1 - 2.10	GP2.1 - 2.10
	GG3	GG3	GG3
CL3	GP3.1 - 3.2	GP3.1 - 3.2	GP3.1 - 3.2
	GG4	GG4	GG4
CL4	GP4.1 - 4.2	GP4.1 - 4.2	GP4.1 - 4.2
	GG5	GG5	GG5
CL5	GP5.1 - 5.2	GP5.1 - 5.2	GP5.1 - 5.2

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Certification?

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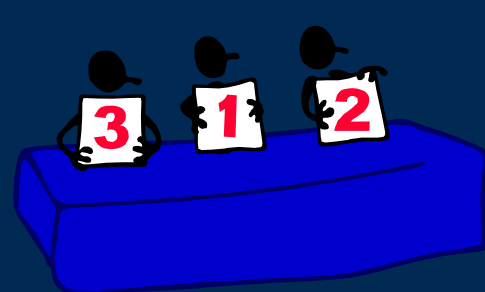
Ratings?

- You perform an APPRAISAL
- You get a RATING
- You **do not** get *CERTIFIED*



Translating technology dollars into business sense.℠

Not one more Seafood Joke!

▲ SCAMPI

▲ **S tandard**

▲ **C MMI**

▲ **A ppraisal**

▲ **M ethod**

▲ **P rocess**

▲ **I mprovement**

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SEI Eats its own Dog food

▲ ANSI/ISO 15504 ("SPICE")

▲ **A**ppraisal **R**equirements for **C**MMI
(TR CMU/SEI-2006-TR-011 ESC-TR-2006-011)

▲ SCAMPI Method **Def**inition **Doc**ument
(HANDBOOK CMU/SEI-2006-HB-002)

▲ Appraisal Plan

▲ Appraisal Results

More on what it is and is not

- Not a Test
- Is a benchmark
  - for where you are for yourselves,
  - not relative to others
- Can be used for many purposes, not just ratings
- DOES NOT require special documentation
- DOES NOT intrinsically impose any tools or work(!)

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Appraisal Mechanics You Must Know

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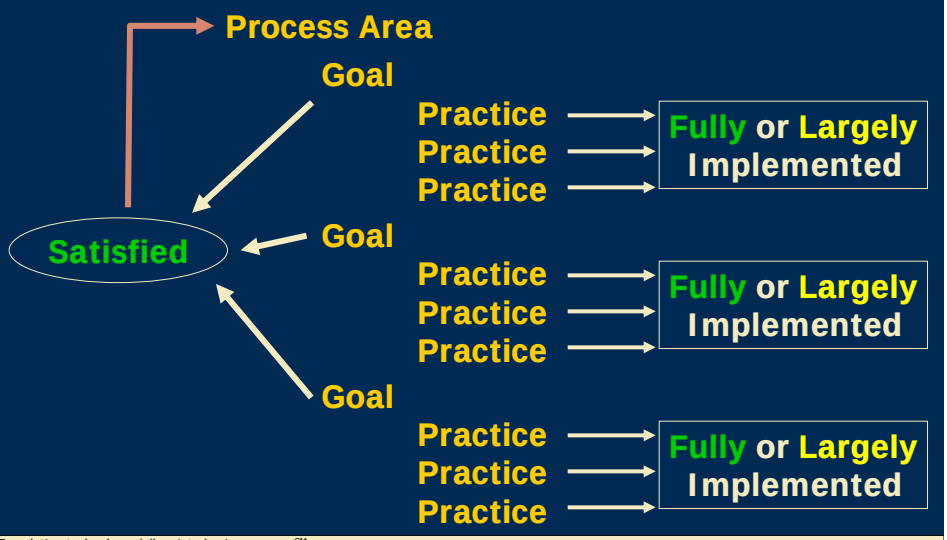
Level Ratings, 1



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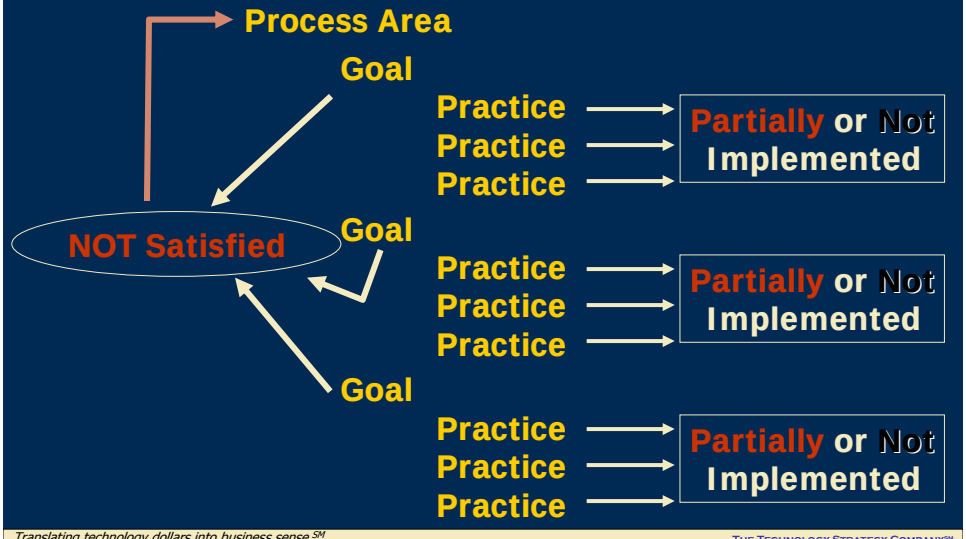
Level Ratings, 2



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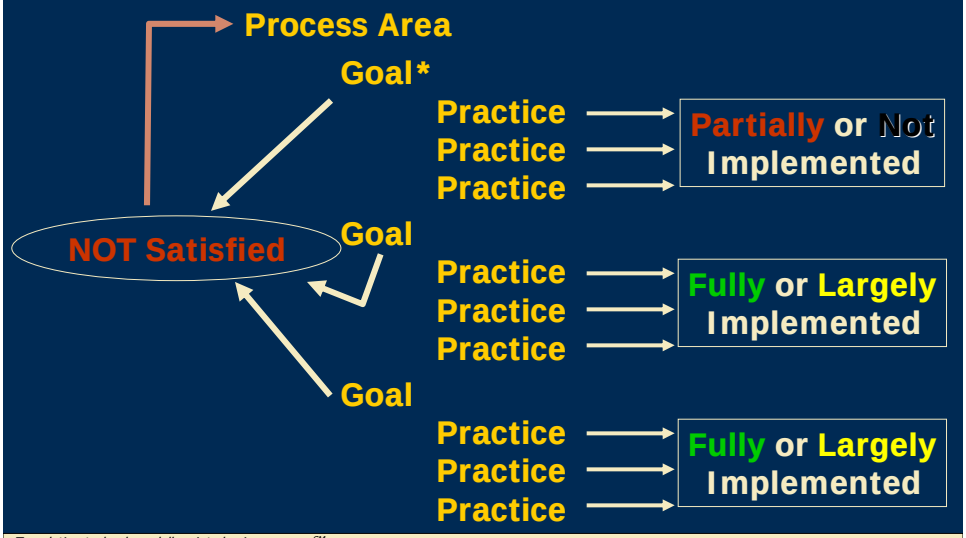
Level Ratings, 3



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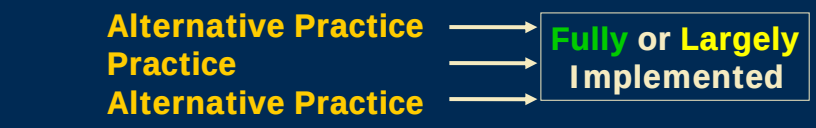
*Not all she wrote



Alternative practices must be qualified, and supported by Objective Evidence

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How we determine FI, LI, PI and NI

- **Objective Evidence**
  - Direct Artifact
    - Direct output of a process/practice, e.g., the process says "write a plan" and the DE is the plan
  - Indirect Artifact
    - Some item that clearly shows a process was being followed e.g., meeting minutes in which a process/practice was addressed
  - Affirmations
    - Verbal (written or oral) communication to the appraisal team that provides positive corroboration of a process.

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FI, LI, PI and NI

Goal				
	Practice			
		Project 1		
		Project 2		
		Project 3		
	Practice			
		Project 1		
		Project 2		
		Project 3		
	Practice			
		Project 1		
		Project 2		
		Project 3		

Goals are just 👍 or 👎

Can only be LI

Can't be FI
Could be PI

Can only be LI

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Minimum Objective Evidence

1 Direct Artifact

+

1 Indirect Artifact or 1 Affirmation

(with a calculated minimum # of affirmations)

Definitions of FI, LI, PI (NI and NR)

▲ **Fully Implemented=**
All required OE and no weaknesses

▲ **Largely Implemented=**
All required OE and qualified weaknesses, or consistency among weaknesses.

▲ **Partially Implemented=**
Missing OE and/or weaknesses that prevent the practice from being implemented.

What's a Weakness?*

- Practices that are *not*, or are only *partially*, performed.
- Evidence that must be massaged to fit the expected practice, or, that you did it looks like a coincidence.
- Evidence that is out of synch with practices definitions.
- Evidence that looks like it was created for the appraisal.

*not a complete list

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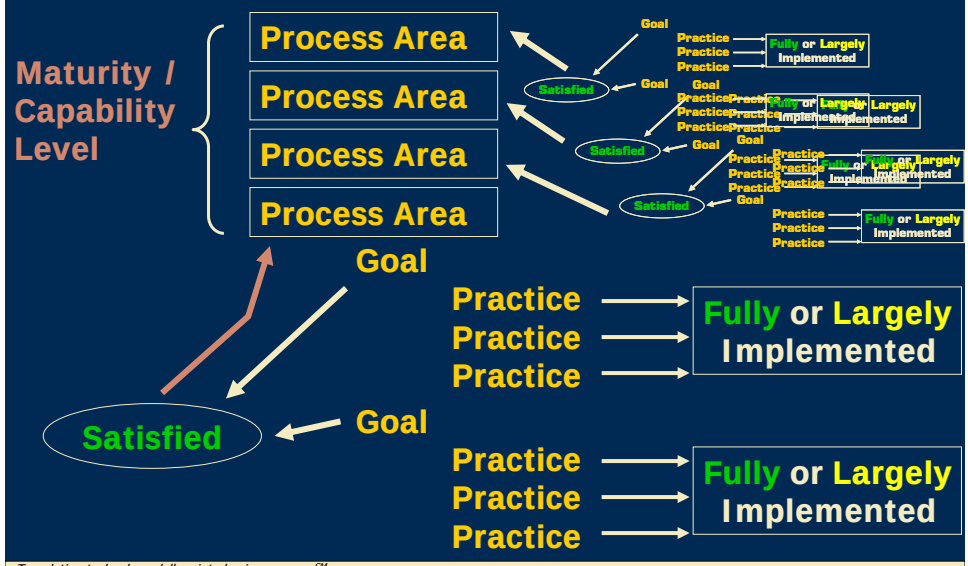
Picture is worth…



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What Gets Appraised? (1)

- Appraisal applies to ***ORGANIZATIONAL UNITS***
  - Not always the entire company.
  - Not always all parts of the organization using CMMI.
  - Defined by the company, not the appraisal team.

What Gets Appraised? (2)

- Sample "Instances"
  - Representative of the Organizational Unit (OU)
  - Include "Focus Projects" and "Non-Focus Projects" as a function of appraisal scope.
  - "Representative Sample" determined collaboratively by OU and Lead Appraiser, based on critical factors
    - Coverage (in several attributes)
    - Domains (usually market, technology, life cycles, …)
    - Geography (sometimes LOBs, localizations, …)
  - Iterations? Releases?

"Project" vs. Instantiation

- SCAMPI Artifacts are based on "Instances" not "Projects".
- Often "Instances" = "Projects", but not always.
- DO NOT ASSUME that what you or your client or your contract call a "project" is the same as:
  - what CMMI (for process use) or
  - SCAMPI (for artifact collection)

  may interpret as an "instance".

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Are you ready?
When are you ready?
Should you bother?

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Basics

- Have policies and processes.
- Follow them.
- Can show (objectively) that you follow them.

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Preparation Basics

- Any company staff on the Appraisal Team **must** have completed an SEI-Licensed course of *Introduction to CMMI*
  - (Team consists of a leader + 3 people)
  - (Can include internal and external members)
- Team members (and leaders) must have certain minimum experience
  - In Engineering, Management and Life Cycle
  - Sticking junior staff on the team is not a good plan

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More Prep

- Lead-in to the Appraisal includes:
  - Readiness Review(s)
  - Appraisal Team Training (not the same as "Intro…")
- Lead Appraiser writes an Appraisal Plan
  - Registers the appraisal with SEI
- These two slides outline what's required by the SEI, not what may needed for YOU.

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Getting Started to Getting Done

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Typical Road Map

- Goal Analysis
  - Where are you relative to the CMMI?
- Training/Knowledge Transfer
- Process Improvement
  - Assuming you "ain't all *that*"
  - Process creation and deployment
- Process Institutionalization and Normalization
- Appraisal Prep

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Factors that affect Time and Cost

- Where you are w.r.t. CMMI? (i.e., Goal Analysis Results)
- How "process-oriented" is your company?
- How much work will your company do on its own?
- How much work will your company need help doing?
- How much progress do you think you'll be able to make?
- How quickly?

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STOP!

- You really must answer some questions of yourself before you even embark upon the SCAMPI journey.
  - Why do you want one?
  - Can your reason be justified in business goals?
  - Can your business goals be qualified in ROI?
  - If you're not the one who calls the shots, who is and will that person give you the resources to get through this successfully?

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THE TECHNOLOGY STRATEGY COMPANY℠

DIFFERENT MACRO-LEVEL WAYS TO GET EVERYTHING SET-UP

Opinion: The most "common" way is the worst way. The "path of least resistance" usually means you hit the wall faster.

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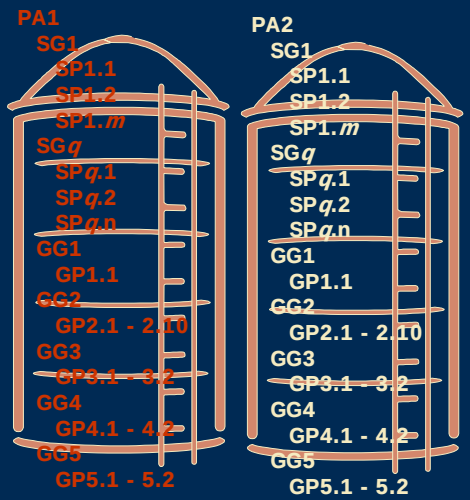
Process Silos

- PAs in a vacuum.
- Each PA is self-contained in it's own silo.
- For each PA instance, practices are planned, performed to its plan.
- Can be implemented w/out affecting 'real' work.
- Adds layers of process overhead & paperwork.
- Makes appraisers' jobs easier.
- Makes developers' jobs harder.
- Least "Institutionalization"



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A word about the GPs

- Generic Practices:
  - Establish an Organizational Policy & a Defined Process
  - Plan the Process
  - Provide Resources
  - Assign Responsibilities
  - Train People
  - Manage Configurations
  - Involve Stakeholders
  - Monitor & Control the Process
  - Objectively Evaluate Adherence & Collect Improvement Information
  - Review Status w/Higher Level Mgmt

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GP Discussion

- Generic Practices
  - Same in every PA
  - Refer to the SPs of the respective PAs
- The Silo'd Approach:
  - Is mechanical and simple (minded)
  - Good for companies with lots of overhead
  - Requires these be done for every project
  - Often unrelated to:
    - what the actual work is
    - when the actual work is done
    - when practices are used
  - Most often, very disruptive
  - Too easy to "get wrong"

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In Our Opinion

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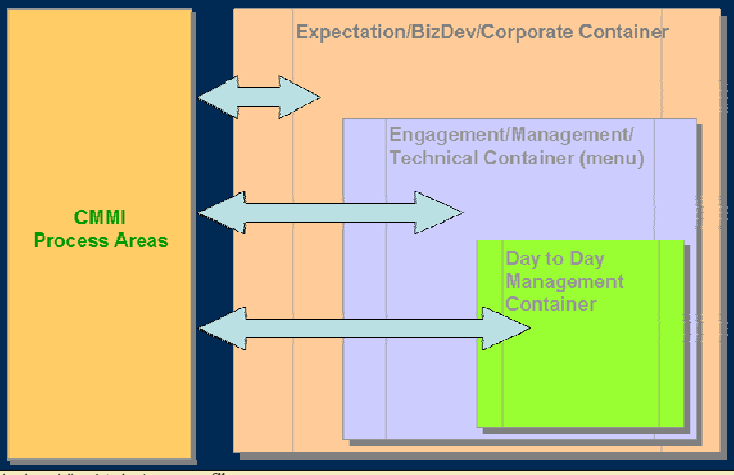
Instead...

▲ Life Cycle Approach with *Process Solutioneering*™ (Patent Pending)

Cascading Life Cycles™



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Process Flow-Down

(Patent Pending)

Policy — Establishes that company projects will adhere to formal processes and states company's policy for quality values, quality work, and how these align with the company's mission and vision.

Quality Manual — Outlines what company does to ensure on-time, on-budget, fully featured/functional projects.

Business Life Cycle — Contains the phases of every project @ company and scopes activities and deliverables within each phase. Establishes each project's parameters.

Proj/Tech Life Cycle (menu) — Contains a menu of management or technical activities that each project can choose from as appropriate. Each project is required to identify a life cycle. This menu provides the list of what can be in a life cycle.

Daily Management — Contains how projects are carried-out.

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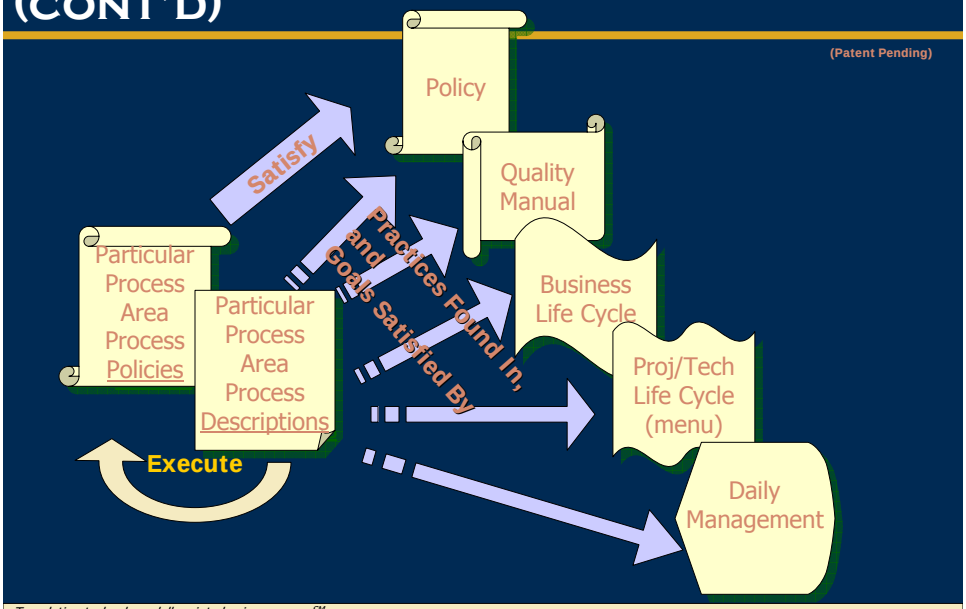
Process Flow-Down (cont'd)

(Patent Pending)



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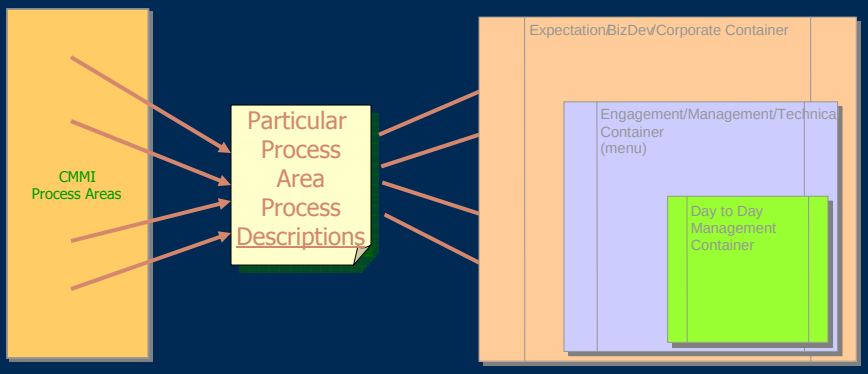
Key Feature

(Patent Pending)

▲ Process definition/description documents define where in YOUR reality practices take place.



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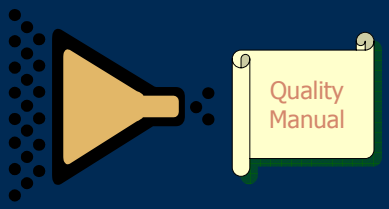
What's in the Quality Manual?

(Patent Pending)

- **Explains how on each project, all company Processes:**
  - are planned-out and tailored from a single set of company processes
  - are assigned as someone's responsibility
  - are provided resources to be done
  - are assured of having people trained in them
  - have their work products configuration controlled
  - involve relevant stakeholders
  - are monitored & controlled
  - are objectively evaluated against applicable standards,
  - have performance reviewed with higher management, and
  - incorporate lessons learned for improvement



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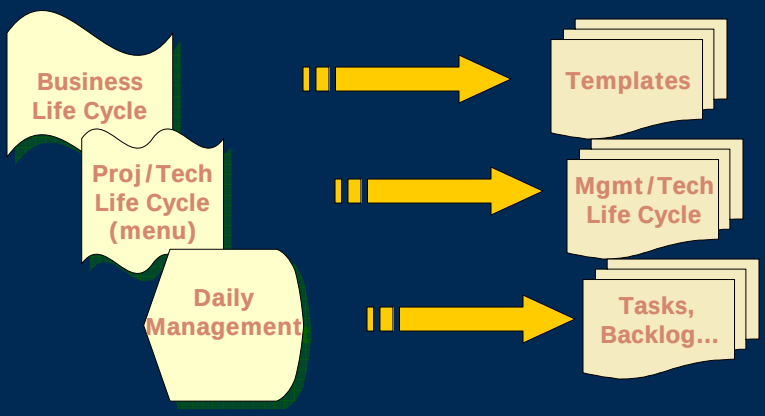
Work-Product Generation

(Patent Pending)



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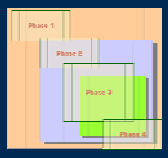
Work-Product Interactions

(Patent Pending)



Templates

Filled-in on

Mgmt/Tech Life Cycle

Carries out

Tasks, Backlog, ...

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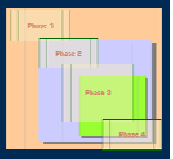
Summary 2

CMMI

- Requirements Management
- Project Planning
- Project Monitoring & Control
- Measurement & Analysis
- Process & Product Quality Assurance
- Configuration Management

Happens Here:

(Patent Pending)



Templates

Engineering Life Cycle

Backlogs & Peer Reviews

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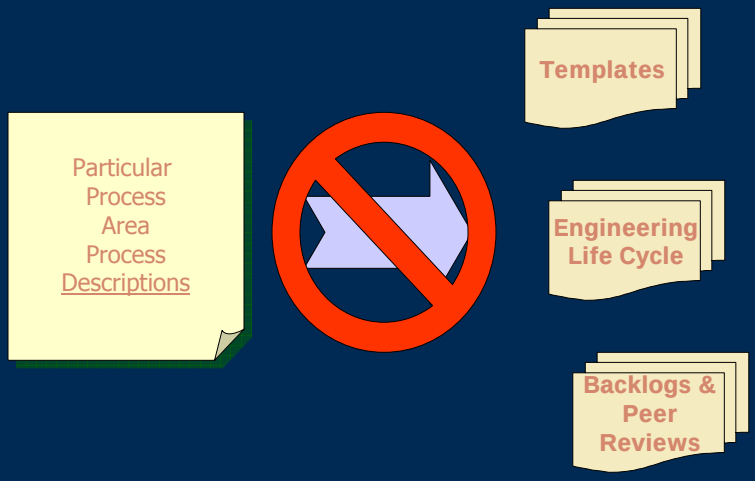
What's Not Here

(Patent Pending)



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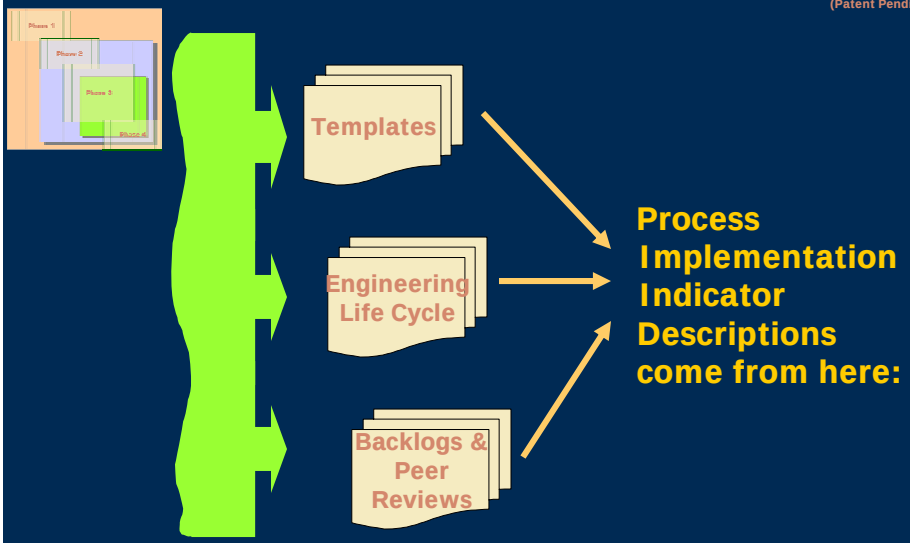
At the Appraisal

(Patent Pending)



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… AND WITH

- ▲ Keeping an eye on profit/waste when designing processes…
- ▲ Ensures processes are not over-designed.
- ▲ Ensures processes are tied to business needs.
- ▲ Ensures processes affecting profit are included.

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BENEFITS

- ▲ Uses realistic product, project and process life cycles.
- ▲ Puts recurring practices in one place.
- ▲ Distributes practices into life cycles.
- ▲ Invokes relevant practices at their point of use.
- ▲ Causes $\lim \Delta\delta(\text{productivity}) \rightarrow 0$
- ▲ Most likely to still be in-place after the appraisal = long-term ROI

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Silver Lining?

- Less Disruption and More Productivity Requires:
  - More up-front process design.
  - Deep understanding of Company Context:
    - Technology
    - Processes/Practices
    - Culture
    - Project types and style
    - Customers
  - Deep understanding of CMMI.
  - Deep understanding of SCAMPI process.
  - More work by the appraiser.
- Lasting results and *real* ROI require *real* investment and *real* discipline.

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Approach Summary

- **Process Silos** = *Bureaucracy*, wasteful, or Overlaying processes onto work you're doing strictly for the purposes of generating evidence, thus adding overhead and disruption to productive/billable work. Increased *production* without necessarily increasing *productivity*.
- **Process Solutioneering™** = *Designed Processes*, or Mapping your "reality" to CMMI. Wherever practices or alternatives aren't done, they are added consistent with value-added productive work.

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Solutioneered Process vs. "Process Silos"

- Solutioneered Processes
  - Lasting Benefits and ROI.
  - Can be appraised repeatedly without re-inventing evidence.
  - Requires up-front process engineering.
  - Requires expertise in CMMI and company's operations.
  - Can cost more up-front.
  - Establishes foundation of improvement.
  - Appraisal simply looks at ordinary output of processes.
- Process Silos
  - Focused on getting through the appraisal (only).
  - Short-term results.
  - Requires less expertise.
  - Can be faster and cheaper (sort term).
  - Each appraisal requires renewed preparations.
  - Staff perceives effort as "make work" w/no value added.
  - Difficult to connect appraisal results to actual improvements.
  - Appraisal looks at data created just for the appraisal.

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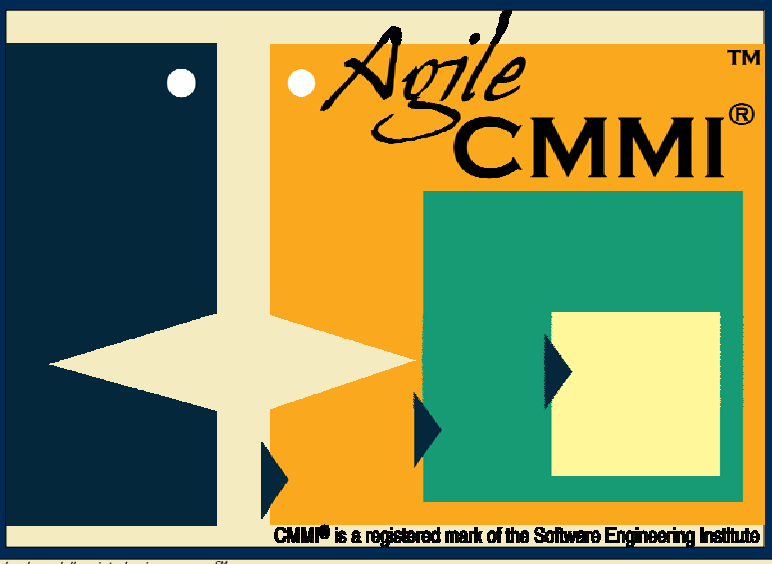
We call it



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How we run it &
What we look for

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How it Works

- Start w/a Kick-Off
  - Explain what we're up to and why
  - Provide CMMI® *Crash Course™*
  - Describe the Goal Analysis process
  - Describe what the Goal Analysis leads-to
  - On-site 1-4 days

Conduct Interviews

- Not focused as much on:
  - 'evidence' as much as on existence or absence of practices
  - Not focused as much on process areas as on practices
- Looking for your "hidden" processes.
- Starting the search for your underlying process architecture.

Interviews to Find

1. Do you have a written process that calls out a practice and is there indication that you follow it?
2. Are you performing a practice even though you don't have it formally defined?
3. Neither 1 nor 2.
4. It's not formal, and it's not exactly "done" but if you talk a lot and we look in enough haystacks it starts looking like you're doing it.

Goal Analysis Outputs

- Goal Analysis report
- Strategy
- Road Map
- Action Plan
- Cost Proposal

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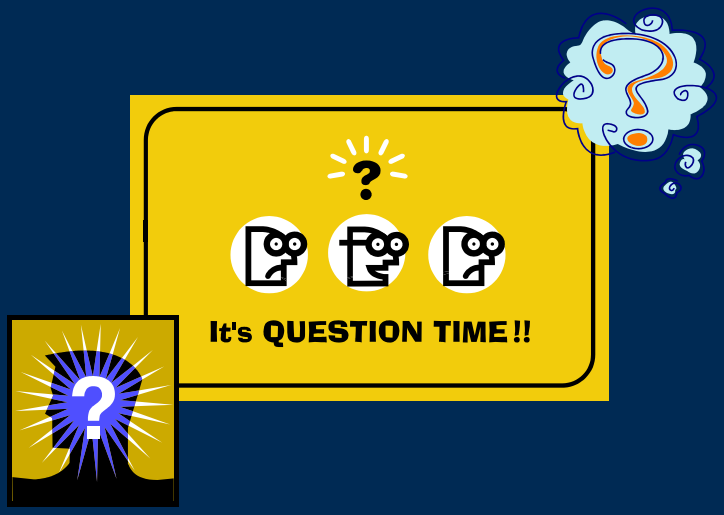
Questions?



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Resources

- CMMI-DEV, v1.2
  (TR CMU/SEI-2006-TR-008, ESC-TR-2006-008)
- **A**ppraisal **R**equirements for **C**MMI
  (TR CMU/SEI-2006-TR-011 ESC-TR-2006-011)
- SCAMPI Method **Def**inition **Doc**ument
  (HANDBOOK CMU/SEI-2006-HB-002)
- *Introduction to CMMI*
- *Intermediate Concepts of CMMI*
- *Introduction to CMMI Instructor Training*
- *SCAMPI Lead Appraiser Training*
- ***Authors' and Contributors' Experience***

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Don't forget to write!

Hillel Glazer
Principal & CEO
hillel@entinex.com
1-877-ENTINEX
www.entinex.com | www.cmmifaq.info | www.agilecmmi.com

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